

Project EDGE

Public Customer Insight and Engagement Study Interim Report

Version 1

June 2022

**This report has been developed with
the support of:**



Important notice

AUTHORS

Dr. Jay Zenkić

Associate Professor Josh Newton

Dr. Jeffrey Rotman

Dr. Virginia Weber

PURPOSE

This report was produced by Deakin University's Better Consumption Lab and forms part of a broader project examining residential, commercial and industry, and local government perceptions of virtual power plants. This report focuses specifically on residential customer experiences and perceptions.

DISCLAIMER

The views expressed herein are not necessarily the views of the Australian Government. The Australian Government does not accept responsibility for any information or advice contained within this document.

ACKNOWLEDGEMENTS

This project received funding from the Australian Renewable Energy Agency (ARENA) as part of ARENA's Advancing Renewables Program.

This project also received support from Mondo Power and Totally Renewable Yackandandah who facilitated the interviews.

COPYRIGHT

This report is copyright of the authors and Deakin University.

ARENA ACKNOWLEDGEMENT AND DISCLAIMER

Project EDGE received funding from ARENA as part of ARENA's Advancing Renewables Program. The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained herein.

VERSION CONTROL

Version 1.0

ARENA summary

Activity title	Project EDGE
Recipient	Australian Energy Market Operator Limited, in partnership with AusNet Electricity Services Mondo Power
Sub-contractors	Nous Group The University of Melbourne Deakin University Energy Web Foundations Opus One Solutions PXiSE Energy Solutions Ernst & Young
Ref	Public Customer Insight and Engagement Study Interim Report
AEMO contact	Nicholas Regan

Executive summary

Sixteen in-depth, semi-structured interviews were conducted with 19 residents from the Hume region, each of whom had varying experience with virtual power plant trials such as Project EDGE. The key purpose of these interviews was to evaluate the motivators and barriers for joining a virtual power plant and to examine their perceptions of virtual power plants more broadly. Qualitative analysis of these interviews revealed three key themes:

1. Participation was facilitated by non-financial benefits and impeded by upfront financial costs.
2. Energy trading sits at odds with the perception that batteries are a personal energy asset.
3. Mondo was viewed more as a hardware provider than as an energy aggregator.

These three key themes are briefly summarised as follows.

Participation was facilitated by non-financial benefits and impeded by upfront financial costs. Interviewees were motivated to participate in Project EDGE by a trifecta of non-financial benefits: supporting the community, helping the environment, and enhancing energy self-sufficiency. At the same time, however, the immediate financial costs of participation – represented particularly by the cost of purchasing a battery – was seen as a significant barrier, not only by those who chose to participate but also among those who did not.

Energy trading sits at odds with the perception that batteries are a personal energy asset. While interviewees were broadly supportive of sharing energy with their local community, this support was situated within strict parameters. Interviewees were typically prepared to share or trade their energy only once their own household requirements were assured, and some wanted to place limits on who could receive this energy. At the same time, many interviewees were concerned that their current battery had insufficient capacity to meet their existing needs, let alone to be used to support trading.

Mondo was viewed more as a hardware provider than as an energy aggregator. While interviewees generally held very positive perceptions about Mondo's hardware provision and service, they also expressed concerns about whether a commercial entity could be trusted to sell stored battery power in ways that benefitted both participating households and the broader community. In this respect, interviewees tended to view Mondo as a provider and maintainer of hardware rather than as an energy aggregator.

Please note: the interviewees in this study may have idiosyncratic views specific to their regional communities. Care should be taken when generalising from these findings.

Contents

ARENA summary	2
Executive summary	3
1. Introduction	5
2. Method	6
2.1 Interviewees and Recruitment	6
2.2 Interview Procedure	7
2.3 Data Analysis	7
2.4 Notes on Interpretation of Results	8
3. Themes and Insights	9
3.1 Motivators and Barriers to Joining a Virtual Power Plant	9
3.2 The Importance of Energy Literacy	16
3.3 Hardware Experiences	18
3.4 Energy Trading and Features	20
3.5 Visions for the Future of Electricity	24
4. Summary of Key Insights	27
4.1 Participation was Facilitated by Non-Financial Benefits and Impeded by Upfront Financial Costs	27
4.2 Energy Trading Sits at Odds with the Perception that Batteries are a Personal Energy Asset	27
4.3 Mondo was Viewed More as a Hardware Provider than as an Energy Aggregator	28
5. Future Research	29
6. Conclusion	30
A1. Semi-Structured Interview Questions	31

1. Introduction

Project EDGE is a proof-of-concept trial that is being conducted in the Hume region of Victoria and which is aimed at demonstrating a market-based trading mechanism for virtual power plants. As part of this trial, customers choose an energy aggregator to act as an intermediary between customer-owned energy resources (such as solar photovoltaics and batteries) and the electricity services required by a distribution network service provider. The role of the energy aggregator is to ensure that customers receive benefits for participating in this trading process while also supporting the requirements of the broader distribution network.

An important element in the longer-term success of virtual power plants like Project EDGE is the development of energy offerings that resonate with customers. Deakin University's Better Consumption Lab was consequently commissioned to undertake research to examine the perceptions and experiences of actual and potential Project EDGE participants with a view to identifying ways of maximising the value proposition for joining a virtual power plant like Project EDGE.

This report provides the findings from the first of five planned phases of research involving residential customers. The specific aims of this report were to:

- Understand the motivations and barriers to participating in a virtual power plant like Project EDGE.
- Evaluate the initial experiences of those participating in a virtual power plant like Project EDGE.
- Examine perceptions of and preferences for the trading component of a virtual power plant like Project EDGE.

2. Method

2.1 Interviews and Recruitment

This study received ethics approval from Deakin University prior to the commencement of recruitment. After each interview had been scheduled, interviewees were sent a Plain Language Statement that outlined the study, reinforced that participation was voluntary, and explained that participants could withdraw at any time.

Working with Mondo, we recruited interviewees across three groups of actual or potential residential customers:

- Those who had purchased a battery as part of a previous Mondo trial and who had subsequently agreed to join Project EDGE.
- Those who had purchased a battery as part of joining Project EDGE.
- Those who had considered purchasing a battery as part of joining Project EDGE but who had ultimately elected not to do so and who were therefore not eligible to join Project EDGE.

In total, nineteen individuals from sixteen households were interviewed across sixteen interviews. Information regarding each interviewee's Project EDGE status is provided by in Table 1 below.

