Project EDGE

General Community Perceptions of Distributed Energy Resources

Version 1

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This report has been developed with the support of:

Important notice

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PURPOSE

This report was produced by Deakin University's Better Consumption Lab and details findings from a community survey of potential customers to understand their perceptions of Distributed Energy Resources (DER) and DER aggregation services.

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.

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ARENA ACKNOWLEDGEMENT AND DISCLAIMER

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Executive summary

A survey of 893 residents of the Australian states of New South Wales, Queensland, South Australia, and Tasmania was conducted to evaluate how the general community perceives Distributed Energy Resources (DERs) and DER energy aggregation services (henceforth, aggregators). Through this research, emphasis was placed on understanding:

- Whether perceptions differed by customer segment.
- What factors predict intention to purchase DERs and join an aggregator.
- What strategies could enhance trust in aggregators.
- The perceived fairness of different policy options for integrating DER into the National Energy Market.

Analysis of the survey responses yielded a range of key insights for consideration:

- *Interest in adopting DER and joining an aggregator was lukewarm.* Participants indicated that they were on average 'moderately interested' in both adopting DER and joining an aggregator, with some further variation across customer segments (solar panel status, adopter category). If the aim is to motivate the rapid uptake of DER-related offerings, further work will be required to enhance the customer value proportion for adopting DER and joining an aggregator.
- *The value proposition for joining an aggregator – over and above adopting DER – was seen as unclear.* Participants perceived that joining an aggregator would deliver equivalent outcomes to adopting DER. Given that DER adoption is required to join an aggregator, this finding suggests that participants saw little incremental benefit in joining an aggregator over and above adopting DER. The one exception was 'helping the community', with participants seeing this outcome as being more likely to occur from joining an aggregator (vs. simply adopting DER). Additional work is therefore needed to develop compelling value propositions for joining an aggregator.
- *Rational outcomes were valued more strongly than emotional ones, particularly in considering whether to join an aggregator.* Emotional outcomes (exciting, enjoyable) are often overlooked as potential motivators in energy decision making, and such outcomes were indeed found to predict interest in adopting DER and joining an aggregator. However, rational outcomes (useful, wise) tended to play a larger role in shaping participants' adoption interest, particularly their interest in joining an aggregator. The heightened importance that participants placed on rational outcomes has implications for how value propositions could be optimally framed to potential customers.
- *Saving money and having a reliable supply of power shaped interest in adopting DER and joining an aggregator.* Participants consistently identified 'saving money' and 'having a reliable supply of power' as key factors influencing their interest in adopting DER and joining an aggregator.
- *Costs of adopting DER tended to be underestimated.* Participants' acceptable price ranges for solar panels and batteries tended to underestimate their actual current cost, highlighting the

importance of both enhancing the value proposition for adopting DER and developing associated marketing strategies for communicating this value to consumers.

- *Most participants were reserving judgment about whether they could trust an aggregator to access and export their stored power.* While one in four participants indicated that they would trust an aggregator to access and export their stored power, the majority (three in five) were unsure. Most participants therefore appeared to be reserving judgement as to whether they could trust an aggregator.
- *Providing consumer control, transparency, and consumer safeguards were seen as ways to enhance trust in an aggregator*. Consumer control (ability to determine when and how much power could be exported), transparency (pre- and post-export notifications), and consumer safeguards (guaranteed financial earnings) were identified by participants as key mechanisms for enhancing trust in an aggregator.
- *Information about consumer safeguards and likely financial benefits were deemed useful in helping decide whether to join an aggregator.* Participants identified a range of information categories that would help them decide whether to join an aggregator, including consumer safeguards (privacy, battery protection) and likely financial benefits.
- *Perceptions of policy fairness were influenced by solar panel status.* Across the entire sample, the policy settings perceived as being most fair were those where solutions for integrating DERs into the National Energy Market only affected DER owners. At a more granular level, solar panel owners preferred options that did not result in greater upfront costs for DER owners.

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1. Introduction

Project EDGE is a proof-of-concept trial designed to demonstrate the effectiveness of a Distributed Energy Resources (DER) marketplace in delivering electricity services to the National Energy Market. As part of this trial, customers select an aggregator to actively manage and use their DER – such as rooftop solar panels and a household battery – to deliver the electricity services required by a distribution network service provider. In return, the aggregator provides financial compensation and other benefits to participating customers.

