Project EDGE

Surveying customers to understand their experiences participating in a Virtual Power Plant field trial

June 2023

This report has been developed with the support of:

Important notice

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PURPOSE

This report has been prepared for Project EDGE by Deakin University. The report provides quantitative insights from 63 surveys conducted with customers across the three participating Distributed Energy Resources (DER) aggregators in Project EDGE to understand their experiences in participating in a Virtual Power Plant (VPP).

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ACKNOWLEGEMENTS

Project EDGE received funding from ARENA as part of ARENA's Advancing Renewables Program.

Each Project Participant acknowledges:

- the work of Deakin University in preparing this report; and
- the support, co-operation and contribution of the other Project EDGE participants and consultants in providing data and information used by Deakin University to prepare this report.

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Executive summary

Deakin University's Better Consumption Lab has undertaken a multiyear program of research as part of Project EDGE to evaluate how current and potential customers evaluate Virtual Power Plants (VPPs). For example, after completing a literature review to identify gaps in the current body of research on Distributed Energy Resources (DERs) and VPPs[1], the Lab conducted a series of studies to address these gaps, including:

- A survey of 893 potential customers within the National Electricity Market jurisdictions to understand their perceptions and intention to adopt DER and VPP[2].
- Interviews with 35 current customers of the Project EDGE DER aggregators to evaluate their experiences with the aggregator and the aggregator's VPP offering[3].

These studies provided important insights into ways of motivating DER and VPP adoption, which segments of the population may be more (vs. less) interested in adopting DER and VPP, how VPP ease of use can be reconciled with a desire for VPP customisation, and customers' experiences with each phase of the VPP customer journey.

The purpose of this study was to generate complementary insights while also addressing other gaps identified in the Lab's review of existing DER and VPP research[4], including how to enhance customer trust in VPPs, how to develop a relational style of interaction with VPP customers, what customers are expecting as appropriate financial returns from their VPP participation, and how to effectively communicate with VPP customers.

This report analyses 63 survey responses (email response rate: 29%) collected in April 2023 from customers of the three DER aggregators participating in the Project EDGE trial: Discover Energy, Mondo, and Rheem (operating under their Solahart brand). Customers were asked to evaluate key features of the VPP that each aggregator was offering as part of the Project EDGE trial that ran between May 2022 and March 2023. Key insights from the survey are summarised as follows:

VPP satisfaction was broad but fragile

- Across multiple indicators, surveyed customers reported being broadly satisfied with their DER and VPP. For example, 88% rated themselves as being satisfied with their DER while 79% rated themselves as being satisfied with their VPP. Similarly, Net Promoter Score, which uses a customer's self-rated likelihood to recommend a product to others as a measure of their loyalty, was +45 for DER and +30 for VPP, indicating that there were substantially more promotors for these technologies than there were detractors.

[1] Rotman, J., Newton, J., Weber, V., & Jacob John, J. (2022). Gaps in existing DER customer insights research. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/project-edge-lit-review-der-customer-insights-research.pdf?la=en

[2] Newton, J., Jacob John, J., Weber, V., & Rotman, J. (2022). General community perceptions of distributed energy resources. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/community-perceptions-of-der-and-aggregation-services.pdf?la=en

[3] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

[4] Rotman, J., Newton, J., Weber, V., & Jacob John, J. (2022). Gaps in existing DER customer insights research. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/project-edge-lit-review-der-customer-insights-research.pdf?la=en

- Notwithstanding customers' broad satisfaction with their VPP, most (68%) were unable to evaluate how their VPP stacked up against other VPPs. Opportunity consequently exists for aggregators to better articulate how their VPP compares with competing offers, particularly with a view to maximising customer retention and increasing the attractiveness of their VPP more generally.
- Only 59% of customers reported being very or extremely comfortable with their aggregator managing their DER, which is noteworthy given that DER management is central to VPPs. Addressing customers' concerns about having an aggregator manage personally owned DERs will likely be necessary to maintain and grow customers' satisfaction with their VPP.

The value proposition for joining a VPP requires enhancement

- While most customers (71%) were satisfied with the financial rewards they had received for participating in the VPP, this satisfaction was somewhat disconnected from any VPP-related reductions to their energy bills. For instance, only 40% reported reduced energy bills due to their VPP participation, with a further 30% not knowing what the financial impact of their VPP participation had been. One explanation for this discrepancy is that in interviews with customers from the same set of aggregators (conducted through one of the Better Consumption Lab's other Project EDGE studies), many reported that financial gains had not been a focal motivation for joining the VPP[5]. For such customers, *any* financial reward may consequently have been viewed favourably. Another explanation is that the financial rewards provided by some aggregators were in the form of vouchers or subsidised DER costs, which may have made it harder to determine how participating in a VPP had affected their energy bills. Irrespective of explanation, further work is required to help customers better understand how they are financially benefitting from their VPP participation, particularly given other Project EDGE findings that financial considerations meaningfully influence the decision to join a VPP[6].
- Customers may accept an equal sharing of benefit between themselves and a service provider, but few would typically want the service provider to benefit more than themselves, particularly when those benefits are derived from personally purchased assets. This dynamic was nevertheless observed among a sizeable proportion of surveyed customers, with 29% believing that aggregators benefitted more from VPP participation than households (vs. 11% who believed that households benefitted more from VPP participation than aggregators).
- When asked to compare the benefits of DER and VPP adoption, 92% of customers believed that DER adoption had benefited their household, whereas only 64% held a similar view with respect to VPP adoption. Moreover, only 57% of customers believed that aggregators served customers' long-term needs.
- Collectively, these findings suggest that aggregators must continue to refine and strengthen the value proposition for joining a VPP. For example, aggregators could consider how to develop VPPs that offer tangible and attractive incremental benefits to customers who already

[5] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

[6] Newton, J., Jacob John, J., Weber, V., & Rotman, J. (2022). General community perceptions of distributed energy resources. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/community-perceptions-of-der-and-aggregation-services.pdf?la=en

have DER (and who, by extension, are already receiving the self-consumption benefits associated with having DER).

Customers were seeking improved communication and transparency

- Whether by default or by choice, VPP functionality was automated for virtually all customers, yet despite this, only two-thirds (70%) perceived their VPP as easy to use. Interviews with customers from the same set of aggregators (conducted through one of the Better Consumption Lab's other Project EDGE studies) may provide a potential explanation for this finding, with some of those customers viewing their VPP as a 'black box' whose inner workings were too complicated to attempt to understand[7]. Further efforts may therefore be required to help demystify the automated 'black box' that VPPs represent in the mind of some customers.
- Of those who recalled receiving a message from their VPP, only half (51%) were satisfied with the content of those messages. Suggested improvements for increasing their message satisfaction included providing greater transparency around when and why VPP activity was occurring and sharing more regular updates about the learnings emerging from the Project EDGE trial.

Short-term, philanthropically focused requests for additional VPP exports may be especially motivating

- Five potential strategies for encouraging additional VPP export activity were examined:
    - Providing better financial returns for exporting stored power.
    - Providing regular free check-ups and maintenance for DER.
    - Allowing virtual access to exported stored power from other locations, such as to charge an electric vehicle.
    - Providing more control over when stored power was exported.
    - Sending a short-term request for an increase in exports to address a power shortage in an emergency, like a bushfire.
- Each of these strategies was found to be very or extremely motivating by 47% or more of customers. However, one strategy – receiving a short-term export request to help address power shortages arising from an emergency – was seen to be very or extremely motivating by 84% of customers. Thus, in times of emergency, infrequent VPP export requests with a philanthropic focus may be particularly motivating.

[7] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

Table of Contents

1. Introduction

Distributed Energy Resources (DERs) are technologies like rooftop solar photovoltaics, electric vehicles, household batteries, and solar hot water systems that allow households to generate, store, and/or distribute energy. Third-party providers have started to offer energy services that aggregate the distribution capabilities of many household DERs through the formation of virtual power plants (VPPs). Through these VPPs, aggregators can control when connected DERs import or export power to the National Electricity Market, allowing them to trade in this market and deliver a range of network services.

Although there is a growing awareness of the potential network benefits that VPPs can deliver, the perceptions and experiences of customers participating in VPPs remain underexplored. Deakin University's Better Consumption Lab consequently undertook an extensive, multiyear program of research as part of Project EDGE that broadly aimed to understand the perceptions and experiences of current and potential VPP residential customers (see Figure 1).

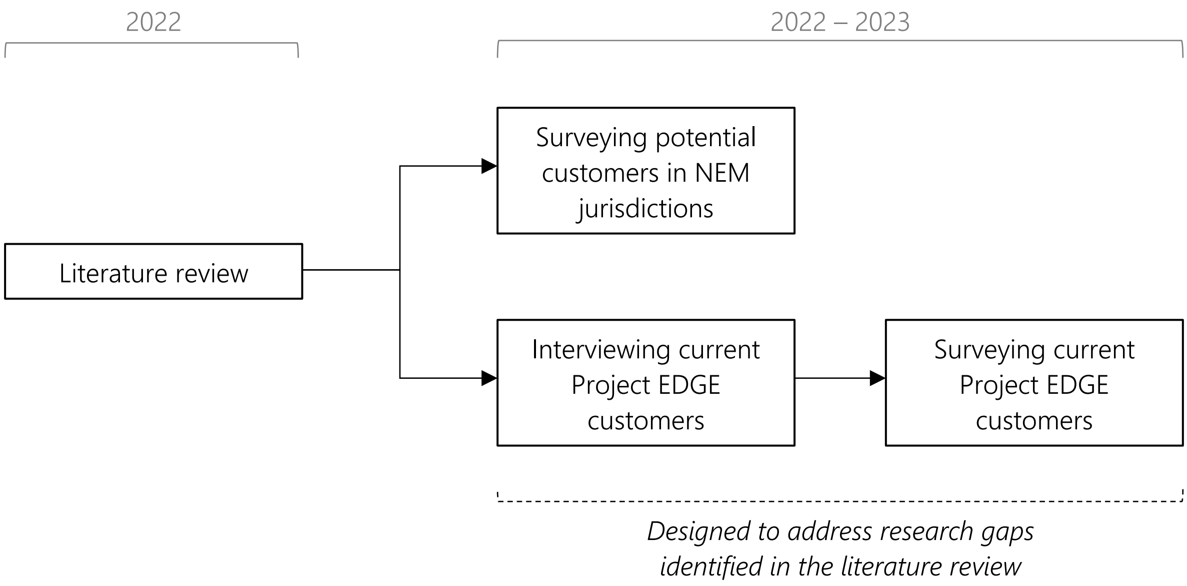

Figure 1 Program of customer insights research undertaken by Deakin University's Better Consumption Lab.

For example, the Better Consumption Lab's **literature review**[8] (see Figure 1) identified a range of research gaps on how customers perceive and interact with DERs and VPPs, including:

- What is required to retain customers in a VPP long-term?
- How do other customer segments – beyond that of early adopters – perceive VPPs?

[8] Rotman, J., Newton, J., Weber, V., & Jacob John, J. (2022). Gaps in existing DER customer insights research. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/project-edge-lit-review-der-customer-insights-research.pdf?la=en

- What are customers' expectations about the financial returns of joining a VPP?
- How can VPP ease of use be reconciled with the desire for customisation?
- How do VPPs compare with the status quo or other energy products?
- What are the potential pathways for increasing trust and reducing VPP risk perceptions?
- How can VPPs develop relational (vs. transactional) customer interactions?
- What must an aggregator do to ensure a smooth acquisition and installation process?