Table 1 Interview Summary Table

Interview	Number of Interviewees	Gender	Type of Participation
1	1	Male	Existing Battery
2	1	Male	Existing Battery
3	1	Female	Existing Battery
4	1	Male	Existing Battery
5	2	Male and Female	Existing Battery
6	2	Male and Female	New Battery
7	1	Male	Existing Battery
8	1	Male	New Battery
9	1	Male	Existing Battery
10	1	Male	New Battery
11	2	Male and Female	New Battery
12	1	Female	New Battery
13	1	Female	Non-participant (No Battery)
14	1	Male	Non-participant (No Battery)
15	1	Male	Non-participant (No Battery)
16	1	Male	Existing Battery

2.2 Interview Procedure

Each interview adopted a semi-structured format in that they followed a base set of questions (provided in Appendix A) but were free to explore additional points or themes that emerged over the course of the interview. This gave the interviewer an opportunity to probe deeper into particular issues while still exploring the motivators and barriers to joining a virtual power plant. After the conclusion of the interview, each interviewee received a \$50 digital gift card or an equivalent donation to a charity of their choice as a token of appreciation for their time participating in the study.

Interviews took place from 17 August 2021 to 22 September 2021. Interview audio recordings were transcribed by a third-party transcription service, and the resulting transcripts were then anonymised before the commencement of data analysis.

2.3 Data Analysis

Transcription of the interview recordings generated approximately 230 pages containing 128,000 spoken words. Thematic content analysis – a bottom-up approach for identifying related concepts in qualitative data – was then applied to these transcripts. Specifically, related concepts within and

across interview transcripts were assigned individual codes, and these codes were subsequently grouped to form higher-order themes. Each theme consequently represents a distinct set of related concepts that describe how interviewees view a particular phenomenon. Nvivo 20, a qualitative analysis software package, was used to assist in this thematic analysis.

2.4 Notes on Interpretation of Results

Before interpreting the insights that emerged from the thematic analysis, several important caveats should be noted:

- As all interviewees had existing ties with Mondo – including in some instances being participants in past Mondo-led trials – their perceptions may not be representative of the broader population. For this reason, the authors suggest that the insights identified throughout this report be considered in light of the characteristics of the interviewees recruited to this study. The authors also suggest that these themes are compared to a future planned quantitative study comprising a broader group of participants drawn from across the Hume region (see Section 5. Future Research).
- Throughout this report, we report the number of interviews in which a specific theme was identified (e.g., 4/16 interviews). These numbers do not imply that such themes were not important or held in opposition among the remaining interviewees; they merely indicate that that theme did not arise during the course of the interview. Further, these numbers should be interpreted in light of the fact that three of the interviewees were not Project EDGE participants and therefore could not evaluate Project EDGE or battery-related experiences.

3. Themes and Insights

3.1 Motivators and Barriers to Joining a Virtual Power Plant

3.1.1 Theme #1: Community, Environmental, and Self-Sufficiency Benefits Were Primary Motivators

Primary motivations for joining the Mondo EDGE trial were both philosophical (community- and environmentally-focused) and practical (energy self-sufficiency) in nature.

Community

All participating interviewees (13/16 interviews) mentioned community considerations as a primary motivator for joining Project Edge. For some interviewees, this motivation was situated within a desire to leverage their personal socioeconomic advantages for the benefit of those around them. As one interviewee noted:

“ [W]e're in a very privileged position that we can afford solar panels and we can afford batteries, and so how then do we become a part of a bigger social movement to support those who can't afford this sort of infrastructure in their house? – Interview 11

For others, the ability to participate in a community-based energy movement that was working towards a shared vision of social and environmental change – and which was establishing partnerships aimed at enhancing the efficacy of that movement – was a compelling reason to join.

“ When you've got a supportive community around you, and a group of people who are committed and reaching out to people like us in the community, and others, and are advocating and creating partnerships which are effective. It makes it a lot easier, doesn't it? – Interview 6

Environment

Environmental concerns (13/16 interviews) were also commonly identified as a motivator for joining a virtual power plant. Interviewees focused particularly on the need for renewable energy to address climate change and on the potential for virtual power plants to satisfy this need.

“ I've always been progressive in my ideas with regard to conserving energy and controlling of what seems to be the results of climate change on our planet. So, I think I early was awaiting something to be able to be involved in. - Interview 1

The feeling that joining Project EDGE was leading to tangible climate action – potentially reinforced by the installation of tangible, environmentally-focused infrastructure like household batteries – was also commented upon:

“ I'm really, really concerned about climate change, so this [joining the Mondo Edge trial] is just one thing that we can do to make me feel better that I'm actually doing something. – Interview 12

Energy Self-Sufficiency

Alongside the community and environmental motivations for joining a virtual power plant was a desire to reduce the personal inconvenience of experiencing an electrical blackout or brownout (8/16 interviews). For some interviewees, the focus was on ensuring the continuity of critical or relied-upon household appliances and services, such as pump-based water:

“ But one of the reasons we wanted a battery was because of this water issue. When we have no electricity we have no water... I'm hoping that when the power goes out we still have our battery. We've asked specifically for a battery that will be able to do that. – Interview 12

Others saw the installation of a household battery as a means for enhancing their disaster preparedness, particularly against a backdrop of past bushfire-related power outages:

“ We've had outages because of bushfires. With the battery's potential, some battery storage, it'd be interesting to know whether or not we could draw down on that in those times. – Interview 6

Notably, some interviewees had not yet had an opportunity to test the performance of the battery to see whether it would provide the level of electricity continuity and resilience they were hoping for in the event of an electricity brownout or blackout. This theme will be discussed further in Section 3.4.1.

Community, Environmental, and Self-Sufficiency Motivators Were Heavily Intertwined

In many instances, community, environmental, and self-sufficiency considerations did not act as independent motivations for joining a virtual power plant but were instead deeply interconnected. Community motivators were often situated within a desire to help and support others in order to facilitate a larger social and environmental movement. One interviewee, for example, saw virtual power plants like Project EDGE as a platform for mobilising broader community action, thereby allowing them to make a more meaningful impact on climate change. For this interviewee, the community dimension of Project EDGE consequently unlocked an enhanced environmental impact:

“ Well, seeing myself as part of a, not a groundswell, but certainly a community effort, can really do something about ultimately our impact on climate change, our emissions. – Interview 10

For another interviewee, Project EDGE was a means for personally supporting the stability of electricity supply to their small community. This attribute was deemed particularly important given the history of regular power outages in the region.

“ So, it could happen seven or eight times a year that they contact us and say, “we’re doing urgent maintenance. Power’s out for the full day.” So yeah, it was really those issues around how do we support our little community? – Interview 3

Thus, the community dimension of Project EDGE was a ‘multiplier’ that allowed residents to more meaningfully address environmental and self-sufficiency issues that deeply resonated with them.

Energy Pioneers and Patrons

The community, environmental, and self-sufficiency benefits associated with virtual power plants gave rise to an attendant benefit associated with joining Project EDGE: supporting a case study demonstrating the benefits of this technology to other communities. In this respect, interviewees implicitly saw themselves as a mix of both energy pioneers and energy patrons, helping to champion the development of a new and potentially transformative technology.