Foundational to the longer-term success of DER marketplace initiatives like Project EDGE is understanding how potential customers view the benefits of adopting DER and joining an aggregator. Against this backdrop, Deakin University's Better Consumption Lab was commissioned to assess:

- The informational requirements and perceptions of potential DER customers.
- Levels of comfort with third-parties managing DER assets as well as potential ways to increase this level of comfort.
- Segment-related differences in motivations to sign-up with an aggregator.
- Segment-related differences in establishing trust in an aggregator.
- Perceptions of equity around different DER export options.
- The relative importance of financial vs. social incentives for joining an aggregator.

2. Method

2.1 Survey and Recruitment

A copy of the study survey questions is presented in Appendix A. These questions and the associated participant recruitment strategy were approved by the Deakin University Ethics Committee prior to the commencement of recruitment.

Participants were recruited in September 2022 through an online commercial research panel. To be eligible to participate, individuals needed to satisfy each of the following criteria:

- *Aged 18 years or over.*
- *Currently residing in the states comprising Australia's National Energy Market, excluding Victoria.* Victoria was excluded to prevent potential overlap with other Project EDGE participant recruitment-related activities occurring over the same period. Participants in this study consequently resided in New South Wales, Queensland, South Australia, or Tasmania.
- *Currently residing in a free-standing house or a duplex.* DER such as solar panels and a household battery are most easily installed on detached or semi-detached residential properties.
- *Owned the property they were currently residing in, either outright or with a mortgage.* Renters or people who do not own their primary place of residence typically do not have the legal authority to install DER at their residence.
- *Consent to participate in the research.*

Of the 1,008 individuals who completed the online survey, 115 failed an attention check, provided 'straight-line' responses, or consistently reported out-of-range values and were consequently excluded from analysis. The remaining 893 formed the study sample.

2.2 Demographic Profile of the Study Sample

The proportion of participants who identified as female (51%) was roughly equivalent to the proportion who identified as male (49%). The average age of participants was 61.3 years, which reflects the requirement for study participants to own their primary place of residence. A full breakdown of the age distribution of the study sample is presented in Figure 1.

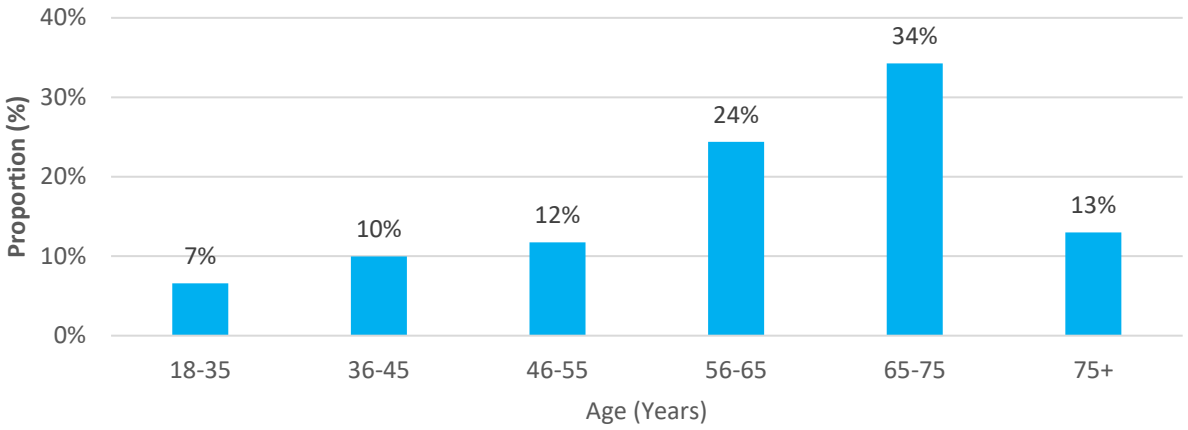

Figure 1 Age Distribution of the Study Sample

The median annual household income was between $40,000 and $79,999 (see Figure 2), with 21% of participants reporting that they earned $120,000 or more per annum.