Gaps identified through this literature review were then examined through:

- A survey of 893 **potential customers**[9] (see Figure 1), which explored the VPP adoption intentions and perceptions of different consumer segments. This survey also examined the financial returns for participating in a VPP that potential customers deemed attractive alongside their views on how VPPs compared with other energy products.
- 35 interviews with **current customers**[10] (see Figure 1) of the three Project EDGE aggregators to explore their experiences with each phase of the customer journey, from initial interactions with sales teams through to DER installation and VPP activity. These interviews also examined the potential tension between allowing VPP customisation while maintaining customer ease of use, identified ways for aggregators to build customer trust in VPPs, and explored how aggregators could develop positive perceptions and long-term relationships with customers.

The purpose of this report was to generate complimentary insights by surveying **current customers** (see Figure 1) of the three Project EDGE aggregators to examine their VPP experiences and to address additional gaps identified in the literature review, including:

- How to enhance customer trust in VPPs.
- How to develop a relational style of interaction with VPP customers.
- What customers are expecting as appropriate financial returns from their VPP participation.
- How to effectively communicate with VPP customers.

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[9] Newton, J., Jacob John, J., Weber, V., & Rotman, J. (2022). General community perceptions of distributed energy resources. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/community-perceptions-of-der-and-aggregation-services.pdf?la=en

[10] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

2. Method

2.1 Participating aggregators

This report focuses on the perceptions of customers from the three DER aggregators participating in the Project EDGE trial: Discover Energy, Mondo, and Rheem (operating under their Solahart brand). While each aggregator had a VPP offering, the types of DER aggregation services included as part of their Project EDGE VPP offering differed. For example:

- Discover Energy and Mondo actively managed each customer's solar panels and household battery, focusing particularly on using customers' stored energy to deliver network services and/or supply power to the National Electricity Market.
- Rheem actively managed each customer's PowerStore, a proprietary smart electric water heater, so that water was heated during periods of low (rather than high) demand for power. Customers also had the opportunity to register other DER – such as rooftop solar photovoltaics, batteries, and electric vehicle chargers – with the VPP managed by Rheem.

2.2 Survey and recruitment

A copy of the survey questions that customers were asked to complete is provided in Appendix A. These questions, along with the approach used to invite customers to complete the survey, were approved by the Deakin University Ethics Committee prior to the commencement of recruitment.

VPP customers were sent a recruitment email by their aggregator (Discover Energy, Mondo, or Rheem). This recruitment email informed customers that the survey was being independently conducted by Deakin University's Better Consumption Lab, that the aggregator would not know who did (vs. did not) participate, that their responses would remain anonymous, and that the aggregator would not receive any identifiable information from the Deakin research team. Customers were also informed that they would receive a $10 Amazon voucher upon completion of the survey.

The recruitment email contained a personalised link to an online survey, and customers who clicked on the link were asked to read and agree to a plain language statement and consent form before completing the survey.

In total, 63 customers completed the survey, which represented a total response rate of 29%. This response rate is comparable to that of other VPP studies (27%)[11] and exceeds the 2021 average response rate of 6% for email-based surveys observed by an industry provider of customer satisfaction surveys[12]. Aggregator-specific response rates were:

- 38% (*n* = 5) for Discover Energy.
- 37% (*n* = 36) for Mondo.
- 21% (*n* = 22) for Rheem.

[11] van Veenendaal, P. (2021). Virtual power plant demonstrations consumer insights report. Available from: https://aemo.com.au/-/media/files/initiatives/der/2021/csba-consumer-insight-final-report.pdf

[12] Chung, L. (no date). What is a good survey response rate for online customer surveys? Available from: https://delighted.com/blog/average-survey-response-rate

2.3 Data analysis

Respondents completed the survey in April 2023. Survey responses were then exported to IBM SPSS Statistics for analysis. Any qualitative responses obtained through the survey's open-ended questions was thematically coded based on the content provided in those responses.

To preserve the anonymity of each aggregator, results have been consolidated throughout this report. By extension, not all findings outlined in this report will relate equally to each of the three aggregators.

3. Customer profile

This section provides a brief overview of the demographic and DER profile of customers who completed the survey (surveyed customers).

3.1 Demographic profile

The demographic profile of surveyed customers was contrasted against census data to determine whether those who had joined an aggregator differed to the broader population. In this regard:

- 59% were aged 60 years or above. By contrast, 23% of the Australian population falls within this age range[13].
- 43% had a postgraduate degree, compared with 12% of the Australian population[14].
- 9% and 52% lived in one and two occupant households, respectively, whereas 26% and 34% of the Australian population resides in one and two occupant households, respectively[15].
- Of the surveyed customers who reported their annual household income, 32% reported an annual income of $140k or more. This income distribution broadly mirrors that of the Australian population, of which 30% earn $130,000 or more each year[16].

[13] Australian Bureau of Statistics (2021). Population: Census Information on sex and age. Available from: https://www.abs.gov.au/statistics/people/population/population-census/2021#data-downloads

[14] Australian Bureau of Statistics (2022). Education and work: Australia data on engagement in work and/or study, current and recent study, qualifications, and transitions to work. Available from: https://www.abs.gov.au/statistics/people/education/education-and-work-australia/latest-release

[15] Informed Decisions (2021). Australia household size. Available from: https://profile.id.com.au/australia/household-size?WebID=10

[16] Australian Bureau of Statistics (2022). Income and work: Census information on income, occupation and employment. Available from: https://www.abs.gov.au/statistics/labour/earnings-and-working-conditions/income-and-work-census/latest-release

Figure 2 presents the age and education of surveyed customers, while Figure 3 charts their annual household income and the number of occupants residing in their household.

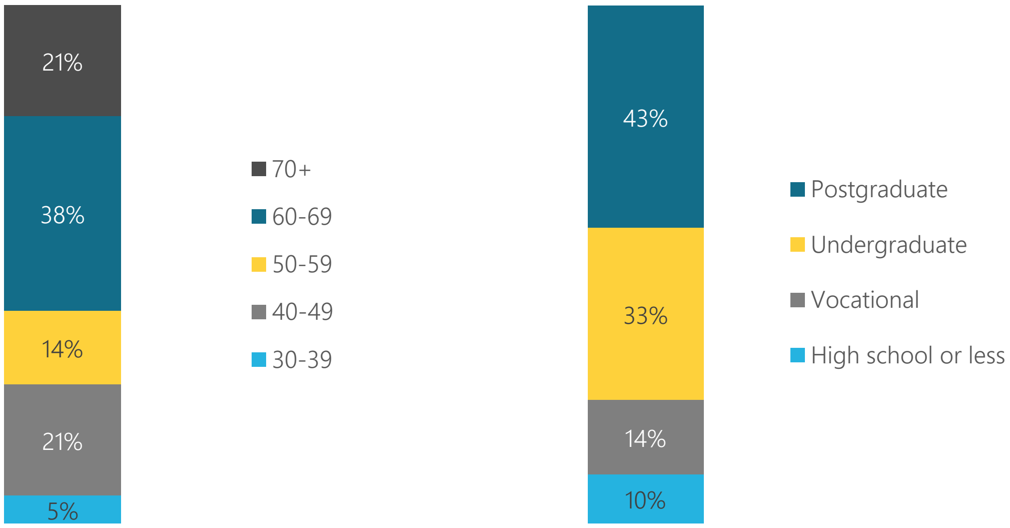

Figure 2 Age and highest level of attained education.

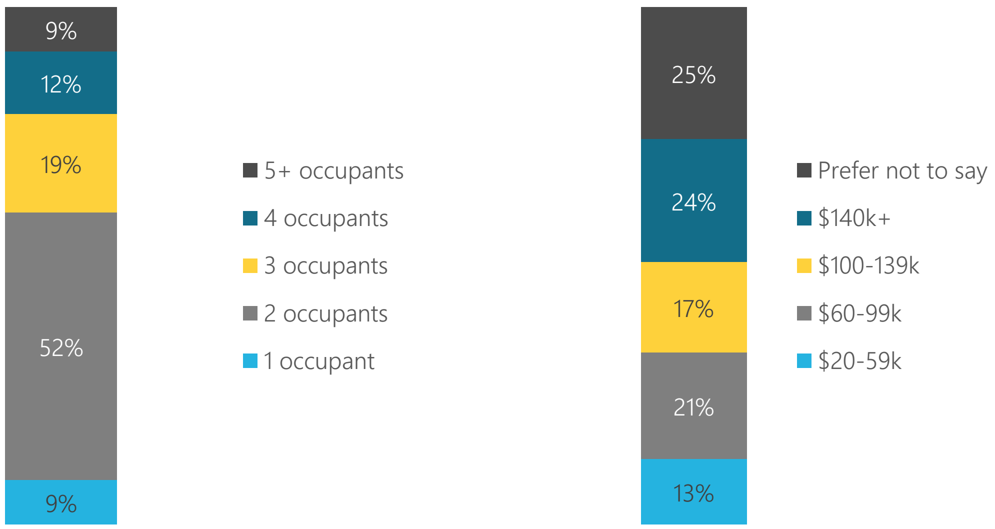

Figure 3 Reported number of household occupants and annual household income.

3.2 DER profile

More than half (56%) of surveyed customers had purchased DER as part of joining the VPP. Moreover, of all surveyed customers, 97% and 90% reported that their DER and VPP, respectively, had been operational for at least three months at the time the survey was conducted.

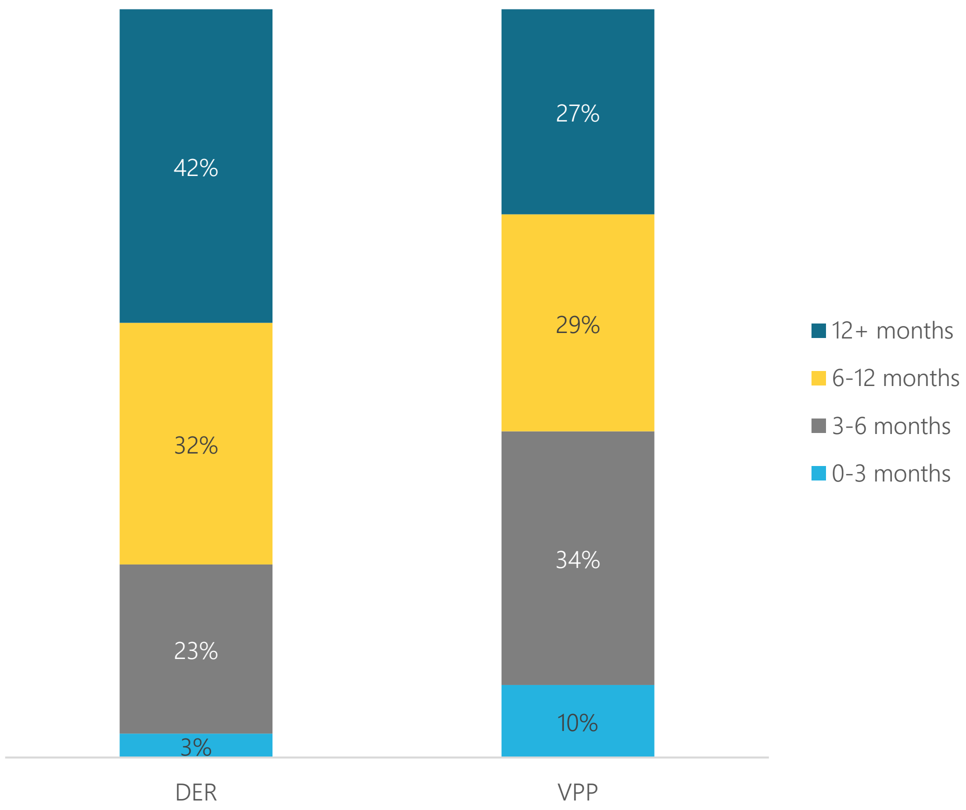

Figure 4 Length of time DER and VPP have been operational at each customer's home.