“ If we can do it here, on a mini scale, and demonstrate that actually it can be done, I just think that’s so important. It’s vitally important that, in this day and age, particularly given that our Federal Government doesn’t seem to be wanting to commit to anything at the moment, well, if they’re not going to do it, we have to. – Interview 1

“ It’s sharing of knowledge and data and information that can be – go towards making the system better in the future, I suppose, and creating a more – what is it, a renewable environment in the area – or any area. It doesn’t matter wherever it is. So just to help people, I suppose. – Interview 2

3.1.2 Theme #2: Financial Benefits Were a Secondary Motivator

Interviewees commonly (13/16 interviews) alluded to the potential for financial benefits to emerge from participating in Project EDGE, such as through reduced electricity bills. However, this benefit was typically deemed to be of secondary importance to the community, environmental, and self-sufficiency benefits described in Section 3.1.1. As one interviewee noted:

“ [M]y primary motivation in any of this is from an environmental sustainability perspective. It's not about saving money in the long term. It's not about protecting us from power failure. It's really coming – my prime motivation, if not my only motivation is from a sustainability perspective. – Interview 13

Helping to explain the relatively weak motivational influence of these putative financial benefits was an awareness, at least among some participants, that the financial benefits for participating in the trial would likely be minor at best, particularly when current hardware costs were considered. According to one interviewee:

“ We'll probably never get the costs of batteries for this house back in the timeframe, but that's okay. We're doing it because we figure there's a lot to be learnt through participation in Project Edge. - Interview 6

This quote aligns with the perception held by many interviewees that they were energy pioneers and patrons who were helping to support the development of a new technology that could deliver broad benefits to their community and to society as a whole (see Section 3.1.1).

3.1.3 Theme #3: Participation Costs Were a Primary Barrier

While financial considerations may not have been a strong motivator for joining Project EDGE, they were frequently identified as a significant barrier to participation. Interviewees focused particularly on battery costs as a major barrier that they needed to overcome in order to join the trial. Thus, when understood with Theme #2, while customers were not highly motivated by the potential financial benefits, they also did not want to take on large upfront financial costs.

“ Initially, the cost of batteries was a dealbreaker when we weren't getting the solar rebate. As I said, we'd already turned away from that a bit, not because I didn't believe in batteries or anything, but just because the whole cost; it's a big cost. – Interview 6

In this respect, most interviewees singled out the financial subsidies that were available to reduce the costs of purchasing and installing the battery as being fundamental to their participation in Project EDGE. According to one interviewee:

“ Yeah, I thought that [subsidising hardware costs] was a good idea. It certainly was something that would get a lot of people over the line when you look at it and go "Well, yep, that's an incentive. Let's go with that." Yep, so yes, that was a good thing from [Mondo's] point of view to do and I think if they hadn't of done that, they may have struggled to get the number of people [to participate]. – Interview 7

A sizeable proportion (5/16 interviews) of interviewees also mentioned leveraging other sources of funding – such as an inheritance windfall or a loan – to help offset the financial costs of participating in the trial.

“ I inherited a bit of money ... so I thought we'd spend it on this. Yeah, otherwise we wouldn't have had the money. – Interview 12

Of note, interviewees often distinguished between the (high) cost of purchasing a battery and the other hardware components required to participate in the trial. Solar photovoltaics, for example, were rarely remarked upon, and when they were, it was within the context of being a tried, tested, and affordable technology. Thus, it was the cost of batteries that frequently garnered special attention:

“ Well, I mean, the cost is obviously the large outlay of batteries and solar cells. I mean, solar cells, the government is making fairly cheap. Batteries, if you get a rebate system, yeah, they're not too bad. Lithium batteries are fairly expensive. – Interview 8

3.1.4 Theme #4: Practical Concerns Regarding Batteries Were Secondary Barriers

Sitting alongside the concerns about battery costs were a set of secondary barriers to participating in Project EDGE, most of which also centred on the battery component of the trial. Some of these barriers were forward-looking concerns about potential issues, such as battery longevity, the ability to use the battery during fire prone days, and the environmental impacts of manufacturing. The most common of these related to concerns around battery longevity (8/16 interviews), particularly once the battery was connected to a virtual power plant with numerous charge and discharge cycles.

“ If you're going to drain it and put it in, drain it and put it in, would that shorten the life of the battery? I understand that they say too that it won't be on a high-risk day blah blah blah blah, but in summer we're on high risk the whole time because this area is a high fire prone area. – Interview 5

Concerns were also raised about the extent to which the battery could be used during high-risk fire days (3/16 interviews), potentially undercutting a primary benefit described earlier about purchasing a battery to safeguard against bushfire-related interruptions to power supplies.

“ [B]atteries will last you a day, but after that, you've got to be able to recharge them somehow, with the fridge down, and you're blanketed in smoke. And you're only going to have a maximum of 24 hours on the batteries that we would have put in. – Interview 3

Although not widely held (1/16 interviews), concern about the environmental impacts associated with the battery manufacturing process – and more specifically, how lithium was being sourced – was also encountered. This concern highlights a potential challenge: residents who may be interested in

joining a virtual power plant for environmental reasons may scrutinise not just the ability to generate and distribute renewable energy but also the environmental impacts associated with the supply chain and disposal of the hardware components that comprise the virtual power plant.

“ Look, it is a whole lot of issues around the manufacturing of the core sea mining of lithium where that comes from and a lot of other social environmental factors with that. It won't stop me, but I will be a concerned citizen. – Interview 15

Many of the interviewees already had experience with batteries or solar photovoltaics by virtue of their involvement in a previous Mondo trial, and these experiences provided useful insights into some of the potential post-use barriers that may emerge as residents start to participate in virtual power plants. One of the most common of these was realising that the battery they had purchased was insufficient to cover their household needs (5/16 interviews).

“ That was something we learnt, that putting in a 6.5 kilowatt-hour battery just didn't cut it, so we're recommending 10-plus as the minimum size of batteries. – Interview 15

Relatedly, cyclical variations in solar photovoltaic output, such as reduced electricity generation in the winter months or on cloudy days, meant that battery performance was often lower than what interviewees had been expecting. This was particularly apparent when certain energy-intensive appliances were running. As one interviewee observed:

“ In the winter, there's a heating element [that] kicks in, which uses quite a bit of power; three, three and a half of kilowatts of power when it's kicking in. In terms of how the battery works, you know, if the hot water is – if it's a cloudy day, of course you don't get a lot... the hot water service will chew that up. – Interview 9

Finally, one interviewee spoke of the unexpected amount of noise pollution emerging from the battery, particularly when fans switched on automatically to cool the device during warmer periods of the day (1/16 interviews).

“ [The fans are loud] usually late afternoon and sometimes in the mornings, but it's when the sun gets on it, so it's usually late afternoon. So it's not a big issue for sleeping and stuff, but it's just a [noise] pollution that we didn't expect. – Interview 2

Further details regarding battery use and experience can be found in Section 3.4.

