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Subject: Promoting Innovation for NSW Energy Customers - Public Consultation Paper

Thank you for the opportunity to comment on the NSW DER 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 NSW DER Consultation Paper.

As the largest Australian manufacturer of water heaters with products in over 4 million Australian homes, we offer a wide range of traditional and renewable energy water heater models to the domestic water heating market 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 three 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 micro grid systems. CET provides home gateway devices and 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 homeowner, retailer and the grid.

Our references to DER in our response should be read to include both generation and flexible load assets as 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, and 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 and hence grid security of supply.

This experience has given us a unique insight and particular interest into the issues raised in the Consultation Paper and has directed our responses to the questions raised within the paper.

We believe that a highest priority smart meter issue, (issue 1 in our response) is the need for standardised local access, at the smart meter, to real time metering data for use in orchestration of customer DER. It is our experience, having installed thousands of sites of mixed DER, that DER metering costs are a significant impediment to widespread adoption of BTM DER in NSW. Many consumers sites have multiple additional (to the revenue meter) power meters installed in the consumer switchboard for each individual DER. Every additional meter for DER control installed at a customer site can add $500 or more to the installation, with costs reaching into the thousands for sites with multiple meters. Enabling equitable access for DER to local real time metering data will have a positive and significant impact in reducing the costs of enabling DER on customer sites across NSW. This will also accelerate DER rollout across a wider socio-economic demographic. Implementation of this one initiative will save NSW residents hundreds of millions of dollars over the next decade.

The NSW Government has taken a lead role nationally in managing the rapid transition to grid scale renewables under its "NSW Electricity Infrastructure Roadmap". Given the forecast growth in scale of controlled DER, we would urge you to take the same leadership approach and prioritisation in supporting the DER transition.

As this submission has been prepared using the expertise of several 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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Background:

Together, Rheem and CET are already actively participating in the emerging DER market with thousands of mixed orchestrated DER sites, including solar PV, batteries, smart water heaters, HVAC, pool pumps and EV chargers across the NEM. This includes leading the ARENA and Government of South Australia sponsored South Australian Smart Network Program, which is targeting the aggregation of hot water, air conditioning and pool pumps in 2,400 homes. Through this experience, we have identified and resolved many issues around how mixed, smart DER sites can be orchestrated to achieve the best financial outcomes for consumers and electricity retailers, whilst providing a foundation for grid support services.

We support the aim of this consultation process *"to identify reforms to improve customer access to and uptake of new energy technologies and innovation"* and agree that *"A key role ... is to provide a pathway to deploy existing and emerging technologies at scale ... and to remove barriers for these technologies ... improving speed and scale of take-up".* We would suggest that our experience has given us a unique insight into the issues delaying widespread and economically sustainable consumer DER uptake.

In our responses below we have identified several issues that we believe the NSW government could play a lead role in resolving. We have restricted our responses to those areas where our experience is most relevant.

We should note that the Consultation Paper is referencing the forecasts from AEMO's 2020 Integrated System Plan (ISP). You may be aware that an updated 2022 ISP was issued in draft on 10 December 2021[1]. AEMO's "Step Change" scenario has now become their most likely scenario for planning purposes. This scenario forecasts a 5-times increase in DER capacity by 2050, with rooftop PV increasing nationally from 15GW to 69GW. If this increase is replicated in NSW it would equate to an estimated 17.7GW (a higher PV capacity than quoted in the Consultation Paper).

There are two key quotes from the ISP that are worth highlighting:

"The most pressing need in the next decade is.....to manage daily variations in fast growing wind and solar output.....modelling forecasts that VPPs, vehicle-to-grid (V2G) services and other emerging technologies will provide approximately 30GW of dispatchable storage capacity, and utility-scale battery and pumped hydro storage 15GW";

and

"Increasingly active management of consumer devices (through smart, cloud-connected and rule-based devices) will reduce the scale of utility-scale investment needed to maintain the reliability and security of the system. This in turn depends on greater consumer adoption of those smart technologies, with support of retailers, networks and other market participants."

[1] https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp

Taken together we can assume that controlled DER is forecast to provide double the dispatchable capability of grid scale solutions, and that there is some urgency for the issues raised in the Consultation Paper to be agreed.