INSIGHT: The typical customer was older, better educated, and more likely to live in a dual occupant household than the broader Australian population.

Homeownership is required to install the DER necessary for VPP participation, so the fact that the typical surveyed customer skewed older than the Australian population may partly reflect declining homeownership rates among younger Australians[17]. Surveyed customers were also more likely to live in dual occupant households, perhaps because couples or 'empty nesters' are more likely to have the discretionary income required to purchase DER. Finally, surveyed customers were substantially more likely to have completed university than the average Australian, which accords with earlier findings that having a university degree predicts interest in purchasing DER[18].

[17] Australian Institute of Health and Welfare (2023). Home ownership and housing tenure. Available from: https://www.aihw.gov.au/reports/australias-welfare/home-ownership-and-housing-tenure

[18] Newton, J., Jacob John, J., Weber, V., & Rotman, J. (2022). General community perceptions of distributed energy resources. Available from: https://aemo.com.au/-/media/files/initiatives/der/2022/community-perceptions-of-der-and-aggregation-services.pdf?la=en

4. Overall evaluation

4.1 Satisfaction

Among surveyed customers, 88% reported being satisfied with their DER and 79% indicated being satisfied with their VPP (Figure 5). Moreover, satisfaction levels did not differ between DER and VPP (Figure 5).

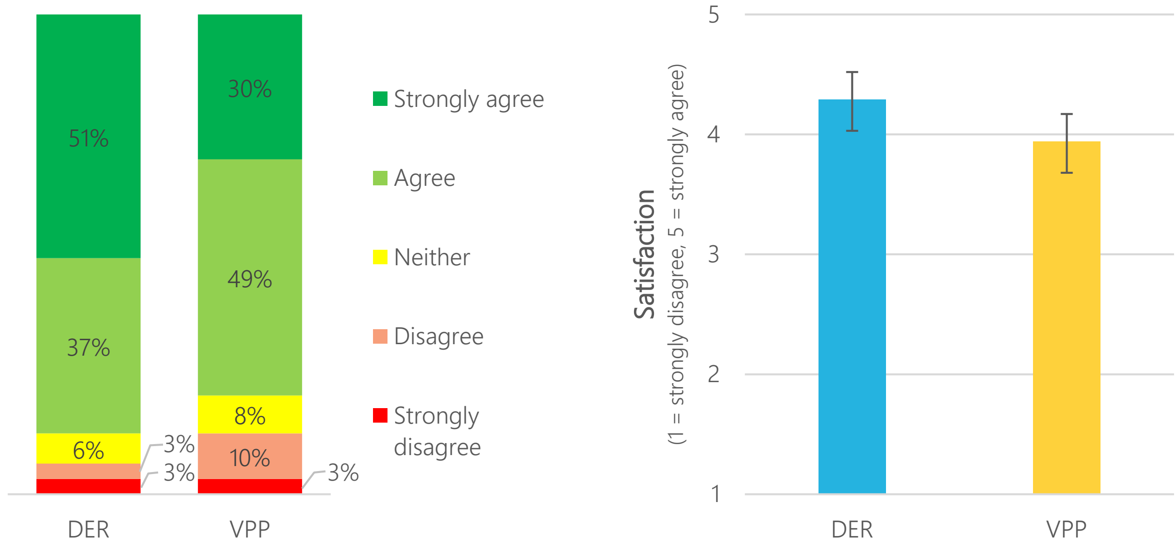

Figure 5 Customer satisfaction with their DER and VPP.

Note: The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

4.2 Net Promoter Score

Surveyed customers separately rated their likelihood of recommending their DER and their VPP to others on a scale ranging from 0 (not at all likely) to 10 (very likely). The Net Promoter Score (NPS)[19], a standard industry metric for assessing customer loyalty, was then computed by subtracting the percentage of customers who reported their recommendation likelihood as 0 – 6 (detractors) from the percentage of customers who rated it as 9 – 10 (promoters). The resulting index can theoretically fall within the range of -100 to +100, with larger positive NPS scores indicating a greater proportion of loyal customers.

[19] Reichheld, F. (2003). One number you need to grow. *Harvard Business Review*, *81*(12), 46-54.

Adopting this approach, the NPS for customers' DER was +45, while the NPS for customers' VPP was +30 (Figure 6). To contextualise these NPS values, recent equivalent scores from other Australian VPPs include:

- NPS score of +11 for customers of seven VPP providers[20].
- NPS score of +65 for customers of the Simply Energy VPPx[21].

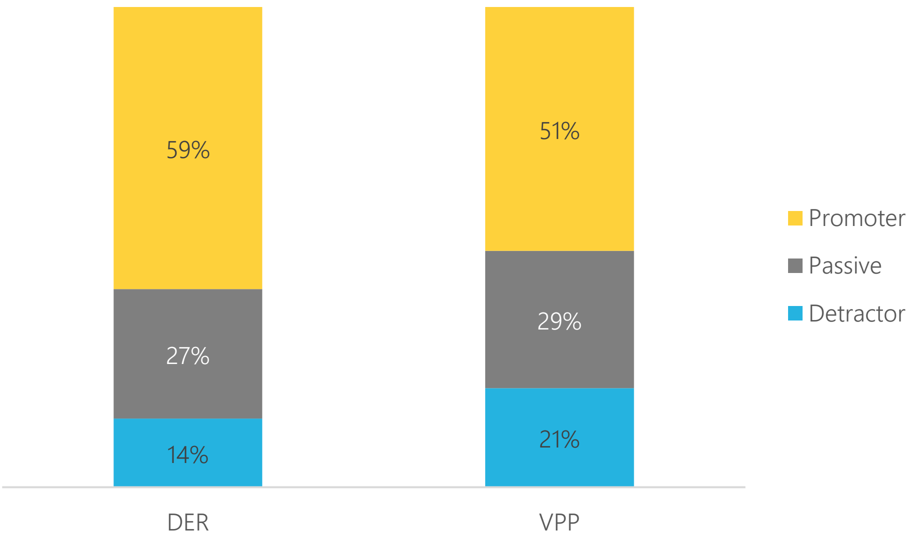

Figure 6 Net Promoter Score ratings for DER and VPP.

4.3 Likelihood of remaining

Customers were also asked to rate their likelihood of remaining with their VPP following the conclusion of the Project EDGE trial on a scale ranging from 0 (not at all likely) to 10 (very likely). The responses obtained to this question are presented in Figure 7, with the majority (59%) of surveyed customers responding in the 8 – 10 range.

[20] van Veenendaal, P. (2021). Virtual power plant demonstrations consumer insights report. Available from: https://aemo.com.au/-/media/files/initiatives/der/2021/csba-consumer-insight-final-report.pdf

[21] Marchment Hill Consulting (2021). Simply Energy VPPx – Stage 3 knowledge sharing report. Available from: https://arena.gov.au/assets/2021/08/simply-energy-vppx-stage-3.pdf

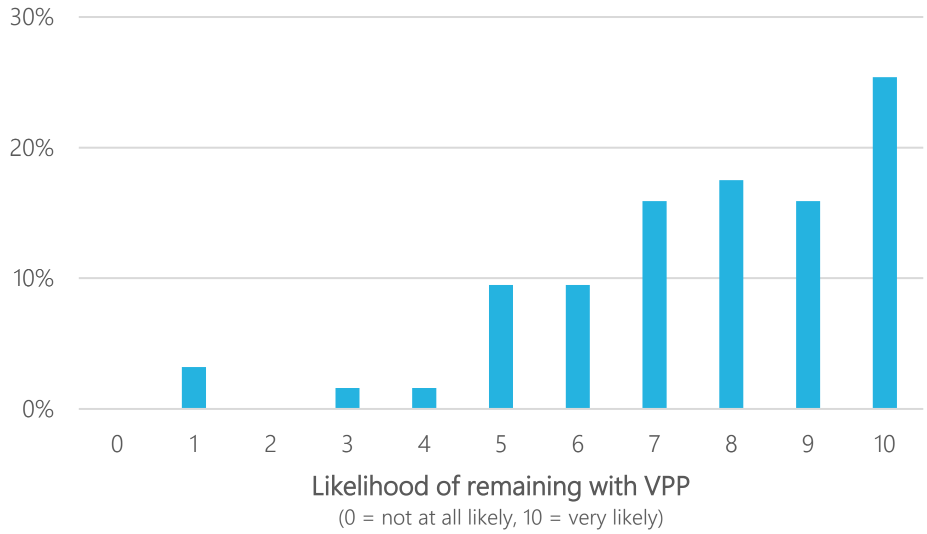

Figure 7 Likelihood of remaining with VPP following the conclusion of the Project EDGE trial.

INSIGHT: Customers were broadly satisfied with their VPP.

Measures of customer evaluations each have their limitations. For example, while it has fast become an industry standard, the stated superiority of NPS to predict managerially relevant outcomes like revenue growth has been brought into question[22]. For this reason, multiple customer evaluation measures (i.e., customer satisfaction, NPS, likelihood of remaining) were used, and across each of these, a consistent picture emerged: customers were generally satisfied with their VPP. While it remains to be seen whether similar findings will be observed as VPPs are adopted by other consumer cohorts, this initial snapshot is promising given the relative novelty of VPPs.

4.4 Competitiveness

Customers were asked to rate whether their VPP compared well with other similar VPPs. As shown in Figure 8, two-thirds (68%) of surveyed customers neither agreed nor disagreed with this statement, suggesting that a sizeable proportion of the sample were not able to evaluate the relative competitiveness of their VPP.

[22] Keiningham, T., Cooil, B., Andreassen, T., & Aksoy, L. (2007). A longitudinal examination of net promoter and firm revenue growth. *Journal of Marketing, 71*(3), 39-51.

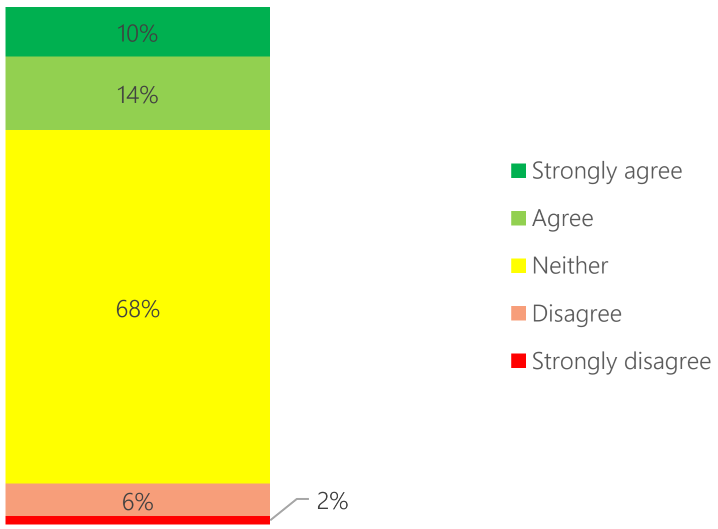

Figure 8 Perception that VPP compares well with other similar VPPs.

INSIGHT: Most customers did not know how their VPP compared with other VPPs.

The overwhelming majority of customers were not able to evaluate how their VPP stacked up against those of other aggregators. There are several ways to interpret this finding. For example, customers may not have had access to publicly available metrics with which to evaluate VPP performance, which would hinder their ability to make effective comparisons. Alternatively, with few aggregators currently in the market, customers may have had few VPPs to compare their own VPP against. Irrespective of interpretation, this finding suggests that an opportunity exists for aggregators to better articulate how their VPP compares with competing offers, particularly with a view to maximising customer retention and increasing the attractiveness of their VPP more generally.

5. VPP benefits

5.1 Financial benefits

The majority (71%) of customers were either somewhat or very satisfied with the financial rewards they were receiving in return for their VPP participation (see Figure 9).