3.1.5 Insights Regarding Motivators and Barriers

Insight #1: The Financial Benefits for Participating did not Offset the Financial Costs

Among our cohort of interviewees, the potential financial benefits for taking part in Project Edge (in the form of lower electricity bills or even the ability to generate revenue) played only a minor role in their decision to participate. Looming far larger in the minds of interviewees were the upfront costs of purchasing the hardware required to participate. As one interviewee noted:

“ It cost us a lot of money to get the solar – to get the battery. It's not *financially* worth it. – Interview 3

Further exacerbating this trade-off between immediate upfront costs and any longer-term potential financial benefits that may eventuate was the current ambiguity around what those future financial benefits might entail, particularly once the trading component of the virtual power plant had been fully implemented. This ambiguity made it challenging for interviewees to determine the payoff horizon associated with purchasing the necessary hardware (i.e., the length of time until they could recoup the costs of their investment). In this respect, providing future participants with greater clarity around the payoff horizons for virtual power plant hardware may be useful, particularly as those payoff horizons start to reduce.

In the interim, the use of subsidies is likely to continue playing an important role in minimising the immediate 'sting' of the upfront financial costs for participating. The benefit of subsidies may not be solely in bringing down the absolute price of hardware to a palatable level; it may also give the impression of a "good deal" by improving the perceived transaction utility of the purchase. That is, just as a discount on the first month's bill may encourage customers to purchase a service, a discount on one of the hardware components associated with virtual power plants may encourage future customers to sign on to participate. Such discounts may consequently play a useful role in facilitating future participation, at least until the longer-term financial benefits of participating can be more clearly demonstrated.

Insight #2: Non-Financial Benefits are Crucial Elements of the Value Proposition for Joining Virtual Power Plants

Non-financial motivations for joining a virtual power plant – such as community, the environment, and preventing power outages – were found to be particularly important, especially when examined against the backdrop of the financial trade-offs outlined in Insight #1. The challenge for energy providers is in structuring their virtual power plant offerings in ways that authentically align with those motivations.

It is worth reiterating at this point that we elicited these motivations from among a group of interviewees who may not be representative of broader Australian society by virtue of their interest in participating in a relatively novel form of renewable energy technology. Future work to examine the generalisability of these findings among a broader group of residents is consequently required (see Section 5). Nevertheless, these findings highlight how certain non-financial attributes may – in

isolation or combination and among certain customer segments – be sufficient to attract customers to join a virtual power plant, even when the financial case for doing so is not always clear. For however long that the financial case for purchasing batteries remains ambiguous, non-financial benefits such as these are consequently likely to play an important role in motivating residents to join virtual power plants.

3.2 The Importance of Energy Literacy

3.2.1 Theme #5: Information, Though Readily Available, was not Always Understood

Information was generally seen as being both readily available and forthcoming from Mondo. Nevertheless, many interviewees self-identified gaps in their own knowledge, particularly on issues such as the sharing or trading of power through virtual power plants (up to 12/16 interviews). One interviewee, for example, expressed being perplexed about how a virtual power plant records where energy comes from and where it goes. In a related vein, another interviewee was confused with how the system knew when one household requires power and how it decides who to take it from.

“ It was all a little bit pie in the sky. “What does this actually mean? How is that actually concrete? How on earth can you work out that power has come from that place and moved to that place?” And some of that still – I still struggle with the concept in some ways. – Interview 3

“ But the concept of actually us receiving somebody else's power when we need it, I don't understand it. I don't know when it happens. It's all magic to me. I don't understand it at all. – Interview 2

These self-identified knowledge gaps were not necessarily a result of the quality of the information provided by Mondo, however. Indeed, a subset of interviewees (5/16 interviews) noted being explicitly happy to NOT understand the finer details of virtual power plants, choosing instead to participate in EDGE based on trust or as a result of the non-financial benefits associated with the program (see Section 3.1.1):

“ Quite frankly I don't care all that much. It's just you know that – you don't have to know the details to know that it's making a contribution, it's worthwhile. – Interview 10

Some interviewees (2/16 interviews) did, however, identify a desire to receive more ongoing information about the learnings and outcomes emerging from previous Mondo trials. This desire aligns with the implicit identification that many interviewees had with being energy pioneers and patrons (see Section 3.1.1).

“ I would have liked more information as the trial was happening, to know what was going on. So there was a lot of information given to us to get us on board. And that was fabulous. And I guess I was probably expecting that that would continue on; that six months down the track we'd have another – everyone get together and just talk about, “this is what we found.” And that was a little bit hard to get. – Interview 2

3.2.2 Theme #6: Some Interviewees With Considerable Energy Literacy Were Especially Critical

Juxtaposed against the interviewees with self-identified knowledge gaps was a smaller proportion of interviewees who, over the course of their interviews, demonstrated considerably more energy literacy with respect to technologies in general and virtual power plants specifically. These interviewees generally had a history of considering energy-related problems, whether in a professional context or as a result of some personal interest.

“ One of the things I picked up in the late '90s was the responsibility for developing environmental policies... into a whole stream of other co-gen systems, other things we could do for cleaner power production just for a manufacturing facility. And that was really the start of starting to look at power gen options, and that was mid-'90s. So I've always had an interest in it. – Interview 15

As a result, they were more likely to critically evaluate both Mondo's business model and virtual power plants.

“ It's never been completely clear to me why...AusNet who own Mondo, has taken the step of setting up Mondo. Like, their business model is not widely clear to me. – Interview 13 (Non-Participant)

Indeed, and as the following quote aptly demonstrates, these interviewees tended to evaluate virtual power plants against other competing energy offerings, which had resulted in some of them choosing not to participate in Project EDGE.

“ [H]aving solar panels of course prompted me to think to the next step with a battery and to investigate costs and benefits of that, and my conclusion at this point in time is that it's – for us individually, it's not a cost-effective thing to do. My trade-off for that is that I purchase 100% renewable. Because I have access to retailers who provide a product of 100% renewable electricity, I feel less pressure ethically to be putting a battery in, because I feel I can get that product through another source – Interview 13

Thus, while this interviewee expressed similar pro-environmental desires as other interviewees (see Section 3.1.1), they chose to manifest this desire by purchasing 100% renewable electricity through their energy retailer as they deemed this to be a more cost-effective solution than purchasing a battery. Another example of this holistic decision-making was observed among an interviewee, who,

like others interviewed as part of this research, was wanting to protect against power outages (see Section 3.1.1). However, the solution this interviewee was thinking of pursuing was to install a diesel-powered backup generator as they identified this as being a more cost-effective solution than installing batteries.