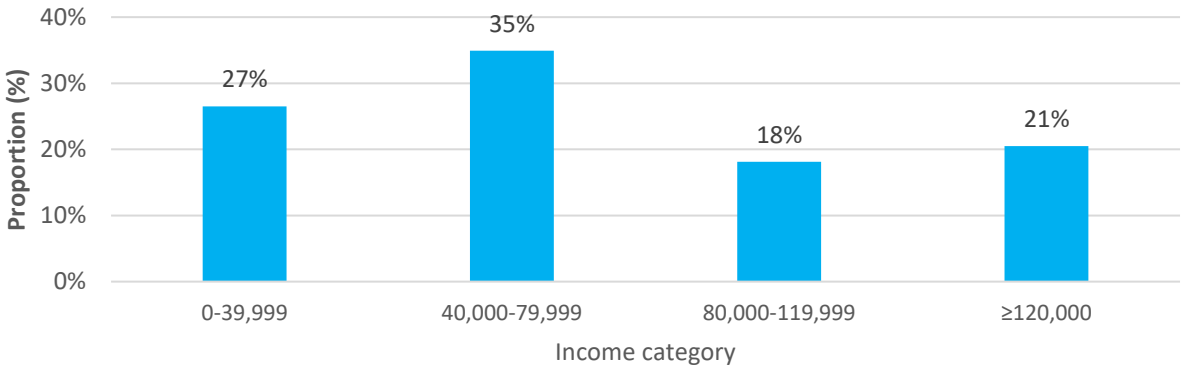

Figure 2 Annual Household Income Distribution of the Study Sample

When participants were asked to describe their highest level of attained education, the most selected response was having a 'vocational degree' (35%; see Figure 3).

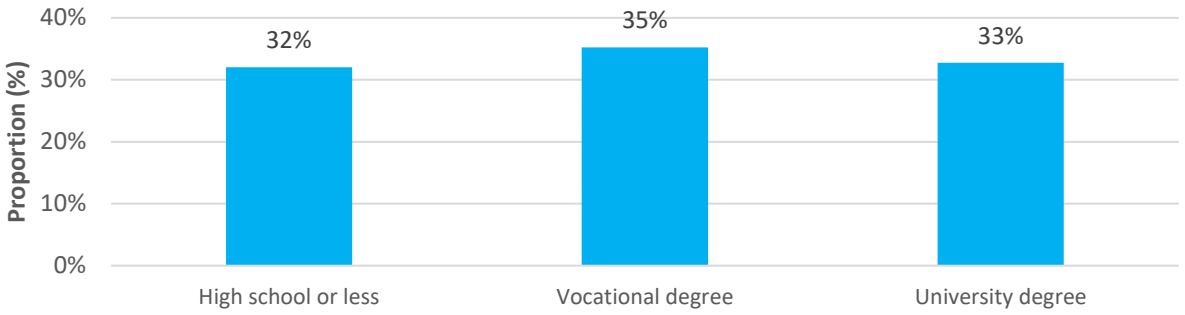

Figure 3 Highest Level of Education Attained by the Study Sample

Quotas were used to ensure proportional sampling from the target states. Thus, most participants (50%) resided in New South Wales, followed by Queensland, South Australia, and Tasmania (see Figure 4).

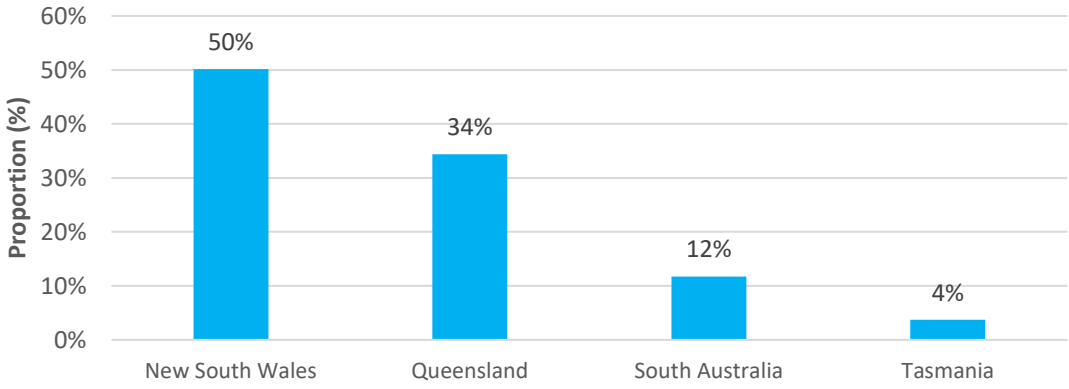

Figure 4 State of Residence Reported by the Study Sample

Most participants (54%) reported residing in a household comprising two occupants (see Figure 5).