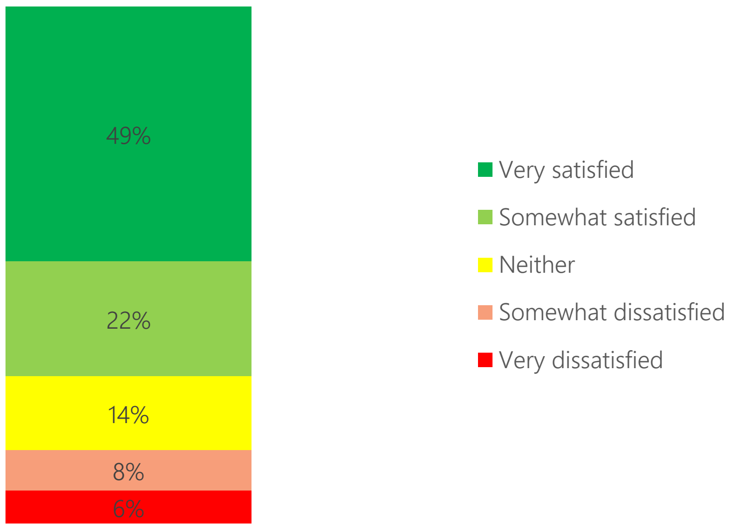

Figure 9 Satisfaction with the financial rewards received for participating in VPP.

A more complex picture emerges, however, when the financial impacts of DER and VPP adoption on energy bills was examined. For example, three-quarters (76%) of customers reported a slight or substantial decrease in their energy bills from adopting DER, whereas only 40% of customers reported similar bill reductions from joining the VPP (see Figure 10). Moreover, almost one-third (30%) of customers did not know what impact joining the VPP had had on their energy bills. Finally, when the bill impacts of DER and VPP adoption were compared, customers reported that adopting DER had resulted in a significantly larger decrease in their energy bills than joining the VPP (see Figure 10).

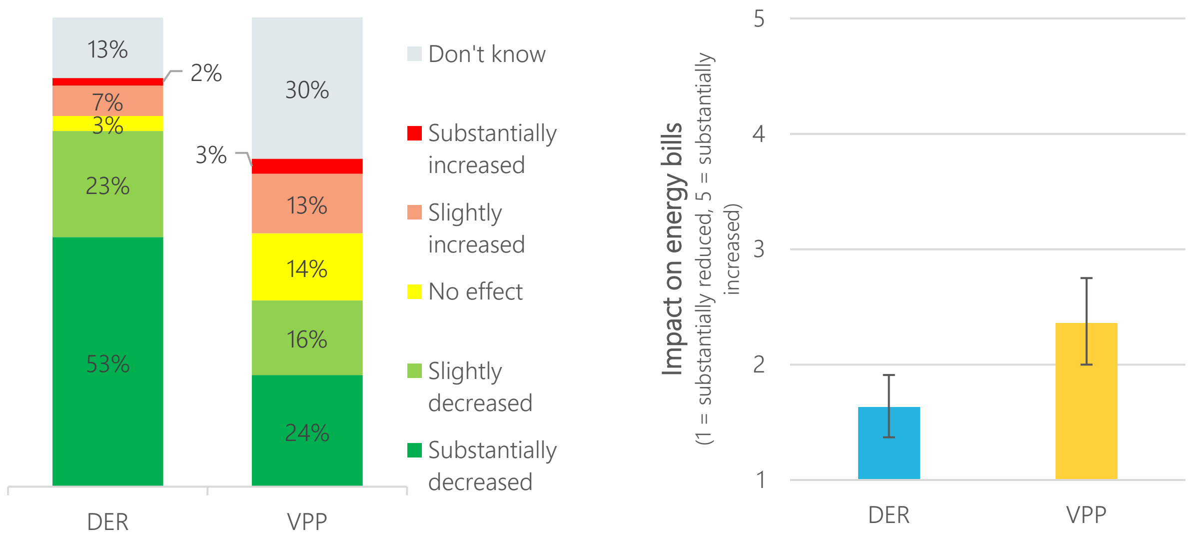

Figure 10 Perceived impact of DER and VPP adoption on energy bills.

Notes: The right-hand panel excludes customers who reported that they "don't know" what impact DER/VPP adoption had had on their energy bills. The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

INSIGHT: While most customers were satisfied with the financial rewards they had received for participating in their VPP, those rewards had not translated into associated energy bill reductions.

While 71% of customers were somewhat or very satisfied with their financial rewards for participating in the VPP, only 40% reported that participating in the VPP had reduced their energy bills. One potential explanation for this discrepancy is that for some customers, financial rewards were at best a secondary motivation for their VPP participation. For example, interviews conducted with customers from this same set of aggregators found that a proportion of customers had joined not to receive financial rewards but to help support the development of a technology deemed essential for building community energy resilience or achieving climate action[23]. Against this backdrop, *any* financial reward may have been seen as a windfall. A second explanation is that the financial rewards provided by two of the aggregators were in the form of vouchers or subsidised DER costs, which may have made it harder to determine how joining a VPP had affected their energy bills.

[23] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

INSIGHT: Almost one-third of customers did not know what impact their VPP participation was having on their energy bills.

Although 90% of customers had been connected to the VPP for at least three months at the time the survey was undertaken (Figure 4), almost one-third had not yet been able to determine whether their VPP participation had had a positive or negative impact on their energy bills. This finding points to a need for improved communications that can better demonstrate the financial impacts associated with a household's participation in the VPP.

5.2 Who shares the benefits of DER and VPP adoption?

Customers were asked to rate the beneficiaries of their DER and VPP adoption: their own household, that of their community, and the environment more generally. Notably, 92% of surveyed customers agreed that their DER had delivered value to their household, with a further 89% agreeing that their DER had provided benefits to the environment (Figure 11). The perceived beneficiaries of customers' VPP participation were somewhat narrower, with 74% agreeing that the VPP had benefitted the environment and only 64% agreeing that the VPP had provided value to their household.

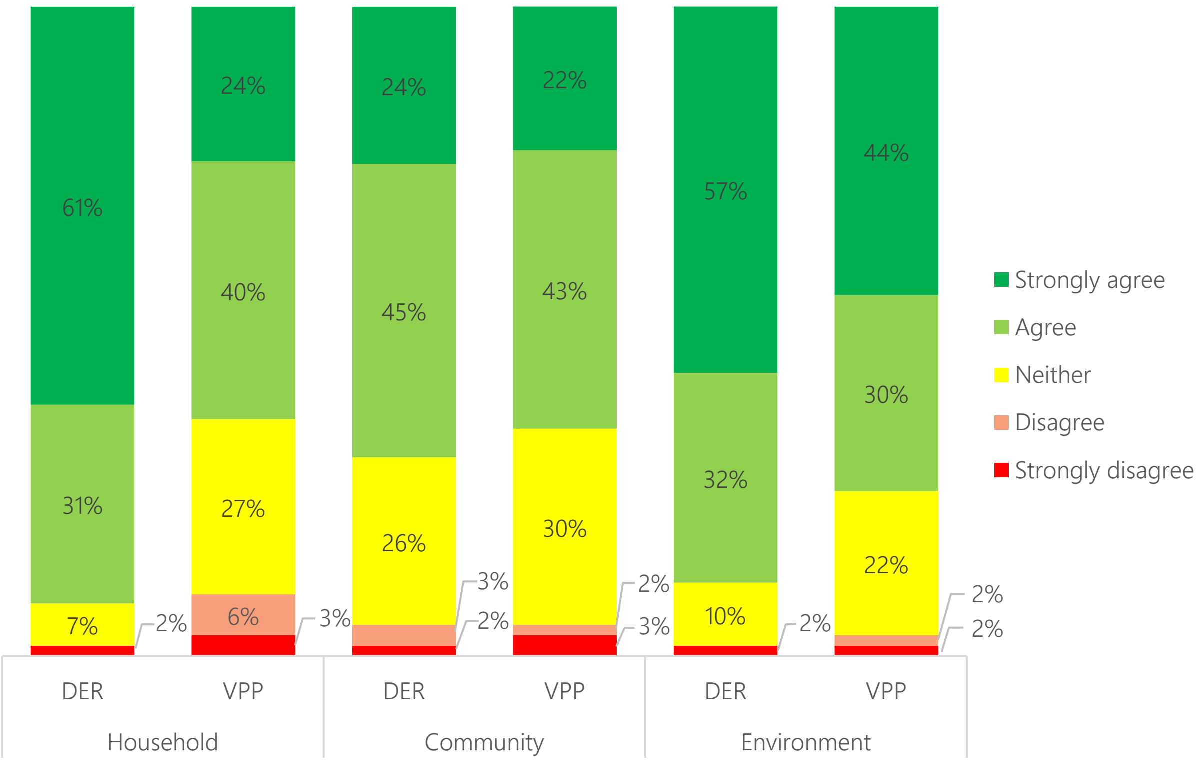

Figure 11 Extent to which household, community, and environment benefit from DER and VPP adoption: Breakdown of responses.

When responses to these questions were compared, the household benefits of adopting DER were seen to be greater than the community benefits of adopting DER and the household benefits of joining a VPP (Figure 12). Similarly, the environmental benefits of adopting DER were seen to be greater than the household benefits of joining a VPP.

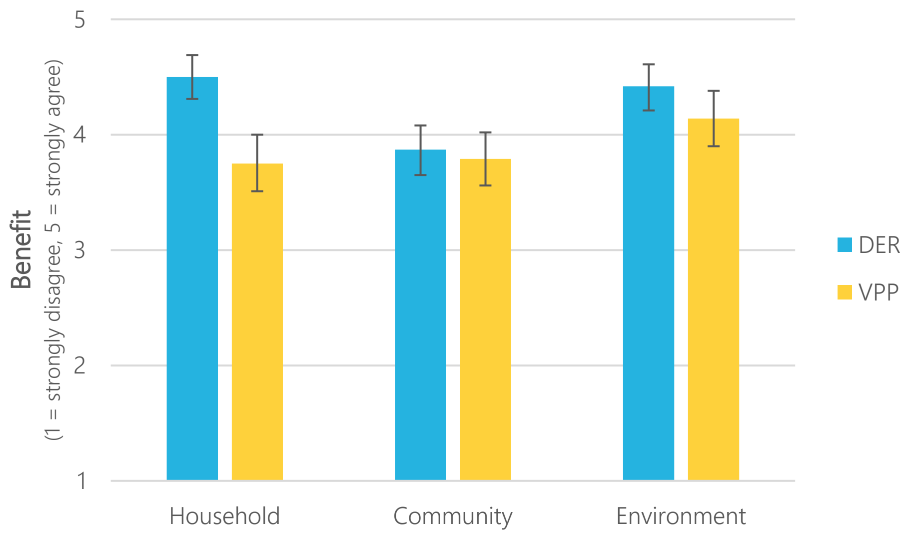

Figure 12 Extent to which household, community, and environment benefit from DER and VPP adoption: Summation of responses.

Note: The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

Finally, customers were asked to rate who they perceived benefitted most from their participation in the VPP:

- Household vs. aggregator.
- Household vs. community.

The results, which are presented in Figure 13, show that while 60% of customers believed that aggregators and households benefitted equally from their participation in the VPP, the proportion who believed that aggregators benefitted more (29%) was greater than the proportion who believed that households benefitted more (11%). A similar dynamic was observed for the sharing of VPP benefits between households and the community; while a sizeable proportion (45%) believed that benefits were shared equally, the number of customers who believed that the community benefitted more (33%) exceeded the number who believed that households benefitted more (22%).