Responses to Questions

Issue 1 - Meter Costs to customers

In its "State of the Energy Market 2021" report, the AER noted that "The ESB considers that current market arrangements, along with those for metering and connection, do not adequately support consumers wanting to participate in the (energy) market and are complex to navigate". We believe that there are several key issues that were given insufficient consideration by the NSW Government in its 2012 Smart Meter Task Force process or the "Power of Choice" Process:

- Local access for consumers (or their appointed agent) to real time metering data. It is our experience, having installed thousands of sites of mixed DER, that DER metering costs are a significant impediment to widespread adoption of BTM DER. In our experience many consumers sites have multiple additional (to the revenue meter) power meters installed in the consumer switchboard for DER orchestration. This can add many thousands of dollars to DER installations. These additional power meters are necessary as there is no standardised, local access available to real time metering data from smart revenue meters. A change in smart revenue meter minimum technical specifications and associated rules changes in the NER to enable local, real time, (minimum 1 second polling) read only local access for consumers to their own metering data would deliver significant savings in DER rollout, supporting DNSP market reform initiatives such as Dynamic Operating Envelopes (DOE's). As a minimum we see the follow changes are necessary:

    - Physical multiuser read only access via industry standard Ethernet / TCPIP. (Such access should not require an electrician for connection of a double insulated Ethernet communications cable to an accessible port on the front of the smart meter).

    - A published standards-based protocol with key request from the metering coordinator for FOC access to enable real time, read only access to power / energy data. (Such data access may be extended to enable further grid services the consumer wishes to participate in such as contingency FCAS).

    - Changes to the NER (Ref 7.15.4) such that the "small customer" (or their appointed agent) is included in the list of parties that is authorised for read only access to smart meters locally.

    The changes detailed above are not costly to implement. All smart meters have an existing communications port and support local access. However, even if the necessary changes to the NER and software, security and communications protocols were enacted, the physical access (on current smart meters) requires removal of a sealed cover by a level 2 ASP (Accredited Service Provider) /electrician, which is a

significant cost impediment to the consumer. This physical access would need to be changed in line with the first dot point recommendation above.

- The speed of the rollout and penetration. The current rate of smart meter deployment is inadequate to support the current DER transformation. This has been acknowledged by the AEMC in its Metering Directions Paper[2] and has been largely attributed to the to the one-by-one smart meter approach for new or replacement meter installs. The current arrangements provide little incentive for retailers to proactively replace existing meters with smart meters. However, the AEMC has not considered a mandated mass rollout as one of the options to resolve this. Any mass rollout should not be enacted prior to changes to the minimum technical specification as detailed above.

- Lowering the cost of installing smart meters. The greatest cost savings for smart meters can be achieved though leveraging economies of installation scale, which are not achievable under the current one-by-one meter install approach by retailers. A mandated, area by area approach would introduce significant economies of scale, most notably in reducing travel times for the installers and planned outages. Additional savings could also be achieved through a different technology approach as discussed at Issue 2 below. Further, site wide savings can be realised in the enablement of consumer DER whereby one meter, the revenue meter, can provide the real time data locally to enable all site BTM DER orchestration.

While the AEMC appears to be considering incremental refinements to metering related regulations, no evidence is presented by the AEMC as to how these proposed refinements would overcome the key identified barriers. Accordingly, we believe that NSW should give due consideration for DNSPs to control or manage a universal, mandated smart meter rollout in NSW.

The effects and benefits of BTM DER are realised by the generators, TNSPs and DNSPs, irrespective of customer mobility between retailers and aggregators. In recognition of the critical role of smart revenue meters to the energy transition, consideration should be given to reverting the responsibility of smart revenue meter roll-out to DNSPs. DNSPs, working within geographic boundaries, can more efficiently prioritise the roll-out of smart meters, according to network requirements, than retailers who deal with a customer base spread across regions. The ability of a DNSP to prioritise and also to achieve economies of scale in installation are significant.

[2] Australian Energy Market Commission "Review Of The Regulatory Framework For Metering Services" 16 September 2021

Issue 2 - Meter life and redundancy charges

The meter-by-meter approach currently in place has necessitated the use of telecommunications services provided via the mobile phone carriers. This is due to the low density of smart meters, which precludes the use of lower cost RF mesh telecommunications. This was the finding of the AER in their assessment of the costs of the one Victorian provider who used mobile cellular technology when rejecting a portion of its requested cost recovery for Smart Metering[3]. This automatically increases the overall cost of smart metering to consumers via:

- 'Obsolescence by design', as smart meters use iterations of 3G/4G and now 5G mobile technologies. This means that smart meters will need to be replaced much more frequently than a normal meter, and accordingly the cost recovery over time will need to be higher.