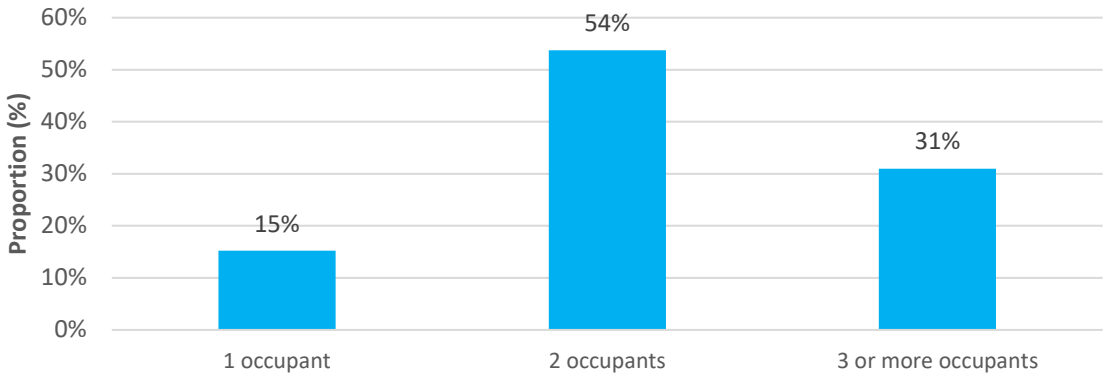

Figure 5 Number of Household Occupants Reported by the Study Sample

Participants were asked to indicate what, if any, energy technology they had installed at their primary place of residence. Rooftop solar panels were the most common technology reported (53%), with the reported percentage exceeding the proportion of Australian households with solar panels (approx. 30%; ARENA, 2022). This discrepancy likely occurred because study participation was restricted to individuals who both resided in a free-standing house/duplex and who owned that property. However, because participation was voluntary, it is also feasible that participants with an interest in energy – as manifested by owning rooftop solar panels – preferentially completed the survey.

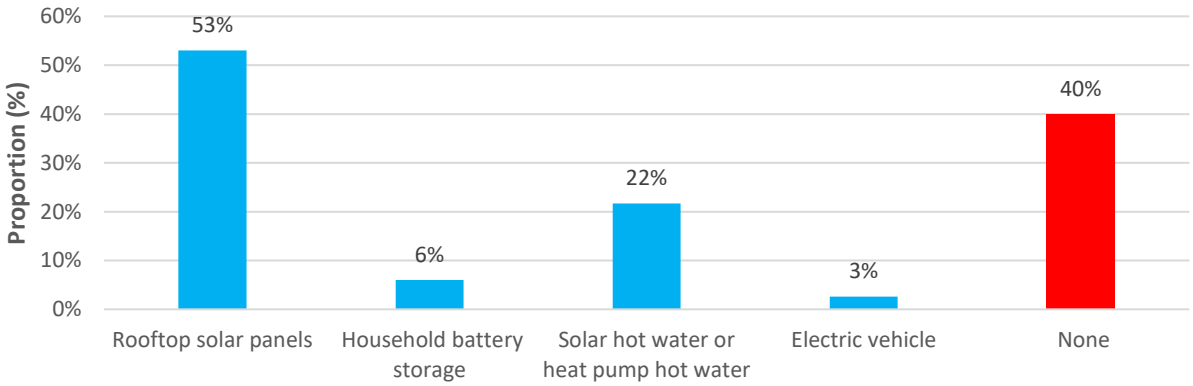

Figure 6 Ownership of Energy Technology Reported by the Study Sample

Participants were also asked to report the frequency and severity of power outages at their primary place of residence, with 27% reporting common and/or major outages and the remainder (73%) reporting that outages were both rare and minor.

3. Consumer Segments

3.1 Solar Panel Status

Participants were categorised into two segments: those who currently have rooftop solar panels on their primary place of residence and those who do not. The relevance of these consumer segments is twofold:

- Consumers who have direct experience with a DER may hold different perceptions and intentions toward adopting other DER or in joining an aggregator.
- Consumers who already own solar panels are closer to having the DER necessary to join aggregators focused on Virtual Power Plant offerings.

The sociodemographic profile of these two segments is outlined in Table 1 below. Education and household income did not vary between those who owned solar panels and those who did not. However, males and two occupant households were over-represented among participants reporting solar panel ownership.