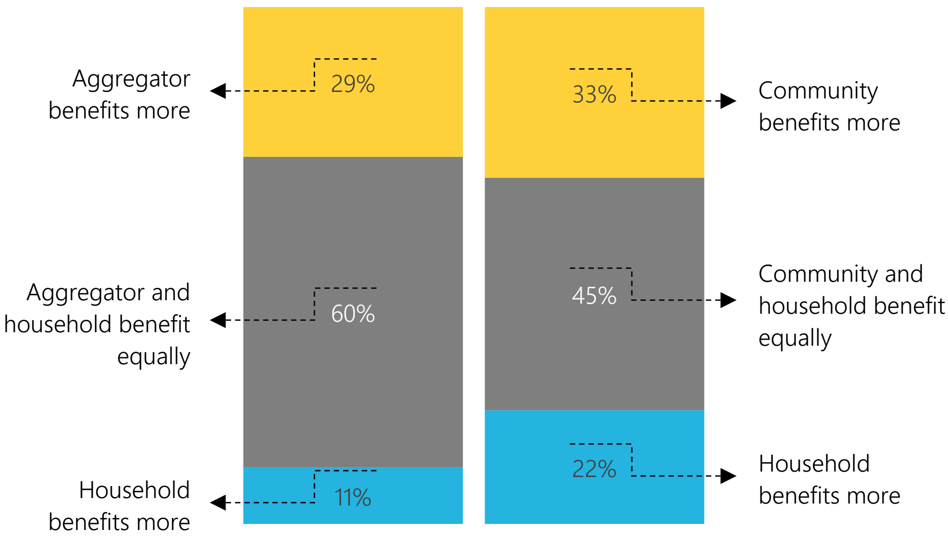

Figure 13 Relative sharing of VPP benefits between household/aggregator and household/community.

INSIGHT: Accelerating VPP adoption will likely require a greater proportion of households to believe that they are benefitting more from their VPP participation than aggregators.

While customers may accept an equal sharing of value between themselves and a service-delivering firm, few would typically want to see a firm receiving more value than they themselves are. Nevertheless, that was the dynamic observed among surveyed customers, with the proportion who believed that aggregators benefitted more (29%) more than double the proportion who believed that households benefitted more (11%). Relatedly, joining a VPP was seen as delivering less value to household than adopting DER. These findings suggest that further value proposition work may be required, whether by readjusting the value that customers receive from joining a VPP or in better communicating the value that aggregators are providing to customers. Similar findings are presented and discussed in Section 6.7.

6. VPP experiences

6.1 Perceived ease of installation/joining

Virtually every customer believed that the process of installing DER and joining the VPP had been easy (Figure 14).

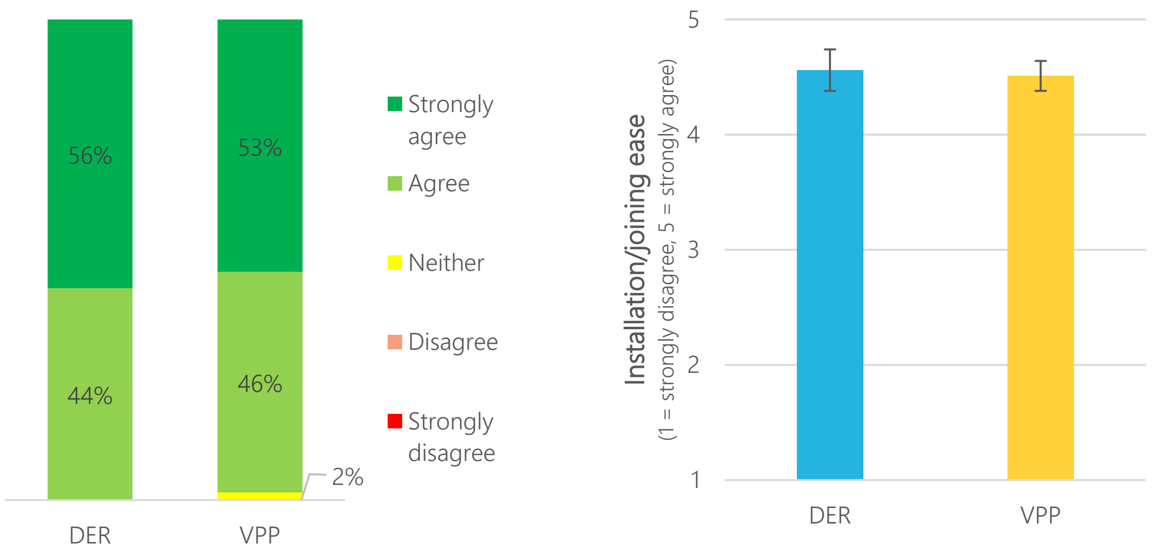

Figure 14 Perceived ease of installing DER and joining VPP.

Notes: Customers who entered the Project EDGE trial with pre-installed DER (44% of the total sample) are not included in the DER results. The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

6.2 Perceived ease of use

In total, 84% of surveyed customers perceived their DER as being easy to use, with 70% holding a similar view with respect to their VPP.

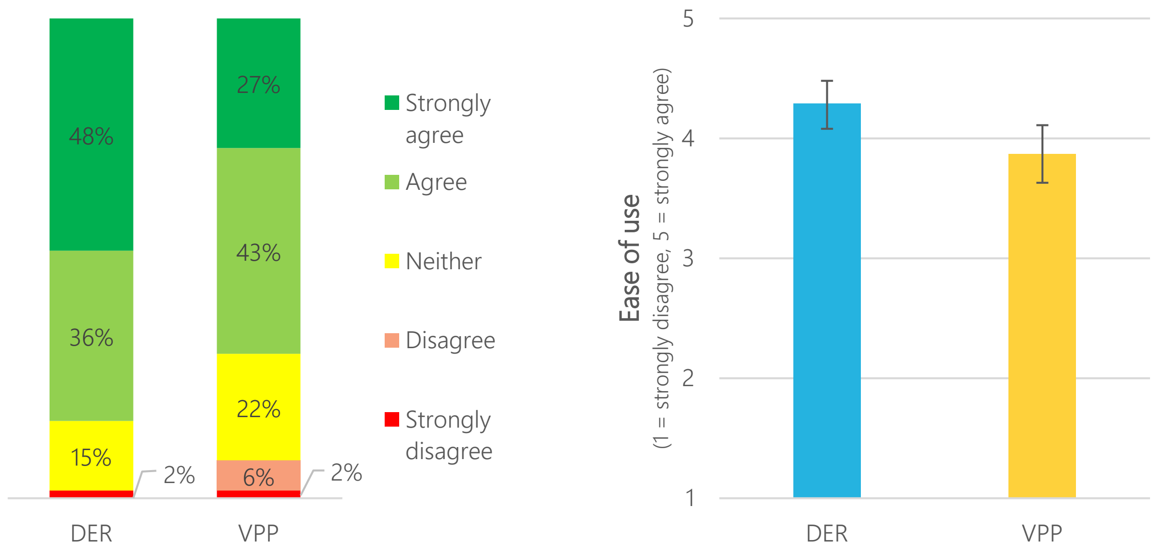

Figure 15 Perceived ease of using DER and VPP.

Note: The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

INSIGHT: Although VPP functionality was automated (whether by default or by choice) for almost all customers, only two-thirds believed that their VPP was easy to use.

Whether by default or by choice (see Section 6.3), VPP functionality was automated for virtually all customers, yet only two-thirds (70%) perceived their VPP as easy to use. Interviews conducted with customers from the same set of aggregators may provide a potential explanation, with some of those customers viewing their VPP as a 'black box' whose inner workings were too complicated to attempt to understand[24]. Corresponding feedback obtained through this survey is also presented in Section 6.4.1. Further efforts may therefore be required to help demystify the 'black box' that VPPs represent in the mind of some customers.

6.3 VPP system changes

Customers of the two aggregators with exclusively battery focused VPP offerings (Discovery Energy; Mondo) were asked whether they had changed any of the settings on their VPP. Only 7% (n = 3) of the customers of those aggregators reported having done so, with two respondents changing the time at which battery exports could occur and the remaining respondent using a force charge feature on their battery (an option that was no longer available through their VPP system).

[24] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

6.4 Comfort with aggregator's active DER management

Of the surveyed customers, 59% reported being very or extremely comfortable with the aggregator accessing and using their DER, with only 13% indicating that they were not at all or only slightly comfortable with ceding this level of control to the aggregator (Figure 16).

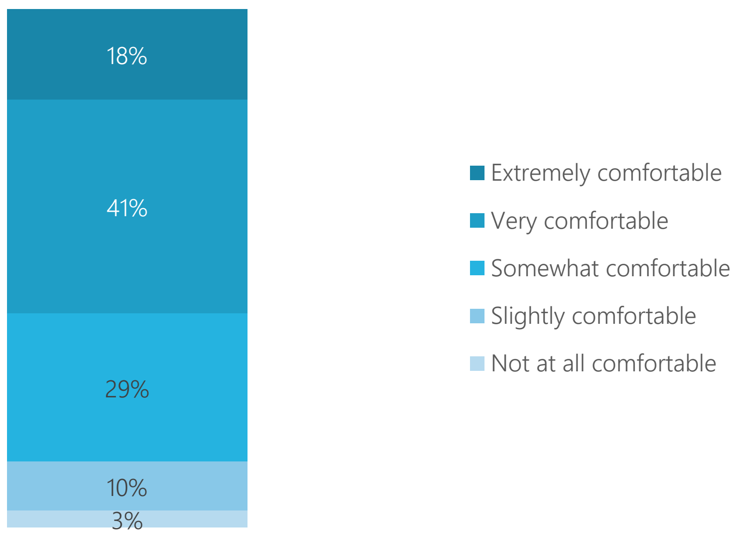

Figure 16 Level of comfort with aggregator accessing and using DER.

Customers were also given an open-ended textbox to provide suggestions for what would have reduced their concern in having an aggregator actively managing their DER. Of the 27 customers who provided suggestions that could be qualitatively coded, the most common suggestions were:

- Enhanced communication (74%; n = 20).
- Better financial rewards (15%; n = 4).

6.4.1 Enhanced communication

Real-time impact of VPP activity: Of the 20 customers requesting enhanced communication, nine sought information that would allow them to understand the real-time impact of VPP activity on their DER.

> If there were additional comms as to when and how they used it. If perhaps there were a flag on portal app indicating when the battery was being controlled by [aggregator]?

> Clearer explanation of why/when the power movements in and out of our battery were occurring

As the previous quote suggests, a subset of customers not only wanted to know *when* VPP activity was occurring, they also wanted to understand *why* that activity was taking place. Indeed, another customer provided the following feedback:

> I dont understand what algorithm or logic they are using in the control of battery charging and network feed-in. I understand that this is a trial and that [aggregator] are trying different strategies but some don't seem to make sense, such as:
> - not using max feed-in even when the battery is fully charged and solar production is (potentially) well above the feed-in limit.
> - charging the battery using imported power at peak rates
> if there is a reason for this I would feel happier knowing why...

Forewarning of planned VPP activity: Seven customers requested forewarning of any planned VPP activity requiring their DER assets so that they could work around that activity.

> Knowing the exact time that it will be accessed so I can plan household chores

> Transparency; eg letting me know ahead of time on the day when and how they would use and access our battery

Project learnings: Four customers also desired greater information about the learnings emerging from the Project EDGE trial.

> More project updates on the outcomes of the testing and operation

6.4.2 Better financial rewards

Notwithstanding the results reported in Section 5.1, the second most common suggestion for enhancing customers' degree of comfort with aggregators accessing their DER was the provision of better financial rewards.