- The higher cost of using mobile carrier provided telecommunications services in NSW relative to the lower per unit RF mesh based telecommunications used by a majority of the Victorian DNSPs as part of their mandated Smart Meter Rollout.

Issue 3 – Solar Connection Delays

A mandated smart meter deployment (along with local, real-time access) would resolve this issue, and also bring forward the benefits of Dynamic Operating Envelopes and controlled DER much more quickly

Issue 7 – Hot Water Embedded Networks

Rheem supplies a number of centralised plant water heating solutions (using either solar thermal or solar PV technologies) that can provide water heated from renewable sources for multi-unit dwellings.

Where this option is not available (mainly in a retrofit situation), Rheem believes that the integration of a controllable central water heating plant to a broader network can result in embedded networks participating in the benefits of the two-sided market. In fact, the variability in usage arising from aggregated multi-unit dwellings in a single building replicates the benefits of a grid wide aggregated approach to opportunities such as demand response control.

As the consultation identifies, there are several issues that will need to be addressed, however the key would appear to be identifying a cost-effective method for metering the water heating energy usage (or water volume via flow meters) of individual units within a multi-unit dwelling that could match time of energy use with the cost of energy. Adding control to the

[3] AER "SP Ausnet AMI budget and charges determination 2012-2015" https://www.aer.gov.au/news-release/aer-rejects-big-increases-in-sp-ausnet-smart-meter-expenditures

centralised, storage water heating equipment can further reduce costs by buffering the need for water usage from peak grid energy times through energy load shifting to match renewable sources.

In the absence of such a metering system, the fallback would be to require all unit owners to pay equally for any benefits arising from their central plants participation in grid events.

Issue 8 – DER in NSW

Issue 8 a, b, c

We are generally supportive of the proposed guiding principles for DER. In particular, the proposal for additional market mechanisms that provide economically efficient price signals to the market.

What appears to be lacking at the present time is an appropriate incentive that would encourage investment in non-network solutions, that would reward DER customers for fleet wide control. The current demand management innovation allowance (DMIA) does not seem to be delivering the required outcomes to consider broader non-network solutions.

The value of controlled DER in the NEM has been calculated in a report by Baringa commissioned by the Energy Security Board[4]. That report found that controlled DER (via VPPs) could provide a benefit across the industry of $6.4 Billion by 2039. Those benefits included DNSP and TNSP benefits that could justify specific payments to be provided to the owners of the controlled DER. The key mechanism recommended for this in the report is flexibility payments made by the DNSP and TNSP to avoid transmission investment, with an estimated value of $50,000 per MW per annum.

Rheem has invested considerable effort in developing a sustainable business model for controlled DER and in overcoming several key issues to access the full "value stack" across the different industry segments, for consumers. This value stack includes opportunities to participate in FCAS, the two-sided market, retail arbitrage and the mitigation of networks' minimum and maximum demand.

The key barrier to scaling controlled DER is that the cost of establishing and maintaining the controlled DER capability is often larger than any one benefit category. This leaves little incentive for the DNSP, retailer, or aggregator to be the "first mover". As a result, these benefits need to be value stacked by an aggregator via commercial arrangements with multiple beneficiaries. This complex issue has been recognised by the AER[5].

Rheem has been fortunate that it's controlled DER trial[6] in South Australia has allowed us to work with SA Power Networks and retailers to realise and share some of the benefits of

[4] Baringa "Assessment of Open Energy Networks Frameworks" May 2020
[5] AER "Consultation paper Demand management incentive scheme and innovation allowance mechanism" January 2017
[6] https://arena.gov.au/blog/rheem-hot-water-systems-set-to-soak-up-sa-solar/

controlled DER. However, our experience of attempting to use a similar model with DNSPs (including in NSW) has not resulted in similar benefit realisation opportunity for consumers.

We would urge the NSW Government to use its position as a major shareholder in NSW DNSPs to seek the testing of a market mechanism, similar to the UK Flexibility Mechanism. This market mechanism available to UK DNSPs has grown from 1GW under control in 2020 to 3GW in 2021. While only a modest proportion of this is currently being met by household VPPs, this is expected to grow significantly.

Issue 8 d

The major barriers to expansion of controlled DER have largely been identified by the ESB under its DER Implementation Plan[7]. We are, however, concerned that the ESB does not appear to be on track to meet its own targeted milestone dates, and that much more urgency is required to meet its commitments. Further delays could result in triage style policy decisions that further entrench the status quo, with any short-term measures needing to inevitably be unwound.