“ [Batteries are] still \$17,000 for maybe one major blackout every couple of years, so that's where we started thinking... that if we had a decent sized generator at \$5,000, that would make us independent, and we wouldn't be subject to these fairly long outages. – Interview 14

Ultimately, the three interviewees who elected not to participate in Project EDGE demonstrated considerable energy literacy in that they were knowledgeable not only about the Australian energy landscape but also about alternative energy offerings. Indeed, and as the previous quotes highlight, they elected not to participate because they deemed virtual power plants as currently offering a poor financial value proposition relative to other energy solutions.

3.2.3 Insights Regarding the Importance of Energy Literacy

Insight #3: Alternative Energy Solutions Were Often Selected by Those Desiring Strong Financial Outcomes

While energy literacy was not completely deterministic in whether interviewees elected to participate in Project EDGE, the three interviewees who chose not to participate all demonstrated a deep understanding of virtual power plants specifically and the Australian energy landscape more generally. In making this decision, these interviewees demonstrated a strong desire for pursuing cost-effective solutions to their energy needs (safeguarding against power outages) or values (renewable energy). Thus, until a robust financial case can be demonstrated, the reasons for participating in a virtual power plant are likely to be based on non-financial motivations.

3.3 Hardware Experiences

3.3.1 Theme #7: Experiences with Batteries Were Mixed

Many interviewees (9/16 interviews) expressed their happiness – and indeed, their positive surprise – with the power resilience that their batteries provided during periods of electricity blackouts and brownouts.

“ [I]t was still a surprise when it actually happened. My next-door neighbour sent me a text saying, “we're sitting eating dinner in the dark. What are you doing?” And I was like, “what are you talking about?” Like a storm had gone through, and yeah, it was stormy outside. And I said, “oh, do you want to come over and watch our TV? Because we're – everything's fine for us.” – Interview 3

The ability to demonstrate this resilience to neighbours affected by those power outages was also noted as a peripheral social benefit.

“ There was an example about three years ago when a few people were going, “We’ve got no electricity, we’ve got no electricity.” A few of us were cheeky and went on the Yak Facebook page and said, “We’ve got electricity, coffee here if you want it.” – Interview 5

At the same time, however, several interviewees pointed out that their battery capacity was insufficient to cover their day-to-day consumption needs (5/16 interviews). Indeed, many interviewees felt they effectively had no “spare” battery power (6/16 interviews) once their own power consumption needs had been considered:

“ Put it this way, it’s only a six and a half kilowatt battery and there’s only so much they can drag out of it. And our needs are more important than the electricity company when it comes to that. – Interview 5

Further detail about interviewee’s battery capacity perceptions can be found in Section 3.1.4.

3.3.2 Theme #8: The Hardware Installer’s Service Quality was Evaluated Holistically

Some interviewees (6/16 interviews) singled out the installer as an important and generally positive service touchpoint throughout the trial, both in terms of the advice they gave regarding the type of hardware to install as well as the feedback and support they provided once the hardware had been installed.

“ The people who are installing the battery are the ones who have done all our solar panels, and they’ve been really good too. – Interview 12

“ The people who installed it were very good. I think they obviously had the contract for the whole area, but they were – Well, it was interesting to talk to them to see what other installers, what they felt the problems were with sort of local installers and whatever they’d been doing. – Interview 14

Opportunities for improvement were, however, identified. One interviewee noted an environmental mismatch with the installer using a fuel-inefficient vehicle to deliver and install renewable hardware. This reinforces an earlier observation (see Section 3.1.1) that some interviewees evaluate environmental benefits holistically, which may extend to examining the environmental bona fides of hardware installers.

“ Yeah. It's just that the supplier... So, one of their younger, but someone with responsibility, supplies these panels, who arrives in his Ram... American pickup type thing, which is a 5.7 litre V8 that chews 14 litres to the 100 k's, and you're going, "Where is the mix in this?" – Interview 11

Another interviewee recounted how they had received inconsistent advice across the installation process.

“ Well, if we're going to do the solar in the shed, you need to put the wires that will run the power from the shed back up to the house." They told me what size wires and we did all that and built the shed and then when it came time to put solar on it, the solar people said, "No, we can't put it that far away from the house." - Interview 2

3.3.3 Insights Regarding Hardware Experiences

Insight #4: Practical Considerations Around Batteries are not Always Understood

Several interviewees reported that their battery provided insufficient or no spare power, suggesting that residents were not always cognisant of their power consumption needs or the limits of current battery technology when deciding which battery to purchase. This suggests that some residents may require further assistance during the pre-purchase process so that they can select a battery size that better aligns with their consumption needs. Further work may therefore be required to support residential customers balance the potential benefits of larger battery storage against the substantial investment costs associated with expanding battery capacity. Likewise, additional customer education and expectation setting may be required to help residential customers appreciate that only the most critical household appliances should be connected to a battery.

3.4 Energy Trading and Features

3.4.1 Theme #9: Sharing or Trading Power with the Local Community Resonated with Interviewees, but Within Strict Limits

As outlined in Section 3.1.1, the community dimension of virtual power plants strongly resonated with a sizeable proportion of the interviewees. The primary manifestation of this was a preference for surplus energy to be made available for the benefit of the local community. However, this preference was situated within strict parameters. For example, many interviewees conceived of energy sharing or trading as something that would only occur once their own power needs had been assured, such as when they were generating more power than could be stored in their battery or during periods when they had no personal need for power:

“ One of the key parts of the pitch was that you should be able to share your power when you're generating more. That seemed a no-brainer, that if I go away for a month and my solar is still generating, my battery's still in use, if I've got one, then other members of the grid should be able to benefit from that. – Interviewee 4

By extension, many interviewees expressed considerable reluctance for energy sharing or trading to occur whenever weather conditions were not conducive to generating replacement power from solar panels, such as on cloudy days or during winter.

“ Well, clearly, I think they would have to access it whenever it is least affecting us. So, they're not going to be it on a dull, wintery day, whenever we desperately need the power to keep us going inside. So, it would have to be in a particular time of the year whenever it has the least likely effect on our current running of the battery... You'd only be foolish if you were to take power when you need it most yourself. – Interview 1

Many interviewees were also particularly protective of any power stored within their battery, viewing it as something that should only be available for their own personal use. For such interviewees, only energy that was surplus to their immediate needs should be available for sharing or trading. As the following quote suggests, this preference often intersected with misconceptions about what a virtual power plant involves.

“ I thought the battery's there for our use mainly and if we generate more than what goes in – like if the battery's fully charged and there's more power generation – that goes in and can get sold off, but I don't know about selling off what's in our battery. – Interview 2

Even when interviewees were accepting of the trading of stored battery power, there was again a desire for this to only occur during periods when the generation of replacement power could be readily assured, such as during the summer months.