Table 1 Sociodemographic Profile of Solar Panel Status

Sociodemographic variable	Solar panels: No	Solar panels: Yes
Gender		
Male	42.4%	55.0%
Female	57.6%	45.0%
Education		
High school or less	31.3%	32.7%
Vocational degree	35.2%	35.2%
University degree	33.5%	32.1%
Annual household income		
$0 - $39,999	27.4%	25.7%
$40,000 - $79,999	31.7%	37.7%
$80,000 - $119,999	18.3%	17.9%
$120,000 and more	22.6%	18.6%
Household occupants		
1 occupant	16.7%	14.0%
2 occupants	49.2%	57.7%
3 or more occupants	34.1%	28.2%

Red and green highlighting is used to indicate if solar panel status is over-represented (green; standardised residual ≥ 1.96) or under-represented (red; standardised residual ≥ -1.96) across a particular set of sociodemographic variables.

3.2 Self-Identified Adopter Category

A literature review conducted by the Better Consumption Lab (Rotman et al., 2022) identified that early adopters have been overrepresented in research conducted to date on DER perceptions. To help remedy this issue, the second study segmentation variable was adopter category. Adopter categories were first advanced by Rogers (1962) to help identify and explain why some groups of consumers adopt innovations earlier than others. Through his research, Rogers identified five adopter categories: innovator, early adopter, early majority, late majority, and laggard.

Adopter categories are usually determined by assessing how soon a consumer adopts an innovation relative to the rest of the population. This approach is not feasible for examining perceptions of adopting DER and joining an aggregator by virtue of the relative recency of these offerings and their (currently) low rates of uptake. For this reason, participants were segmented on their *self-identified* adopter category. Specifically, participants were asked to select one of the labels reported in Table 2 that they believed best represented their pattern of energy technology adoption. These labels were based on the conceptual definitions advanced by Rogers (1962) for distinguishing between the various adopter categories. Consistent with Rogers' definitions, we found a low prevalence of innovators and early adopters within the study sample (see Table 2). These categories were subsequently combined to ensure sufficient sample size to permit segmentation analysis.

Table 2 Definition and Frequency of Self-Identified Adopter Categories Within the Study Sample

Category	Label	n	%
Innovator	I like to be one of the very first to try new energy technologies	31	3.5%
Early adopter	I like to be a leader in trying new energy technologies	65	7.3%
Early majority	I like to hear about other peoples' experiences before I try new energy technologies	473	53.0%
Late majority	I only try new energy technologies when the people I trust have already done so	229	25.6%
Laggard	I don't see much need for trying new energy technologies	95	10.6%

The sociodemographic profile of the adopter categories is presented in Table 3, with males over-represented in the innovator/early adopter category. The late majority and laggard categories were over-represented among those with a high school (or less) education, while those with a university degree were over-represented among the innovator/early adopter and early majority categories. The innovator/early adopter and early majority categories were more likely to have an annual household income of $120,000 or more. Laggards had a higher proportion of single-occupant household living arrangements, while the innovator/early adopter category was over-represented among households with three or more occupants. Finally, participants in the innovator/early adopter and early majority categories were more likely than the other categories to have solar panels installed at their primary place of residence.

Table 3 Sociodemographic Profile of the Adopter Categories

Sociodemographic variable	Innovator / early adopter	Early majority	Late majority	Laggard
Gender				
Male	62.5%	47.1%	51.1%	41.1%
Female	37.5%	52.9%	48.9%	58.9%
Education				
High school or less	18.9%	28.9%	39.4%	43.5%
Vocational degree	29.5%	34.7%	39.4%	33.7%
University degree	51.6%	36.4%	21.2%	22.8%
Annual household income				
$0 - $39,999	19.3%	22.5%	30.9%	42.0%
$40,000 - $79,999	29.5%	35.4%	35.3%	37.5%
$80,000 - $119,999	21.6%	18.4%	19.3%	10.2%
$120,000 and more	29.5%	23.7%	14.5%	10.2%
Household occupants				
1 occupant	7.8%	13.4%	18.9%	23.2%
2 occupants	41.1%	53.5%	57.9%	56.8%
3 or more occupants	51.1%	33.1%	23.2%	20.0%
Solar panel status				
No rooftop solar panels	25.0%	42.5%	54.6%	70.5%
Rooftop solar panels	75.0%	57.5%	45.4%	29.5%

Red and green highlighting is used to indicate if an adopter category is over-represented (green; standardised residual ≥ 1.96) or under-represented (red; standardised residual ≥ -1.96) across a particular set of sociodemographic variables.