Other barriers to be considered include:

- Lower cost and faster mandated rollout of smart meters (refer to issues 1 and 2 above).
- Local access at no charge to real-time power and energy data at the smart revenue meter for aggregators, leading to the reduction in duplication of metering costs for export limiting and dynamic operating envelopes at a customer site.
- The extension of DER incentive schemes currently focused on batteries to include other smart household appliances. This will enable wide socio-economic penetration in NSW homes of DER (flexible load and generation) and not restrict participation to only those households that can afford solar PV and batteries. These schemes include the NSW Government's Empowering Homes Program and the cancelled Smart Energy for Homes and Businesses Program. Extending these schemes to include DER appliances such as smart hot water, HVAC and pool pumps would achieve similar outcomes and savings to batteries, but at a much more efficient cost/benefit than the incentivising of batteries. Such a change could make the benefits of controlled DER accessible to every NSW household and could be used to support the infrastructure needed for the future controlled/orchestrated charging of EV's. Further, DER (generation and flexible load) participating in such incentive schemes should as a minimum be required to support open, standards based local physical interfaces, and open, standards-based communications protocols, giving access to fully featured monitoring and control of the DER.

[7] Energy Security Board "Post-2025 Market Design Final advice to Energy Ministers" August 2021

Issue 8 e

The Consultation Paper identifies a risk that DER may produce inequities amongst consumers as some household segments do not have access to low-cost rooftop PV, however we are concerned that this risk should not translate into the NSW Government disincentivising any consumer investment in DER.

Remotely halting household PV generation or limitations on the size of customer PV installations will slow the installation of DER, but are unlikely to lead to more equitable outcomes for disadvantaged consumers. To the contrary, we believe that any increased take-up of DER will likely lead to lower overall costs for all energy consumers – as long as flexible load is more adequately incentivised both in terms of upfront costs and ongoing reward for flexibility. The NSW net zero emissions targets will drive increased electrification of appliances, and large amounts of solar PV energy will be required to charge these devices. Regulators can play a significant role in encouraging DER that provides the best cost-benefit outcomes for both consumers and the grid. Ubiquitous appliances like water heaters are needed in every Australian household. A smart electric water heater has a much better rate of return as a grid asset than a household battery. Incentives that mitigate the incremental cost only of a smart water heater over a standard water heater are an excellent investment with a high rate of return as a grid asset. They also provide extra returns to the consumer in terms of self-consumption and storage of rooftop solar PV energy, or lower cost grid energy during the solar period for those without their own rooftop solar PV.

While South Australia has introduced a minimum requirement for rudimentary remote PV production management, they have announced this will soon be replaced by a requirement for remote export limiting (zero or dynamic value). This architecture aligns with AEMO's objective for DNSPs to have Dynamic Operating Envelopes and avoids the inequitable situation of the customer having to pay for grid electricity when they have invested in a PV system. It also maximises the generation of renewable energy for net zero objectives.

The infrastructure platform used for DOEs can also be used to provide demand response services and DER participation in the future two-sided market. This will have the dual benefits of bringing additional financial benefits to customers, maximising the use and storage of PV production, and will provide a capability that could be extended for localised demand / supply balancing for the DNSP.

Issue 8 f, g

The draft 2022 GenCost Report[8] forecasts a further 65% decline in the cost of rooftop PV by 2050. Accordingly, rooftop PV systems will continue to grow in capacity and will continue to deliver the lowest cost energy to consumers. In jurisdictions such as South Australia this preponderance of PV is already providing negative wholesale pricing for 15% of the time.

This excess of low-cost PV energy, along with proposed tariffs that encourage "shifting" times of energy usage, usually results in a call for the increased uptake of household battery

[8] Graham, P., Hayward, J., Foster J. and Havas, L. 2021, GenCost 2021-22: Consultation draft,

storage. However, the high up-front capital cost of batteries, as well as the questionable payback for all but the largest energy users, does not make this a realistic option for most households. The promise of controlled electric vehicle charging is also subject to the same barriers for many households for at least the next decade. So this leaves the question as to the most appropriate option for the majority of Australian households to:

- Maximise use of their own solar PV generation, rather than export it for minimal benefit
- Enable a non-DER household to take advantage of a lower cost tariff offering during the middle of the day (such as the "SA Solar soaker" tariff)
- Take advantage of the benefits of the emerging two-sided market for energy including "turn down services"

Rheem considers that more attention should be given to the opportunities presented by other flexible load appliances such as smart water heaters, HVAC and pool pumps. Due to the broad penetration of these devices in Australian households, they offer greater opportunities than batteries in the short to medium term to manage future grid constraints, especially in maximising self-consumption of household solar PV 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 eventually be phased out because of decarbonisation targets, electric water heaters are likely to play an even greater role in the grid in coming years. Water heaters also represent an affordable entry point for consumers wishing to participate in the monetisation of demand management.