“ And by the end of – so normally, in the summer, we would get to the morning and the battery would still have 50-60% charge. And it would only just need a top up, and then we would be exporting. But in the winter, by nine o'clock at night of that day, the battery is empty. And so then it's back on the mains. So yeah, for me, it would be looking at between May and October, maybe, where I wouldn't want anyone touching my battery, because we're using that. – Interview 3

Other interviewees placed stipulations on who should receive any power that was shared or traded through the virtual power plant. For one interviewee, only members of the immediate local community (in this case, Yackandandah) should benefit from the virtual power plant:

“ As in Yackandandah. I don't need anyone from Wodonga using the power. That's what the incentive is: it's the community's power. Almost at a point you think some time in the future you'd like to cut off from the grid and say, "Righto, we [Yackandandah] don't need you anymore, we're generating enough of our own." – Interview 7

For other interviewees, the ideal recipients were those who were doing it tough, such as vulnerable members of their community or young families.

“ [I]f there’s public housing that we can feed into, some other area where people’s capacity to generate their own power is less than ours, then we can offset some of their power bills, and if we can do that, that’s great. If this sort of network allows you to do that, well, let’s go with it. Why not? - Interview 6

3.4.2 Theme #10: Trust in the Trading Process

Notwithstanding broader concerns around the financial benefits associated with trading energy (Sections 3.1.5) or having stored battery power made available for trading (Section 3.4.1), interviewees had mixed views about the degree to which they could trust a commercial entity to responsibly trade their energy. Some interviewees (7/16 interviews), for instance, expressed concern that the profit motives of a commercial energy aggregator might come into conflict with their own desire for participating in a virtual power plant, which was to provide benefits for the local community:

“ I think there’s a small amount of me that has a degree of cynicism about any commercial organisation wishing to trade. They’re not altruistic, that’s not their driver, their driver is dollars really, I guess. Hopefully there’s a little bit of integrity there somewhere. – Interview 11

Other interviewees (6/16) noted a potential willingness to trade their stored power so long as the financial returns for doing so were sufficient.

“ I’m fine with it as long as at the end of the day, it provides some kind of benefit, whether that’s financial or something else. But if they can show that it does, if you’re prepared to forgo a load during peak times but you’ll be compensated for that and then it’s just personal decisions about how much you value it and how much compensation you think it’s worth to give it up. – Interview 16

Even among this second cohort, however, there was still a degree of reservation about the extent to which a commercial energy aggregator could be trusted to undertake this trading process. One interviewee, for example, was adopting a ‘wait and see’ approach, indicating that they had yet to grant their full and complete trust.

“ Well, I guess it’s a wait and see how it goes, really. Because it is a kind of a bit – what can I say – strange that somebody’s controlling what goes in and out of your battery. And I guess that’s where the trust is, but if we see how it works for us, and it’s working for us and it’s working for them, then yeah, I mean that’s fine. – Interview 9

The cynicism directed towards the profit motives of commercial energy aggregators was juxtaposed with strong apparent support for involving local, community-based energy retailers in power trading

arrangements. Many interviewees, for example, expressed an interest in partnering with Indigo Power, a community-based energy retailer operating in the region.

“ We haven't got involved with this, but we probably will. I think there's Indigo Power now, which is taking the excess that Yackandandah's producing, and acting as a wholesaler to on-sell that. So, that's another initiative that's sort of happened locally through that whole push. – Interview 14

3.4.3 Theme #11: Interviewees Were Accepting of a “Fair” Fee for Energy Trading

Interviewees were asked about their opinion on the payment of transaction fees for engaging in energy trading. Interviewees were generally accepting of such fees, provided they were structured in ways that were transparent, subjectively fair (in the interviewees' favour as producers of power), and financially beneficial. One interviewee, for example, noted that they could not sell stored power by themselves and so acknowledged that such a service was both required and should be paid for via a fair fee.

“ I can't do it [sell power myself]. Even if I knew how, I wouldn't have the ability to do it. So yeah, if they're selling it at a good price and you're benefiting, then it's probably a reasonable thing to do. – Interview 9

Nevertheless, such support should be interpreted with caution given that most interviewees were primarily motivated by non-financial benefits (Section 3.1.1) and commonly believed that they had insufficient 'spare' battery power for trading to begin with (Section 3.4.1).

3.4.4 Insights Regarding Energy Trading and Features

Insight #5: The Function and Benefits of Energy Trading Need to be Carefully Communicated to Customers

Further communication about the trading component of Project EDGE is necessary as many interviewees did not have a strong understanding of what energy trading involves and when it will occur. Interviewees also saw batteries as primarily existing to support their own household consumption, so additional work is required to develop a cogent and compelling set of value propositions for customers to trade their stored energy, particularly given that financial motivations were not currently deemed a strong reason for joining a virtual power plant (see Section 3.1.2). Finally, and as outlined in Section 3.4.1, many interviewees believed that their current battery storage was already insufficient to meet their current household needs, let alone whatever was required to support trading. Assurances around what trading will mean for interviewees' current battery utilisation alongside further information about when trading will and will not take place will therefore be essential to building support for energy trading.

Insight #6: Supporting the Community is a Potential Motivator for Engaging in Energy Trading

A motivator for participating in energy trading that strongly resonated among this segment of residential customers was supporting the community. Many of the interviewees, for example, had explicitly joined Project EDGE because it was seen as an important steppingstone for supporting their community's transition to renewable energy. Supporting the community did not waive their own personal interests, however; interviewees were still wanting to ensure that their own energy needs were being met before stored energy was traded to others. The challenge for energy aggregators will consequently be in balancing this desire to support the community (among those for whom this value is important) against customers' demand for ensuring that they tangibly benefit from the considerable personal investment they have made by purchasing a battery.

Insight #7: Idiosyncratic Customer Preferences may Require Deep Customisation Options "Under the Hood"

Interviewees held diverse views not only about how and when trading should occur but also in terms of the extent to which they wanted to be notified ahead of time about any changes taking place to their battery. These idiosyncratic customer preferences may require an ability for customers to be able to customise their setup options, albeit within the broader understanding that while some interviewees appear reticent to engage deeply with technical information about energy products (see Section 3.2.1), those with considerable energy literacy might revel in this detail. Put differently, options for customisation should be cognisant of the (often contradictory) needs of different customer segments.

3.5 Visions for the Future of Electricity

3.5.1 Theme #12: Interviewees' Visions for the Future were Grounded in Their Trial Experiences

Visions for the future of energy often revolved around extensions of interviewees' trial experiences. Some interviewees, for example, conceived of a super-sized version of Project EDGE trial that featured significantly larger battery storage so that all household appliances could operate from battery power over extended periods of time.

“ Well, the ideal way would be to have much larger battery systems in houses than little 10 [kwh] - you'd need four or five times the quantity of batteries. You want to be able to have enough battery storage to sort of - I mean, this is incumbent upon it being sunny enough to generate the power - to be able to store enough power to run your house during the day, all night, run air conditioning systems and whatever and maybe what's left over, put it into the local grid - Interview 9

Other interviewees saw the potential for expanding the membership of virtual power plants to include non-residential dwellings, such as buildings operated by industry, local government, or community-based organisations, particularly as a means of balancing out periods of peak electricity demand.