> when the research is finished I would not allow my battery to be discharged to support the grid unless I would be paid paid [sic] more than the cost/kWh for my battery i.e. 29cents/kWh

6.5 Changes in power consumption habits due to VPP activity

Only 27% (n = 17) of surveyed customers mentioned making changes to their power consumption habits due to the aggregator's utilisation of their household DER. Among this subset of customers, most (71%) reported having been happy or very happy to have made those changes (Figure 17).

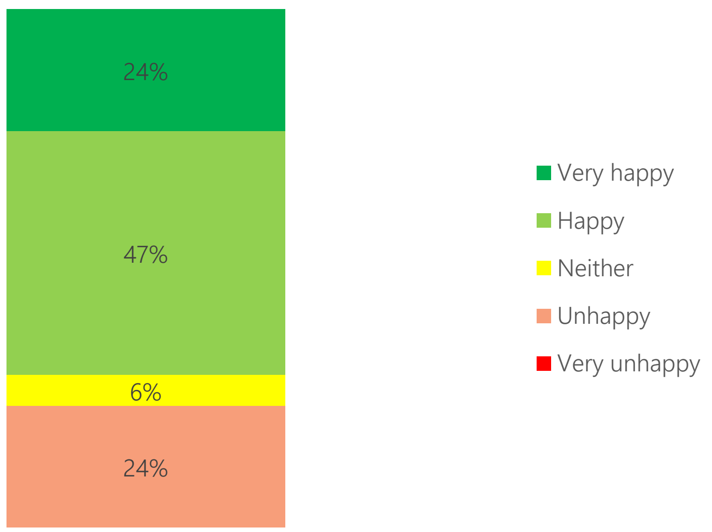

Figure 17 Extent to which customers were happy to change their power consumption due to VPP activity.

Note: Only includes customers who reported having made a change to their power consumption due to VPP activity.

Those customers who reported having changed their power consumption habits were asked to elaborate on the changes they had made. Of the 11 customers that provided information that could be qualitatively coded:

- All 11 mentioned shifting the timing of their appliance use to take advantage of their stored or self-generated energy, whether directly (e.g., "waited to use dishwasher and washing machine") or indirectly (e.g., "Forced to limit power use in the evenings due to battery not being fully charged for the peak period").
- One also mentioned changing the settings on their hot water service to reduce its energy use.

6.6 VPP messages

Customers of Discover Energy and Mondo (n = 41) were asked to report whether they recalled seeing some form of message from the VPP. The majority (63%) did recall seeing at least one such message, and of this subset of customers, 51% indicated being satisfied with the message(s) they had received (Figure 18).

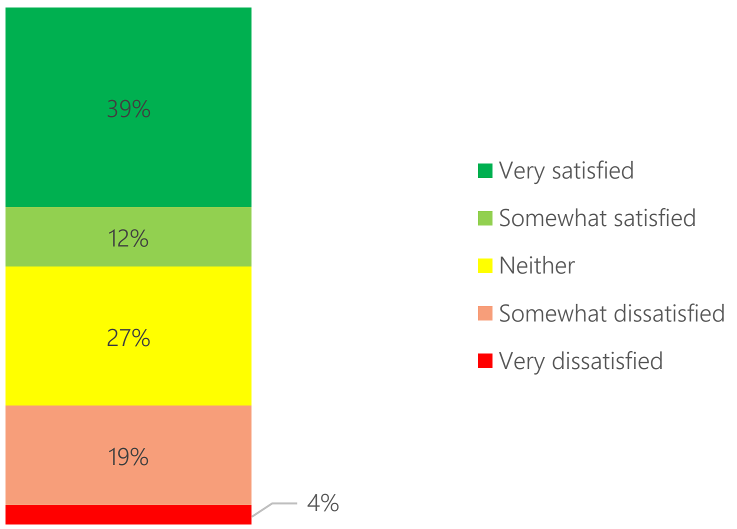

Figure 18 Satisfaction with the messages received from the VPP.

Note: Only includes customers who reported receiving a message from the VPP.

Customers who reported having received a message from the VPP were then given an opportunity to provide suggestions on what, if anything, would have improved their satisfaction with the message(s) they received. Of the 12 customers who provided suggestions that could be qualitatively coded, the most common mirrored those reported in Section 6.4.1:

- Real-time impact of VPP activity (*n* = 4).
- Forewarning of planned VPP activity (*n* = 4).
- Project learnings (*n* = 3).

INSIGHT: Around half of customers who recalled receiving at least one message from the VPP were satisfied with the content of those messages, with suggested messaging improvements including notifications about current and future VPP activity.

Only half (51%) of customers were satisfied with the messages they received from the VPP, suggesting that an opportunity exists for enhancing satisfaction with the messages being communicated by the VPPs. As in Section 6.4.1, suggested messaging improvements focused on enhancing transparency around current and future planned VPP activity so that customers could be better appraised about when and how their DER assets would be utilised. Customers also desired further information about the learnings emerging from the Project EDGE trial.

6.7 Aggregator's service delivery

Customers rated the quality of the aggregator's service delivery across a series of dimensions, including whether the aggregator:

- Knew what they were doing.
- Was a reliable and trustworthy company to deal with.
- Looked after [the customer's] long-term needs.
- Was easy to contact.
- Listened to [the customer] and made [the customer] feel comfortable.
- Quickly addressed any issues [the customer] encountered.

Across these dimensions, 86% of surveyed customers agreed that their aggregator was reliable and trustworthy, while 76% agreed that the aggregator 'knew what they were doing' (Figure 19). Conversely, only 57% agreed that the aggregator looked after the longer-term needs of their household.

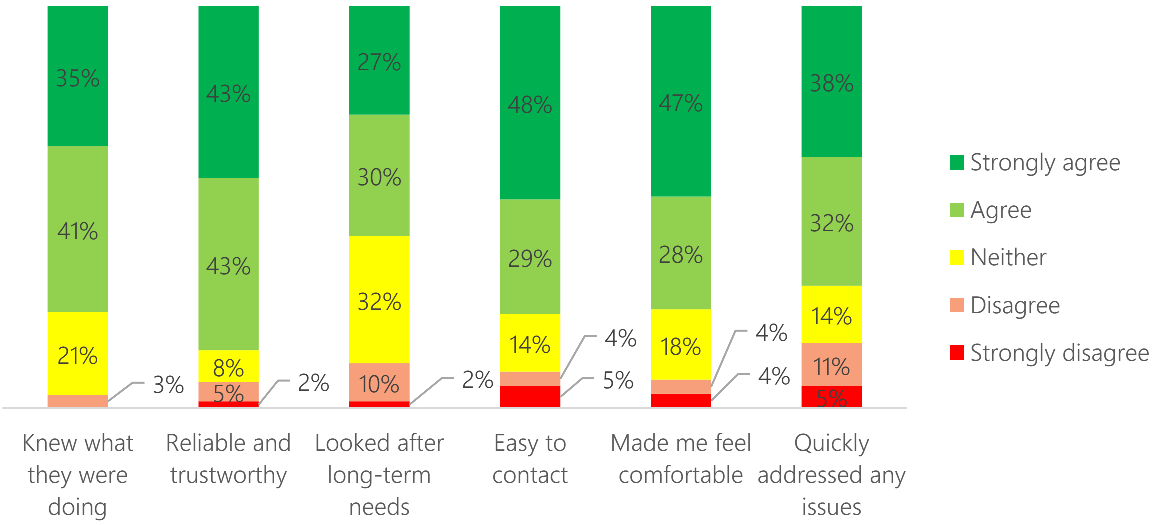

Figure 19 Perceptions of aggregator service experience: Breakdown of responses.

When relative differences across these service dimensions were compared, one difference was identified: customers' ratings of the aggregator as reliable/trustworthy were significantly higher than their ratings of the aggregator as being focused on looking after the long-term needs of customers (Figure 20).

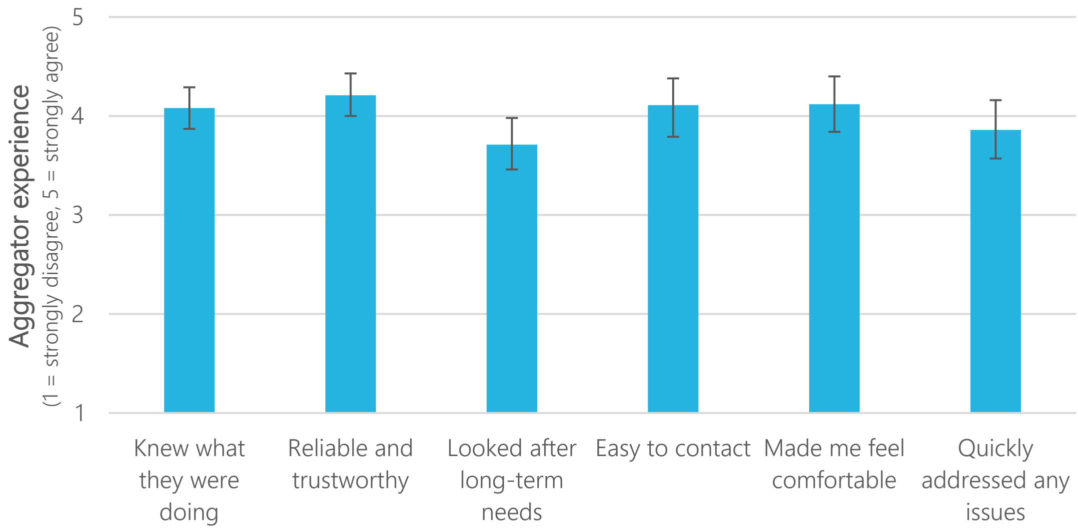

Figure 20 Perceptions of aggregator service experience: Summation of responses.

Note: The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

INSIGHT: While aggregators were perceived as trustworthy/reliable, this had not translated into an associated perception that aggregators were serving customers' long-term needs.

Consistent with the findings reported in Section 5.2, the service dimension that received the lowest level of endorsement was 'looking after my long-term needs'. This finding is consistent with earlier Project EDGE findings that customers are looking to enter a long-term, communal partnership with aggregators[25]. Further work may consequently be required to not only to achieve better long-term value for customers participating in a VPP but also to effectively communicate that value.

6.8 Social approval for VPP

More than half (56%) of surveyed customers agreed or strongly agreed that their friends and family positively viewed the VPP, although one-third (37%) responded ambivalently to this question (see Figure 21).

[25] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

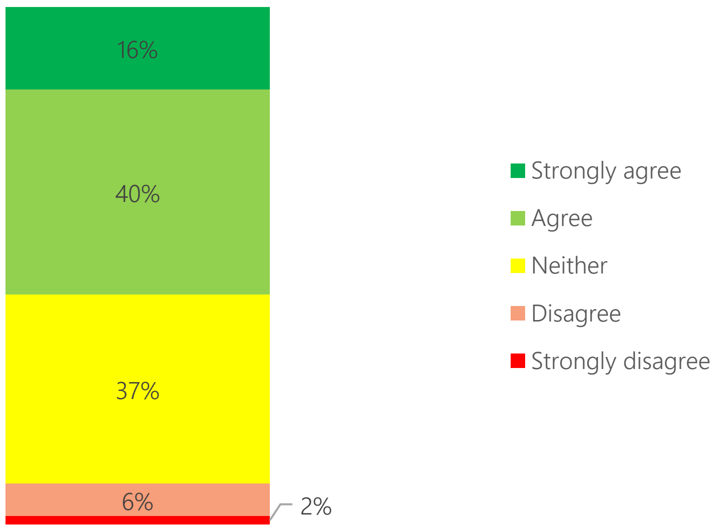

Figure 21 Friends and family viewed the VPP positively.

INSIGHT: While social approval for VPPs may not (yet) be universal, at least half of surveyed customers were willing to become advocates for this technology.