It is also important to note that the daily energy consumption of the average resistive storage hot water system (11.7kWh for a medium sized household) is actually higher than the daily forecast for EVs (5.4kWh), so using renewably generated energy for water heating will be a key objective over the coming years.

Rheem has invested considerably in the opportunities presented by smart, remotely managed water heaters, resulting in some clever digital innovations. In particular, we have developed the capability to vary the input power to a water heater instantly to match the highly variable nature of household DER, thus maximising the use of free, excess solar PV. These capabilities are now available in the Rheem / Solahart PowerStore range of water heaters, of which there are now thousands being remotely monitored and managed throughout Australia.

The key attraction of using a water heater as a "thermal battery" for excess PV generated energy is the cost/benefit of this technology relative to batteries.

Using industry standard calculation methods, our own analysis found that our PowerStore product is able to achieve 55% of the financial benefits of a 14kWh battery for 10% of the cost.

A 4.8kW PV system could supply up to 90% of the energy consumption of a water heater - energy that would otherwise currently have been exported to the grid for a feed in tariff. However, under the Access and Pricing rule change, during the next regulatory period, excessive export beyond 1.5kW during the solar minimum will incur a charge (two-way pricing). Self-consumption becomes even more financially attractive for consumers. Independent analysis has identified that a 5.4kW PV system should provide 95.5% of hot water energy requirements. It is worth noting that both of these figures are dating rapidly, as the current average new PV array size installed in Australia is now 8.9kW. [9]

The incremental upfront cost of the extra technology in a smart water heater, including control and communications hardware suitable for whole of home DER orchestration, has a relatively low payback period of around five years. But this incremental cost is enough to deter many consumers from investing in the grid-friendly technology. Our objective is to make this payback even shorter when combined with the "value stack" of future controlled DER benefits from including realising network benefits, FCAS, and participation in two sided markets.

We do note that the NSW government has recently expanded its Solar for Low Income Households program, which does provide a potential solution for the most socially disadvantaged. We believe, however, that the forecast reduction in the cost of PV, and future controlled DER benefits, will provide innovative opportunities for most households to participate in the next generation grid.

Issue 8 h

In addition to the forecast reduction in the cost of rooftop PV noted above, aggregated, controlled, smart hot water is likely to offer the most cost-effective solution to address the minimum demand issue. With the AER's stated intention to move away from controlled load alongside the introduction of cost reflective tariffs, in combination with AEMC's two way pricing rule change and DNSPs moving to implement Dynamic Operating Envelopes (DOE) at the NMI, smart water heaters that ensure consumer amenity and legionella sterilisation in parallel with enhanced solar self-consumption and participation in grid services, will play a significant role in grid security of supply. Rheem has modelled the storage capacity for New South Wales using a scenario that envisages all existing storage hot water systems being removed from controlled load circuits and replaced with smart water heaters, under HEMS orchestration, over the next 15 years. Our modelling indicates that a fleet of smart water heaters, such as our PowerStore range, operating on cost reflective tariffs under HEMS orchestration with other site/home DER enabling a DOE, would have a load shift capability of 4.7GW and a daily storage capacity of 11.6GWh. Smart water heating can be deployed at a fraction of the cost of an equivalent household battery. With comparable capability, this solution is far more realistic for all socio-economic demographic groups.

[9] Sunwiz "Executive Insights" Solar Market Report December 2021

Issue 9 – Enabling Dynamic Operating Envelopes (DOE)

The ESB considers DOE as an essential tool to manage the distribution network of the future:

"emergency backstops (such as remote production stopping) are a blunt instrument and need to be complemented with ..... implementation of enduring solutions such as dynamic operating envelopes and two-sided market reforms."[10]

There are several important issues that need to be addressed for successful implementation of DOE, and which equally apply to Dynamic Export Limiting of PV.

Rheem believes that the priority for the NSW Government should be to support a "whole of home" orchestration approach. This is the only approach that can enable a site wide DOE as supported by the AER and DNSPs. This contrasts with the alternative approach involving the control of individual DER by different providers which has multiple suboptimal outcomes for the consumer and grid security of supply.