“ The opportunities are there not just for household. You're probably aware of the VPP we've set up in Yackandandah, is in the public halls. Now, there are so many public buildings which are utilised 20% of the time. The best country public halls, churches, et cetera, if all of those were equipped as ours are with an Ubi, a solar and a battery, then you've got a really true distributive power generation network to draw on, and you would be able to trade the power coming off those. – Interview 15

The potential for virtual power plants to benefit those less fortunate in the community was also recognised by some interviewees.

“ Probably when we're all on solar and wind and there's a lot – or 100% – renewable right through the state or states or country, whatever that renewable is, and we all share and our bills aren't an issue for anybody. Like, nobody's getting too hot in the summertime or too cold in the winter because they can't afford a power bill. – Interview 2

3.5.2 Theme #13: Integrating Virtual Power Plants into the Australian energy Landscape

Some interviewees took a more holistic view and situated virtual power plants within the broader Australian energy landscape. One interviewee, for example, saw the energy landscape evolving to include centralised generation alongside a mix of virtual power plants and behind-the-meter microgrids.

“ I think it will be a blend of things. 20, 30 years, you'll still have major generation. It will be probably more – much more renewable than others, but you'll still have large generation sites that power through transmission networks to us. But I think we'll have a blend of microgrids meshed – kind of meshed networks. So, we'll have behind the meter and in front of the meter battery storage. – Interview 16

Another interviewee identified the benefits of using energy sharing to leverage geographically determined advantages in renewable energy generation, although they also recognised the high costs associated with introducing new transmission infrastructure to support such sharing.

“ I mean, you've got lots of different power sources, from geothermal to wind and hydro and all this, and each region has their own best option. And so, if everyone can help everyone else out, and to be able to supply power at a really competitive price, then that's really great. But you also have to balance that, how far do you actually distribute it? Which, in a country like Australia, with 50,000km of power lines... there's a huge infrastructure cost to actually provide that. And at some stage, the benefit of sharing is reduced by the cost of the infrastructure to allow that sharing capability. – Interview 8

3.5.3 Insights Regarding Visions for the Future of Electricity

Insight #8: Current Trials are Shaping Consumer Perceptions for the Future and Should be Carefully Managed

The prevalence of distributed energy production and virtual power plants in interviewees' views of the future of electricity suggests that they consider this technology to be an important part of that future. Mondo is therefore helping to shape the expectations of the future of energy in Australia and will have substantial influence into what is considered as normal and/or ideal.

4. Summary of Key Insights

While numerous themes and insights were identified across the course of the interviews, three key insights emerged as core findings and takeaways of this research:

1. Participation was facilitated by non-financial benefits and impeded by upfront financial costs.
2. Energy trading sits at odds with the perception that batteries are a personal energy asset.
3. Mondo was viewed more as a hardware provider than as an energy aggregator.

We discuss each of these insights in turn.

4.1 Participation was Facilitated by Non-Financial Benefits and Impeded by Upfront Financial Costs

Interviewees were not participating in Project EDGE in anticipation that they would receive significant financial benefits from their involvement; if anything, many recognised that they would not recoup the costs associated with their battery investment. Interviewees were instead motivated to participate by a trifecta of non-financial benefits: supporting the community, helping the environment, and enhancing energy self-sufficiency. At the same time, however, the immediate financial costs of participation – represented particularly by the cost of purchasing a battery – was seen as a significant barrier, not only by those who elected to participate but also among those who did not. While this decision-making trade-off (non-financial benefits vs. financial costs) may be unique to the communities we sampled, they suggest that unless or until a tangible financial value proposition can be developed, the emphasis of future customer acquisition activities should be directed towards leveraging these non-financial benefits. At the same time, incentives, subsidies, or other financing arrangements may still be required to lessen some of the upfront financial costs associated with participation.

4.2 Energy Trading Sits at Odds with the Perception that Batteries are a Personal Energy Asset

While interviewees were broadly supportive of sharing energy with their local community, this support was situated within strict parameters. For example, interviewees were typically prepared to share or trade their energy only once their own household requirements were assured, and some also wanted to place limits on who could receive this energy. At the same time, many interviewees spoke about their current battery as having insufficient capacity to meet their existing needs, let alone to also be used for trading. Collectively, these findings highlight the importance of further developing and clarifying the value propositions associated with energy trading, particularly given that it involves customers ceding some control of a privately-owned asset.

4.3 Mondo was Viewed More as a Hardware Provider than as an Energy Aggregator

Interviewees generally held very positive perceptions about Mondo. At the same time, however, many interviewees expressed concerns about whether a commercial entity could be trusted to sell stored battery power in ways that benefitted both interviewees and the broader community. In this respect, interviewees tended to view Mondo as a provider and maintainer of hardware rather than as an energy aggregator. This perception may partly be a carryover from an earlier Mondo-led trial, which was focused on demonstrating the technical capabilities of energy sharing hardware. Nevertheless, it does highlight an area of opportunity: building trust among program participants that energy trading will occur in ways that benefit those participants alongside the broader community.

5. Future Research

This report provides the findings from the first of five planned stages of research to be conducted with current or potential residential customers. The insights generated in this research will therefore inform these future stages of research. Specifically:

- Non-financial benefits such as community and the environment were identified in this report as fundamental motivations for participating in a virtual power plant, yet this research was conducted in a small community and among a group of interviewees who were both interested in and knowledgeable about renewable energy systems. Stage 2 will consequently survey people from across the Hume Region to examine whether this motivational profile for participating in a virtual power plan is also found among a more general sample of community members.
- One of the core insights emerging from this research was the need to develop a tangible value proposition for participating in Project EDGE specifically and virtual power plants more generally. To support this process, Study 3 will use conjoint analysis to identify the optimal mix of tangible and intangible product attributes for maximising the attractiveness of virtual power plant product offerings to residential customers.
- Interviewees spoke of their satisfaction with Mondo as a deliverer of hardware but also of their concern with Mondo taking on the role of energy aggregator. Understanding residential customers' post-adoption satisfaction with Project EDGE is consequently of particular importance. Research that follows a subset of customers through each stage of their customer journey (Stage 4) will therefore be conducted using an ethnographic study design. A separate piece of research will also explore customers' post-adoption experiences, perceptions, and overall satisfaction with Project EDGE (Stage 5).

6. Conclusion

Deakin University's Better Consumption Lab conducted sixteen interviews with nineteen interviewees to examine perceptions of energy sharing, evaluate initial experiences with Project EDGE, and elicit perceptions of energy trading. Qualitative analysis of the resulting data revealed three key insights:

1. Participation was facilitated by non-financial benefits and impeded by upfront financial costs.
2. Energy trading sits at odds with the perception that batteries are a personal energy asset.
3. Mondo was viewed more as a hardware provider than as an energy aggregator.