4. Insights

4.1 Relative Perceptions of Adopting DER and Joining an Aggregator

4.1.1 Relative Interest in Adopting DER and Joining an Aggregator

Participants were asked to evaluate their interest in adopting DER ('solar + battery' for those without solar panels; 'battery' for those with solar panels) and joining an aggregator. Note that a brief description of an aggregator was provided to participants prior to completing the aggregator-specific questions (see Appendix A for a copy of this description). More detail relating to this description is provided in Section 4.3.

As shown in Figure 7, overall levels of reported interest were relatively muted, with the highest levels of interest – which was observed among participants with solar panels – not significantly differing from the scale mid-point (3 = moderately interested). Participants with solar panels also reported a significantly greater interest in adopting DER (battery) than their counterparts without solar panels had in adopting DER (solar panels + battery). However, reported interest in joining an aggregator did not vary by solar panel status.

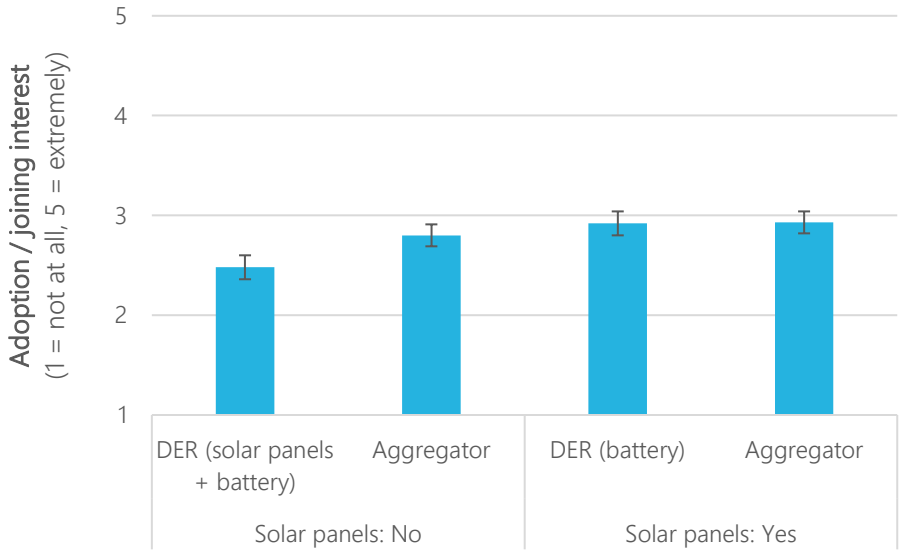

Figure 7 Interest in Adopting DER or Joining an Aggregator, Segmented by Solar Panel Status

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

Key Take-Away: Interest in adopting DER and joining an aggregator is lukewarm

Current interest in adopting DER and joining a DER aggregation service is neither very strong nor extremely low, with average interest across most groups sitting at or close to the 'moderately interested' level. Thus, while those who already own solar panels show greater interest in adopting additional DER than those who currently do not own any, across the board, participants appear to be reserving their interest in adopting or joining these DER-related products and services. This pattern of results suggests that additional work is required to enhance the perceived value proposition of adopting DER and joining an aggregator.

4.1.2 Relative Attitude Towards Adopting DER and Joining an Aggregator

Participants completed a set of items designed to separately assess their *rational attitude* and *emotional attitude* towards adopting DER or joining an aggregator.

Rational attitude is a cognitive evaluation of the outcomes that could emerge from adopting a certain behaviour, and in this study was determined by asking participants to rate whether they perceived adopting DER or joining an aggregator to be:

- Useless vs. useful
- Foolish vs. wise

Emotional attitude, by contrast, is an evaluation of the emotional outcomes that could arise from adopting a specific behaviour. In this study, emotional attitude was assessed by evaluating whether adopting DER or joining an aggregator was perceived as being:

- Boring vs. exciting
- Unenjoyable vs. enjoyable

As outlined in Figure 8, rational and emotional attitude towards adopting DER or joining an aggregator was uniformly positive, with all averages sitting significantly above the scale mid-point (3 = neutral). Several interesting patterns are also worth noting:

- Rational attitude toward each product/service offering was consistently and significantly higher than the corresponding emotional attitude for that product/service offering.
- Participants with solar panels had more positive rational and emotional attitude toward adopting DER (battery) than participants without solar panels had toward adopting DER (solar panels + battery).
- Solar panel status had no apparent influence on rational or emotional attitude toward joining an aggregator; similar attitudes were observed across participants with and without solar panels.