Rheem currently controls the DER of thousands of homes across Australia via a Home Energy Management System (HEMS) at each site, typically supporting a combination of DER. HEMS is implemented via a site edge gateway that orchestrates the site DER and provides a single-entry point to the site for the purposes of "whole of home" DOE implementation. DER under orchestration includes Rheem PowerStore smart water heaters, solar PV systems, storage batteries, pool pumps, EV charging, and HVAC appliances. Our systems support visibility, logging, individual and aggregated orchestrated control over all sites (at the NMI), both individually and under fleet wide aggregation, with real time connectivity to our aggregation platform.

This experience has given us a unique insight into the future potential of DER control, including the need for continual refinement of algorithms to improve on the objective of maximising consumer benefits. Importantly, we take a "Whole of Home Approach" to site wide orchestration of DER where all DER on the site (both load and generation) is orchestrated by a HEMS gateway. This enables the home grid footprint to be adjusted on a real time basis, with the HEMS making the necessary adjustment to all DER to achieve the desired "Net Power Flow" at the NMI. The result is that any negative impact on consumer amenity is minimised, and financial outcomes are maximised, all whilst maintaining grid support.

A number of our sites contain battery installations that are separately controlled by a different operator (i.e. – the batteries are NOT part of the HEMS site orchestration of DER as the OEM has not enabled local, standards-based control access). Based on our experience, the control of individual DER by multiple operators has a negative impact on consumer financial outcomes and impacts grid security of supply. The approach is also incompatible with a DOE. We have direct examples of how this "split control" approach has resulted in sub-optimal financial outcomes for the consumer and caused grid security of supply issues. We have provided a real-world example below (see annexure A) to illustrate the negative impact of individual DER control by different operators on consumers. These indicate that the battery is diverting

[10] ESB Op Cit

excess solar PV needed by the water heater, only to see the battery discharging back into the water heater. This unnecessarily cycles the battery, reducing its life and incurring efficiency losses of power transfer in the process.

We also have field evidence that indicates that direct grid services commands to individual DER that are not included in whole of house orchestration will create poor outcomes. For example, a remote command to discharge a battery for grid support (e.g. FCAS), where that battery is NOT part of the DER orchestration by a HEMS, may immediately illicit a HEMS response to turn on water heating, or other active load, as the HEMS (wrongly) believes there is excess power flow to the grid that can be used. This mitigates the energy response being supplied to the grid by the battery.

Issue 9 a

We do not support encouraging customers to limit the size of their PV system. See our response to Issue 8e above.

Issue 9 b

We do not believe there would be a risk to grid security if DOE and Dynamic Export Limiting is broadly adopted or mandated. Noting that DEL is simply a subcomponent of a DOE. Broad adoption would be more likely with a Market Mechanism as discussed at issue 8 a.

One major security issue that does need to be addressed as a matter of urgency is the large and growing number of PV inverters, battery inverters and other DER assets that are ultimately controlled in aggregate via a DER device OEM cloud platform 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 DNSPs 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.

Issue 9 c.

See our response to issue 8e above.

Issue 9 d.

DOE can be best supported via:

- Supporting standards based DER interoperability as discussed in our response to Issue 10
- Supporting a "Whole of Home" approach which enables a DOE, as discussed in our response to Issue 9.
- Providing incentives to encourage the faster take-up of lower cost smart metering, and ensuring minimum technical standards for local real-time access to metering data, as discussed in our responses to Issues 1 & 2

Issue 9 e.

Rheem recommends

- Clear and readily available education to consumers regarding controlled DER
- A mandate for open standards to prevent customer "lock-in"

Issue 9 f.

These issues are typically not NSW specific. The exception is the potential for NSW DNSPs to control or manage a universal and mandated smart meter rollout.

Issue 10 – Quality Standards and Compliance

Rheem and CET are founding members of the ANU chaired IEEE2030.5 (SEP 2.0) CSIP-AUS working group that has produced the CSIP-AUS implementation guide. We are working with SA Power Networks (SAPN) to implement DOEs at homes/businesses via an IEE2030.5 (CSIP-AUS) connection between our Consumer Self-Install Energy Management Unit (EMU) at the home and the SAPN DERMS, ahead of the formally required implementation from 1 July 2022.