We note that these findings should be considered in the context of the communities in which interviewees resided, which may not be generalisable to other communities. Accordingly, four further stages of research are being conducted to further examine residential customers' perceptions of virtual power plants.

A1. Semi-Structured Interview Questions

Energy sharing perceptions and experiences

We're going to start off with some general questions.

- Before you began the trial, what were your perceptions of energy sharing?
- Have your perceptions of energy sharing changed now that you have had some experience with the trial? If so, in what way?
- From your perspective, what are the main advantages and disadvantages of energy sharing?

Mondo Yackandandah trial: perceptions and experiences

Note: trial-related information – such as the length of time interviewees were involved in the trial and whether they had a battery installed – will be obtained from Mondo.

- Why did you initially choose to take part in the Mondo trial?
- Why did you choose to continue with the Mondo trial?
- To what extent did the support and endorsement of Totally Renewable Yackandandah influence your decision to join the trial? *Potential follow-ups:*
 - o Why was the support of Totally Renewable Yackandandah important?
- What has been your experience with using:
 - o Mondo Ubi?
 - o Rooftop solar?
 - o Battery?
- We're now going to broaden our focus slightly. Overall, what has been your experience with the Mondo trial as a whole?
- What were your expectations of the trial before you began? *Follow-ups:*
 - o Which of these expectations were:
 - 'Need to have' vs. 'nice to have'?
 - Met vs. exceeded vs. unfulfilled?
 - o To what extent did these met/unmet expectations affect your:
 - Attitude towards the trial?
 - Attitude towards Mondo?
 - Attitude towards energy sharing?
- How did Mondo communicate with you through the trial?
 - o Who contacted you, and in what way?
 - o How often did they contact you, and what did they typically contact you about?
- How would you evaluate Mondo's communication throughout the trial? *Follow-ups:*
 - o What, if anything, could Mondo have done to improve its communication?
 - o If you had concerns or questions:
 - How did you raise them with Mondo?
 - How did Mondo seek to address them?
 - o Were you satisfied with how Mondo responded?

- *(For interviewees in Group 3):* Was information about the battery discharge tests communicated with you effectively?
- What parts of the trial did you enjoy the most?
- What were the 'pain points' of the trial?
 - Are there any issues related to the trial or your hardware that you are currently still experiencing?
- What do you wish was part of the trial that wasn't?
- What do you know now that you wish you knew before you started the trial?

Battery/Asset Usage Preference

- We're now going to focus on one specific element of the trial: allowing Mondo to access and use your battery. How satisfied were you with this part of the trial?
- What, if anything, would you have changed?

Promotion of Trial

- Did you ever talk with your family or friends about the trial?
 - If yes:
 - What did you tell them about the trial?
 - What did you mention first?
 - What was their reaction to what you told them?
 - What did they find most interesting or important?
 - Did they raise any concerns about the trial?
 - If no:
 - If you were to tell your neighbour about the trial tomorrow, what would you say to them?
 - How do you think they would react? / What would they think?

Readiness to participate in future Mondo-led trials

- Now that you have participated in the trial, what is your attitude towards Mondo?
- Would you consider being involved in the Hume Virtual Power Plant, also known as Project EDGE? Why or why not?

Attractiveness of potential value propositions

- In your view, what benefits or attributes would motivate you to participate in the Hume Virtual Power Plant? *Potential prompts:*
 - Financial returns / reducing energy bills
 - Deciding where energy goes / who receives your energy
 - Tracking how much energy things use
 - Grid autonomy
 - Minimising inconvenience of blackouts / fires / etc
 - Personalization
 - Being an energy pioneer
 - Showcasing environmental tech
 - Environmental benefits
 - Supporting the local community

- What 'deal-breakers' would stop you from participating in the Hume Virtual Power Plant?
 - Potential prompts:*
 - o Limited financial returns
 - o Expensive hardware / installation costs
 - o Not having complete control over hardware / not having energy when needed
 - o Issues arising from hardware testing
 - o Poor communication
- How important would incentives be in determining whether you would participate in the Hume Virtual Power Plant? *Potential follow-up:*
 - o What sort of incentives would you be looking for?
- Imagine there was a company that could trade some of the energy stored in your battery on your behalf and for the best price possible.
 - o How would you feel about letting this company have control of your battery to do these trades?
 - o How would you feel about the company taking a commission or fee (for example a percentage of the revenue) for trading this energy on your behalf?
 - o Follow-up: What would a fair revenue (e.g., percentage) split be?
 - o How much would you trust a company to find the greatest financial benefit for you?
 - o What information would you like about each trade?
 - o Prompts: Where the energy is going?
 - o How much money you are making with each trade?
 - o How much would you trust a company to make energy trading decisions on behalf of your household?
 - o Assuming you were guaranteed a good financial reward whenever a company like Mondo accessed and used your battery, which of the following approaches would you prefer?
 - o Allow Mondo to use my battery whenever they wanted
 - o Only allow Mondo to use my battery during days / times of the day that I had nominated
 - o Only allow Mondo to use my battery during a specific test periods (eg. 2 week test period)
 - Follow-up: How much control is it important for you to maintain yourself?
 - Would you allow your battery to participate in these markets all the time or would you be selective about times / days that you would participate?
 - o In a Virtual Power Plant, it could be possible for you to set aside some of your total battery capacity for your own household with only power in excess of this amount available to be sold.
 - o How would you decide how much power to set aside for your own household?
 - o How much power, as a percentage, would you want to set aside?
- Imagine that this company could also charge your batteries from the grid before a potential outage such as an upcoming storm
 - o Would you see this as a valuable for you to have?

- Would you be comfortable with the company charging your battery like this?
- Would they need to have your permission each time, or would you be comfortable for this to be handled automatically?
- Would you want this power only for your own household, or would you be happy for this energy to be sold back to the grid during the outage?
- Suppose the Virtual Power Plant included an app that could send you important notifications about the Virtual Power Plant and your battery and solar panels
 - What would you want to be notified about? *Potential prompts:*
 - Earnings (how frequently?)
 - Issues with solar panels (dirty/tree blocking?)
 - Potential outages
- How would you feel about having your solar exports dialled down at critical times so that everyone can connect their solar compared with the current “first in best dressed” scenario?
(a description will be provided at this time)

Envisaging future energy needs

To finish the interview, we’re going to shift our focus to the broader electricity sector in Australia.

- What is the ideal level of engagement that you would have with your electricity provider?
- Technology is rapidly changing. We saw this with mobile phones, where simple phones like the Nokia evolved to become smartphones like the iPhone. Imagine that current electricity providers are like a Nokia. What would the iPhone of electricity providers offer/look like?
- Let’s now set aside technology constraints. What would you like electricity providers to offer that they currently do not?