Decision-making research has long identified the central role of social approval in influencing behaviour[26]. The fact that more than half (56%) of customers perceived some form of social approval for their decision to join a VPP is therefore promising, although greater levels of social approval will likely be required to accelerate VPP adoption. Indeed, that more than one-third (37%) of customers could not report whether their friends or family viewed their VPP positively may simply reflect that they had not talked about this (admittedly niche) technology with others in their social network. Aggregators could consequently consider ways of supporting or encouraging their existing customer base to become advocates for VPPs as a means of enhancing social approval, particularly given that 51% of surveyed customers were prepared to promote this technology to others (see Section 4.2).

[26] Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

7. Motivating VPP activity

Surveyed customers were presented with a set of hypothetically focused strategies to identify potential ways of motivating increased VPP activity.

7.1 Motivating customers to increase VPP export activity

Customers of the two aggregators with battery focused VPP offerings (Discover Energy and Mondo; *n* = 41) were asked to rate the motivating influence of five strategies for increasing VPP exports:

- Receiving better financial returns for exporting your stored power.
- Receiving regular free check-ups and maintenance for [their] home's energy system (e.g., solar panels, battery).
- Having access to [their] exported stored power from other locations (e.g., when charging an electric vehicle).
- Having more control over when [they] can export your stored power.
- Receiving a message from [their aggregator] requesting a short-term export increase to address a power shortage in an emergency like a bushfire.

The results of these findings are presented in Figure 22. Notably, each of the examined strategies were deemed to have at least some motivating influence, with the proportion of customers indicating that a strategy was very or extremely motivating ranging from 47% (accessing exported stored power from other locations) to 84% (short-term request to help in an emergency).

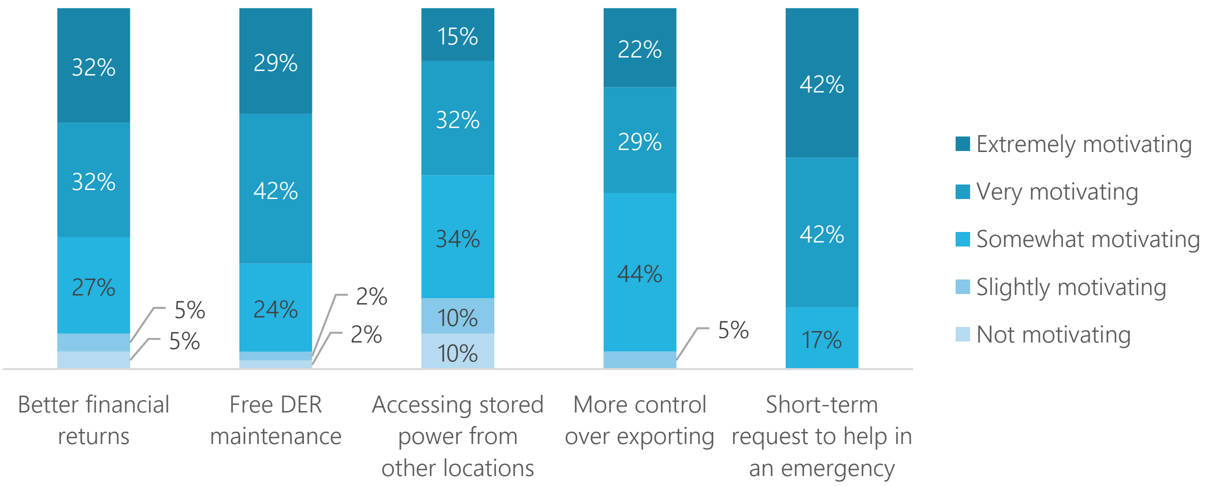

Figure 22 Perceived motivating influence of different strategies for enhancing VPP export activity: Breakdown of responses.

The relative motivating influence of each strategy was also examined. As shown in Figure 23, short-term requests for additional VPP exports to help address power shortages experienced in an emergency were rated as more motivating than two other strategies for encouraging additional VPP exports: accessing exported stored power from other locations and having more control over when power exports occurred.

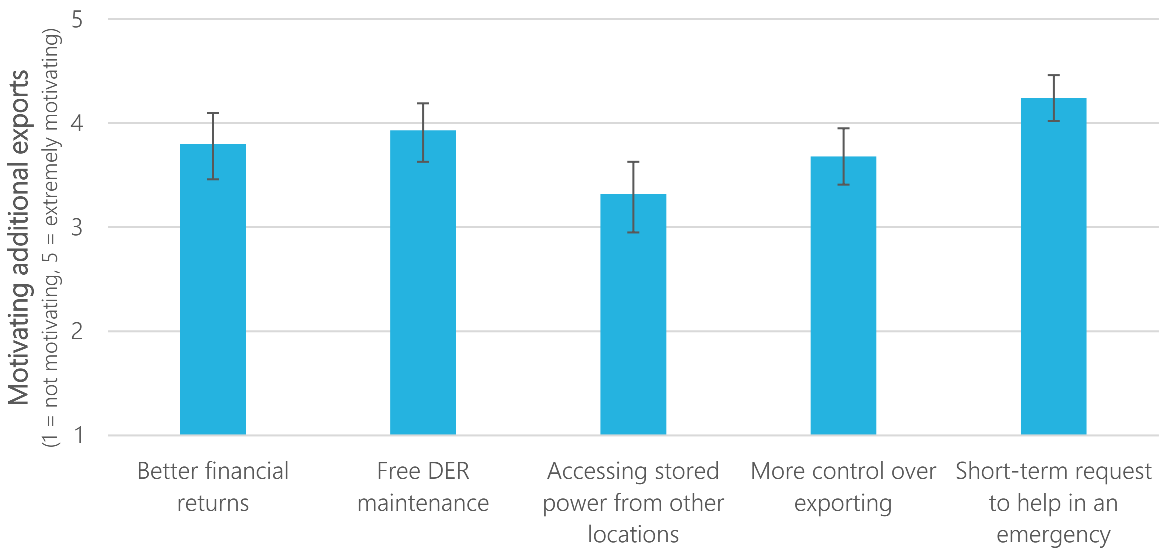

Figure 23 Perceived motivating influence of different strategies for enhancing VPP export activity: Summation of responses.

Note: The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other.

INSIGHT: Customers may be motivated by requests for additional VPP exports that are philanthropically focused.

One of the learnings from interviews conducted with customers of the same Project EDGE aggregators was that requests for short-term additional exports to address philanthropic needs might prove motivating[27]. The current survey findings provide empirical support for this proposition. Given this empirical support, it is worth restating an adjacent finding from those previously conducted interviews: if aggregators were to implement philanthropically focused short-term requests for additional power exports, customers would expect to receive follow-up communications that outline the tangible impact of those exports.

[27] Jacob John, J., Gatumu, M., Newton, J., Rotman, J., & Weber, V. (2023). Qualitative insights into the experiences of customers participating in a Virtual Power Plant field trial. Available from: https://aemo.com.au/-/media/files/initiatives/der/2023/project-edge-qualitative-insights-for-customers-in-a-vpp.pdf?la=en

7.2 Motivating customers to register additional DER with VPP

Rheem's customers (*n* = 22) were presented with a slightly different scenario to better account for the specifics of the VPP they had joined. Specifically, these customers were asked to rate the motivating influence of three strategies for encouraging them to register additional DER with the VPP:

- Receiving better financial returns for allowing the aggregator to manage your DER.
- Receiving regular free check-ups and maintenance of the DER that the aggregator manages.
- Having more control over when the aggregator can manage your DER.

From the outset, it should be noted that there were insufficient surveyed customers within this sub-group to permit the computation of 95% confidence intervals for the relative motivating influence of each strategy. Nevertheless, it is noteworthy that receiving free DER maintenance was seen as being very or extremely motivating by 72% of surveyed customers (see Figure 24). In contrast, having greater control over when DER could be managed by the aggregator was rated as very or extremely motivating by only 39% of surveyed customers.

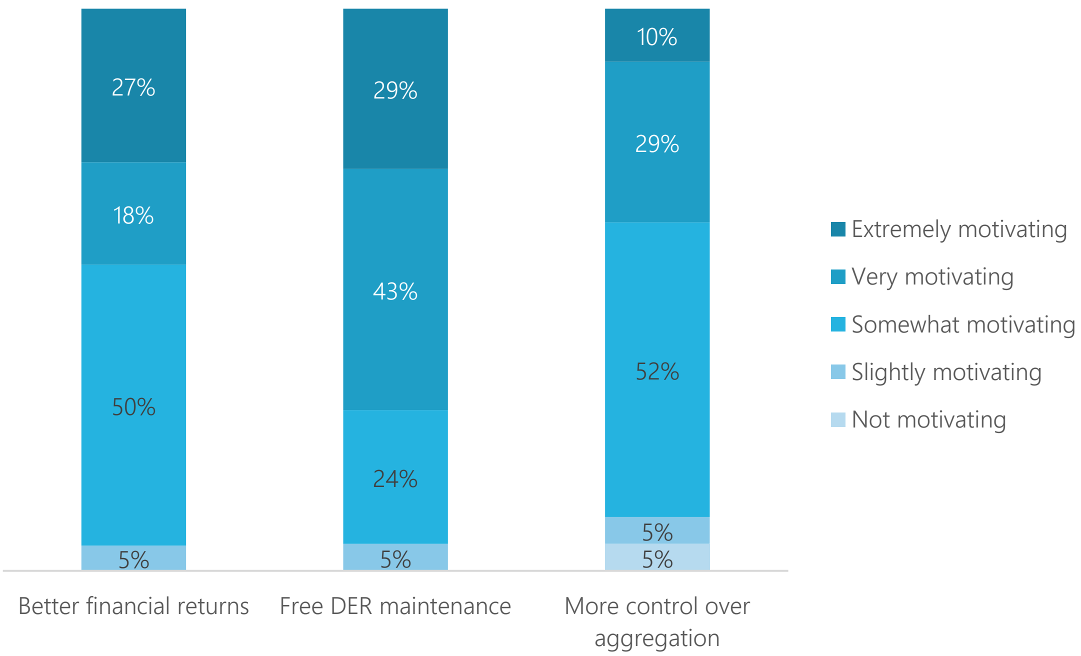

Figure 24 Perceived motivating influence of different strategies for registering additional DER with VPP.

8. Conclusion

Current customers of the three DER aggregators participating in the Project EDGE trial (Discover Energy, Mondo, Rheem) were surveyed to evaluate their perceptions of each aggregator's VPP offering. Insights emerging from this survey are thematically grouped below into four key learnings.

Key learning 1: VPP satisfaction was broad but fragile.

Most (79%) customers were satisfied with their experience with the VPP, although there may be some fragility to this satisfaction rating given that most (68%) customers were also unable to evaluate whether their VPP was competitive relative to other VPPs. Moreover, only 59% of customers reported being very or extremely comfortable with their aggregator accessing and using their DER. Helping customers appreciate the competitive value of their VPP and addressing their concerns about aggregators actively managing their DER may therefore be necessary to maintain and grow these satisfaction levels.

Key learning 2: The value proposition for joining a VPP should be further enhanced and communicated.