We support the NSW Government view that mandating standards for DER will "enable customers to derive the maximum benefit from DER and provide the most benefit to the distribution network". We note that this is an area that has been prioritised by the ESB as a Horizon One activity under its DER Implementation Plan10[11]. We believe that standards will enable a customer to churn to the energy market service provider of their choice preventing customer "lock in", particularly if a provider exits the market. In this way greater levels of competition and innovation can be introduced to the benefit of consumers. Consumers in

[11] Energy Security Board "Post-2025 Market Design Final advice to Energy Ministers" August 2021

general are unaware they may be locked into their current provider, which stifles innovation and competitive market offerings.

One way that the NSW government could support this initiative is to mandate the following requirements for its own DER programs (for example, Empowering Homes, Solar for Low Income Households, Smart Batteries for Key Government Buildings). This would provide incentives for DER equipment providers to bring forward these standards into their equipment:

- compliance with IEEE2030.5 (CSIP-AUS) for site backhaul of a single DER on a site or edge gateway supporting CSIP-AUS where multiple DER exists on a site. This will provide the foundation for further site wide orchestration of DER and the implementation of Dynamic Operating Envelopes (DOE).

- requiring all solar PV inverters / battery inverters to include a physical means of enabling external communications with the inverter, such as Ethernet or RS485. This readies the site for the option of solar PV export control, future dynamic operating envelopes, and intelligent site wide interoperable DER orchestration. This requirement would overcome the considerable connectivity issues we have seen in the market with systems that rely on Wi-Fi and systems that provide no local control interface.

- All solar PV inverters / battery inverters should have their external communications protocols enabled by default when sold, and free of any additional fees. It is our experience that almost all solar PV inverters and battery inverters support Sunspec Modbus (or a close variant), as a means of controlling inverter functions, such as output power settings, including export control settings. However, this functionality is often disabled by the manufacturer by default and requires enablement at time of installation (by a suitably qualified person) or it requires a site visit at a later date.

Rheem would caution the NSW government against mandating DER standards without taking a considered view of the market in which they operate. For example, the current development of AS/NZS 4755.2 will result in a workable demand response standard for water heaters, however there is a negative cost/benefit and major impacts on consumer amenity if the standard is applied to electric water heaters up to and including 120L capacity products. Rheem considers the additional cost to consumers that would arise from mandating the standard, on products that would be unlikely to ever be used for DER purposes, would be counterproductive in gaining consumer acceptance of the benefits of DER and an integrated grid.

Issue 10 a. b. c. d

If the communication protocols noted above are mandated and each PV, battery or EV charger install requires the nomination of a Relevant Agent (as in SA) then many of these issues could be addressed by the Relevant Agent. We do not believe that DNSPs are best placed to manage this issue on a daily basis, however supportive statements calling up interoperability and open standards for connectivity could be embedded within DNSP network connection agreements. There is precedence for such an approach with AS4777.2:2020 being called up in the NER from 18 December 2021, placing an obligation (enforced by the AER) on DNSPs to ensure compliance with the standard via their network connection agreements.

Issue 11 – Improving the visibility of residential DER and data management

Widespread deployment of smart meters that are controlled by and visible to DNSPs, and that enable local data access to approved DER aggregators or orchestrators, would largely resolve the issue of greater visibility of DER fleets and their impact on the network.

By moving responsibility for smart revenue meter provisioning and roll-out to DNSPs, and by giving full rights of access to local, real-time metering data to consumers, all industry service providers will be able to compete equitably. Enhanced market competition will drive efficiencies in costs and increase revenue to consumers arising from the full ownership and control of their DER, and the meter data required to orchestrate it for HEMS and grid services.

Issue 12 – Community Batteries

We have not yet seen evidence that community batteries are financially viable. Their viability is impacted by the current regulatory arrangements in the NEM that require that energy being stored in front of the meter is subject to DUOS charges, to both charge and use the energy from a community battery[12]. There are also question marks about whether the claimed economies of scale for community batteries, compared to residential batteries, can be achieved[13], due to their use of third-party land and the cost of planning and development approvals.

We would suggest that more equitable outcomes would be achieved for NSW households if the focus was on broad and universal controlled DER that was technology agnostic, as discussed at Issue 8 above.