Several lines of converging evidence highlight that further work is required to improve the value proposition for joining and remaining with a VPP. For example:

- Satisfaction with the financial rewards that customers were receiving for their participation was reasonably high (71%) but somewhat disconnected from the impact that their VPP participation had had on their energy bills, with only 40% reporting reduced energy bills due to their VPP participation. Whether similar levels of satisfaction will be observed among a more diverse group of customers or as different forms of financial rewards are offered by aggregators remains to be seen.
- When asked to rate who benefitted most from VPP participation – households or aggregators – the proportion of customers who rated aggregators as being the primary beneficiary of VPP participation (29%) was more than double the proportion who believed households to be the primary beneficiary (11%), with the remainder believing that benefits were shared about equally between aggregators and households. While customers may accept an equal sharing of benefits between themselves and an aggregator, to accelerate rates of VPP participation, customers should ideally see more of the benefits of participation coming to households, particularly given that participation is dependent on having first personally purchased expensive DER.
- Joining a VPP was seen as delivering significantly less value to households than adopting DER. This provides an opportunity for aggregators to clearly outline the value proposition of joining a VPP over and above DER ownership.
- While most (86%) customers perceived their aggregator as trustworthy and reliable, this had not translated into a perception that aggregators were serving customers' long-term needs, with only 57% of customers agreeing with this proposition.

Key learning 3: Customers were seeking improved communication and transparency.

Even though the majority of VPP activity was entirely automated, only 70% of customers perceived the VPP as easy to use. Potentially contributing to this view was the perception that the inner workings of the VPP was a 'black box' that was too complicated to fully understand. Reinforcing this interpretation, customers identified several ways in which VPP communication could be improved, most of which centred on providing greater transparency around when and why VPP activity was occurring.

Key learning 4: While the examined strategies for enhancing VPP export activity are all likely to have some motivational influence, short-term, philanthropically focused requests may be especially motivating.

Five potential strategies for encouraging additional VPP export activity were examined, and each was rated as being very or extremely motivating by at least 47% of customers:

- Receiving better financial returns for exporting stored power.
- Receiving regular free check-ups and maintenance for DER.
- Having access to exported stored power from other locations, such as to charge an electric vehicle.
- Having more control over when power stored power was exported.
- Receiving a short-term request for an increase in exports to address a power shortage in an emergency like a bushfire.

However, one strategy – philanthropically focused requests for additional export activity – was seen to be very or extremely motivating by 84% of customers.

Examined collectively, these learnings highlight that while customers were broadly satisfied with the VPP experience they received as part of the Project EDGE trial, opportunities exist for further enhancing that experience. For example, customers sought improvements to the value proposition for joining and remaining with their VPP as well as greater transparency in how their DER assets were being used. Customers were, however, also open to increasing their VPP exports, provided that any requests for increased exports delivered tangible benefits for themselves or vulnerable stakeholders.

A1. Survey

[Section A: Overall satisfaction]

A1. Overall, I am satisfied with my [battery / PowerStore].
- [1 = strongly disagree; 5 = strongly agree]

A2. Overall, I am satisfied with [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP].
- [1 = strongly disagree; 5 = strongly agree]

[Section B: Net Promoter Score / Retention]

B1. How likely are you to recommend purchasing a [battery / PowerStore] to someone like you?
- [0 = not at all likely; 10 = very likely]

B2. How likely are you to recommend joining [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] to someone like you?
- [0 = not at all likely; 10 = very likely]

B3. How likely are you to remain with [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] once the Project EDGE trial finishes?
- [0 = not at all likely; 10 = very likely]

Section C: DER hardware

C1. Did you purchase a [battery / PowerStore] as part of joining [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP]?
- [1 = No]
- [2 = Yes]

C2. How long have you had a [battery / PowerStore] at your home?
- [1 = Less than 3 months]
- [2 = 3 to less than 6 months]
- [3 = 6 to less than 12 months]
- [4 = 12 months or more]

C3. How long has [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] been fully operational at your home?
- [1 = Less than 3 months]
- [2 = 3 to less than 6 months]
- [3 = 6 to less than 12 months]
- [4 = 12 months or more]

[For Solahart customers only]

C4. Have you registered any other energy technologies with the Solahart EDGE VPP?

- [1 = No]
- [2 = Yes]

[If C4 = yes]
What other energy technologies have you registered with the Solahart EDGE VPP?
Please select all that apply.
- [1 = Solar panels]
- [2 = Battery]
- [3 = Electric vehicle charger]

[For Mondo/Discover Energy customers only]
C5. Have you changed any of the settings for [Mondo's Project EDGE / Discover Energy's VPP]?
- [1 = no; 2 = yes]

[If C5 = yes]
What settings did you change? ______
What prompted you to change these settings? ______

[Section D: Customer experience]

D1. Having a [battery / PowerStore] benefitted my household.
- [1 = strongly disagree; 5 = strongly agree]

D2. Being part of [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] benefitted my household.
- [1 = strongly disagree; 5 = strongly agree]

D3. Having a [battery / PowerStore] benefitted the broader community.
- [1 = strongly disagree; 5 = strongly agree]

D4. Being part of [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] benefitted the broader community.
- [1 = strongly disagree; 5 = strongly agree]

D5. Having a [battery / PowerStore] benefitted the environment.
- [1 = strongly disagree; 5 = strongly agree]

D6. Being part of [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] benefitted the environment.
- [1 = strongly disagree; 5 = strongly agree]

D7. My [battery / PowerStore] was easy to use.
- [1 = strongly disagree; 5 = strongly agree]

D8. [Mondo's Project EDGE / Discover Energy's VPP/ The Solahart EDGE VPP] was easy to use.
- [1 = strongly disagree; 5 = strongly agree]

D9. If I wanted to, I could customise [Mondo's Project EDGE / Discover Energy's VPP] to suit my needs.

- [1 = strongly disagree; 5 = strongly agree]

D10. [Mondo's Project EDGE / Discover Energy's VPP/ The Solahart EDGE VPP] compares well with other similar VPPs.

- [1 = strongly disagree; 5 = strongly agree]

D11. Throughout my experience with [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP]:

- [Mondo / Discover Energy / Solahart] knew what they were doing.
- [Mondo / Discover Energy / Solahart] was a reliable and trustworthy company to deal with.
- [Mondo / Discover Energy / Solahart] looked after my long-term needs.

  [1 = strongly disagree; 5 = strongly agree]

D12. My friends and family viewed [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] positively.

- [1 = strongly disagree; 5 = strongly agree]

D13. The process of installing a [battery / PowerStore] was easy.

- [1 = strongly disagree; 5 = strongly agree]

D14. The process of joining [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] was easy.

- [1 = strongly disagree; 5 = strongly agree]

D15. If I needed help, staff at [Mondo / Discover Energy / Solahart] were easy to contact.

- [1 = strongly disagree; 5 = strongly agree; 6 = not applicable]

D16. Staff at [Mondo / Discover Energy / Solahart] listened to me and made me feel comfortable.

- [1 = strongly disagree; 5 = strongly agree; 6 = not applicable]

D17. [Mondo / Discover Energy / Solahart] quickly addressed any issues I encountered.

- [1 = strongly disagree; 5 = strongly agree; 6 = not applicable]

[Section E: DER experiences and perceptions]

[For Mondo / Discover customers only]

E1. How comfortable were you with [Mondo / Discover Energy] accessing and using your battery?

- [1 = not at all comfortable; 5 = very comfortable]

E2. What, if anything, would have made you more comfortable with [Mondo / Discover Energy] accessing and using your battery?

- [text response]

E3. Did you make any changes to your household's power use as a result of [Mondo / Discover Energy] accessing and using your battery?

- [1 = no; 2 = yes]

  [If E3 = yes]
  What changes did you make? _____
  Overall, how happy or unhappy were you to make these changes?
  - [1 = very unhappy; 5 = very happy]

E4. How satisfied were you with the financial rewards you received for participating in [Mondo's Project EDGE / Discover Energy's VPP]?
- [1 = not at all satisfied; 5 = very satisfied]

E5. Did you receive any messages from [Mondo's Project EDGE / Discover Energy's VPP] informing you when they were going to access and use your battery?
- [1 = no; 2 = yes]

  [If E5 = yes]
  What messages did you receive? _____
  Overall, how satisfied were you with the messages you received?
  - [1 = not at all satisfied; 5 = very satisfied]

  What changes, if any, would have increased your satisfaction with these messages? _____

E6. What would motivate you to allow [Mondo / Discover Energy] to export more of your stored battery power to the grid?
- Receiving better financial returns for exporting your stored power
- Receiving regular free check-ups and maintenance for your home's energy system (e.g., solar panels, battery)
- Having access to your exported stored power from other locations (e.g., when charging an electric vehicle)
- Having more control over when you can export your stored power
- Receiving a message from [Mondo / Discover Energy] requesting a short-term export increase to address a power shortage in an emergency like a bushfire
- [1 = would not motivate me; 5 = would strongly motivate me]

[For Solahart customers only]
E7. How comfortable were you with Solahart determining when your hot water system should be charged?
- [1 = not at all comfortable; 5 = very comfortable]

E8. What, if anything, would have made you more comfortable with Solahart determining when your hot water system should be charged?
- [text response]

E9. Did you make any changes to your hot water use as a result of Solahart determining when your hot water should be charged?

[1 = no; 2 = yes]

[If E9 = yes]
What changes did you make? ______
Overall, how happy or unhappy were you to make these changes?
- [1 = very unhappy; 5 = very happy]

E10. How satisfied were you with the financial rewards you received for participating in the Solahart EDGE VPP?
- [1 = not at all satisfied; 5 = very satisfied]

E11. Would you like Solahart to notify you whenever they are controlling your hot water or other connected appliances?
- [1 = no; 2 = yes]

[If E11 = yes]
How would you like Solahart to notify you when they are controlling your hot water or other connected appliances?
[1 = Your Solahart Home Energy Management System shows a flag whenever one of your appliances is being controlled]
[2 = You receive an SMS notification whenever one of your appliances is being controlled]

E12. What would motivate you to allow Solahart to manage other appliances in your home's energy system (e.g., solar panels, household battery, pool pump, electric vehicle charger)?
- Receiving better financial returns for allowing Solahart to manage your appliances
- Receiving regular free check-ups and maintenance of the appliances that Solahart manages
- Having more control over when Solahart can manage your appliances
- [1 = would not motivate me; 5 = would strongly motivate me]

[Section F: Perceptions of equity]

F1. What impact has having a [battery / PowerStore] had on your energy bills?
- [1 = substantially reduced my energy bills; 5 = substantially increased my energy bills; 6 = too early to tell]

F2. What impact has participating in [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] had on your energy bills?
- [1 = substantially reduced my energy bills; 5 = substantially increased my energy bills; 6 = too early to tell]

F3. Who do you think benefits most from being a member of [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP]: your household or [Mondo / Discover Energy / Solahart]?
- [1] My household benefits most
- [2] My household and [Mondo / Discover Energy / Solahart] benefit about equally
- [3] [Mondo / Discover Energy / Solahart] benefits most

F4. Who do you think benefits most from being a member of [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP]: your household or the broader community?

- [1] My household benefits most
- [2] My household and the broader community benefit about equally
- [3] The broader community benefits most

[Section G: Open-ended questions]

G1. Do you have any other feedback about your experience with [Mondo's Project EDGE / Discover Energy's VPP/ the Solahart EDGE VPP] that you would like to share?

[Section H: Demographics]

H1. What is your gender?

- [1] Male
- [2] Female
- [3] Non-binary / third gender
- [4] Other
- [5] Prefer not to say

H2. What is your age in years? ________

H3. What is the highest level of education you have completed?

- [1] Did not complete high school
- [2] High school
- [3] Vocational training (e.g., apprenticeship, TAFE)
- [4] Bachelor's degree
- [5] Postgraduate degree
- [6] Prefer not to say

H4. How many people usually live in your house? ________

H5. What is your annual household income before taxes?

- [1] Less than $20,000
- [2] $20,000 - $39,999
- [3] $40,000 - $59,999
- [4] $60,000 - $79,999
- [5] $80,000 - $99,999
- [6] $100,000 - $119,999
- [7] $120,000 - $139,999
- [8] $140,000 or more
- [9] Prefer not to say