[12] Energy Security Board note on the ITP Distribution Level Storage Report. https://prod energycouncil.energy.slicedtech.com.au/distribution-level-storage-report

[13] https://reneweconomy.com.au/battery-storage-will-force-us-to-rethink-network-tariffs-and-structures/

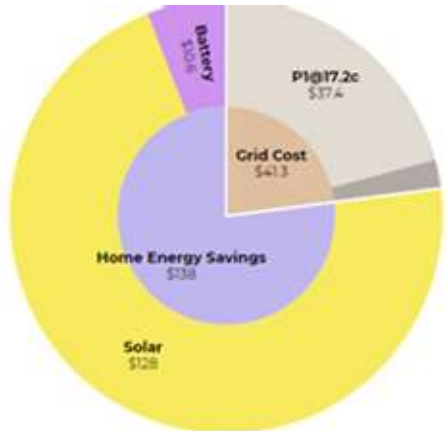
ANNEXURE A

Example 1 – Multiple control pathways into a home

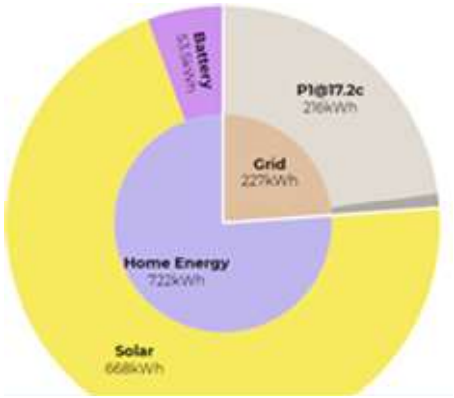
Warrandyte Victoria – Hot Water data for 6 months to 27 May 2021

This home has a HEMS system that is provided by Rheem. The DER capability of the home includes: 5kW solar system, 3.6kW PowerStore Hot Water and a 14kWh battery which is NOT controlled by the Rheem HEMS. During this 6-month period 948 kWh of electricity was used for water heating, with 53.5 kWh of this sourced from the battery. The home energy savings of $138 has 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



	$	
	169 days	Daily Ave
Grid Cost	41.30	0.24
- P1	37.40	0.22
- P2	3.85	0.02
Energy Savings	138.00	0.82
- solar	128.00	0.76
- battery	10.60	0.06



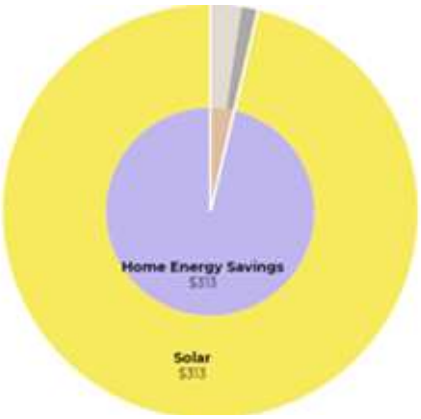
	kWh		
	169 days	Daily Ave	%
From Grid	227.0	1.3	23.9%
- P1	216.0	1.3	22.8%
- P2	10.8	0.1	1.1%
From solar	668.0	4.0	70.5%
From battery	53.5	0.3	5.6%
Total	948.0	5.6	

Example 2 – Whole of site under a single HEMS orchestration for control

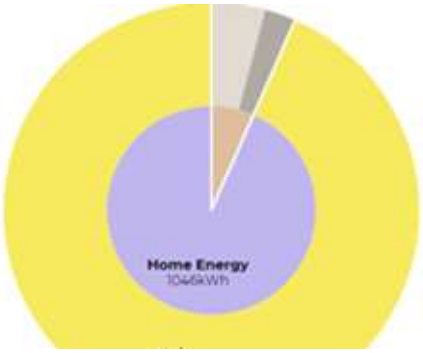
Vermont Victoria – Hot Water data for 6 months to 27 May 2021

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 PowerStore Hot Water and a 9kWh battery which are ALL controlled by the Rheem HEMS. During this 6-month period 1,120 kWh of electricity was used for water heating. In contrast to the individually controlled battery in Example 1, none of the energy for water has come from the battery. Further, as the battery and water heater are orchestrated by the HEMS, there is a more efficient allocation of the excess solar PV such that less grid energy has been used in water heating, despite the site also having a smaller PV system. Control / orchestration of the battery by the HEMS with other DER results in increased (over Example 1) home energy savings for hot water of $313 for the period.

Water Heater



	$	
	169 days	Daily Ave
Grid Cost	12.00	0.07
- P1	7.91	0.04
- P2	4.11	0.02
Energy Savings	313.00	1.73
- solar	313.00	1.73
- battery	0.02	-



	kWh		
	169 days	Daily Ave	%
From Grid	73.9	0.4	6.6%
- P1	47.0	0.3	4.2%
- P2	26.8	0.2	2.4%
From solar	1,046.0	5.8	93.4%
From battery	0.1	-	0.0%
Total	1,120.0	6.2	