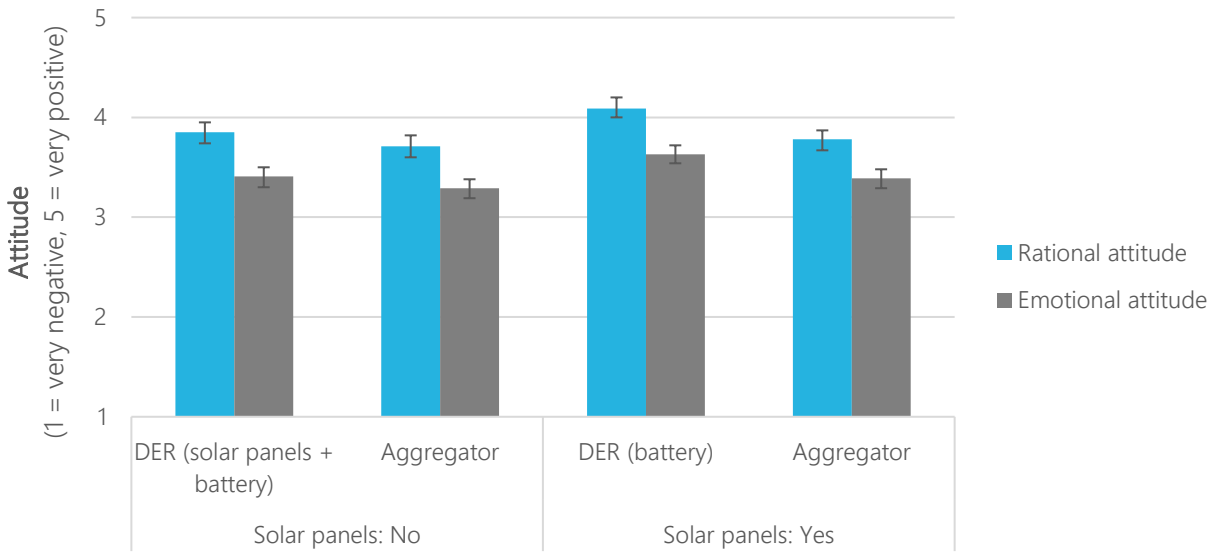

Figure 8 Attitude Toward Adopting DER or Joining an Aggregator, Segmented by Solar Panel Status

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

Equivalent analyses examining rational and emotional attitude across the adopter categories are reported in Section 4.2.4 (adopting DER) and Section 4.3.4 (joining an aggregator).

Key Take-Away: The rational outcomes of adopting DER and joining an aggregator are evaluated more positively than the emotional outcomes

Consumers perceive adopting DER and joining an aggregator to be a useful and wise (rational) decision, even more so than they perceive it to be an exciting and enjoyable (emotional) one. Those who already own solar panels also hold more positive rational attitude toward purchasing a battery than those who do not already own solar panels toward purchasing DERs. These findings highlight the importance of rational considerations in how DER products and services are perceived.

4.1.3 Competitive Analysis of Perceived Outcomes of Adopting DER and Joining an Aggregator

Adopting DER and joining an aggregator are marketplace choices that compete with other product and service offerings to fulfil the energy needs of consumers. The better a product/service offering can fulfil the needs of consumers, the greater the likelihood that a consumer will adopt that product/service offering. The likelihood of adoption also increases when a current product/service choice is not seen as adequately satisfying consumer needs.

To evaluate this competitive marketplace dynamic, participants were asked to evaluate a series of goal outcomes from four perspectives:

- The general importance of achieving those goal outcomes.

- The extent to which their current power arrangements helped them achieve those goal outcomes.
- The perceived likelihood that adopting DER would help them achieve those goal outcomes.
- The perceived likelihood that joining an aggregator would help them achieve those goal outcomes.

The goal outcomes that participants were asked to assess were:

- Saving money.
- Having a reliable supply of power.
- Reducing CO_2 emissions.
- Helping the community.
- Reducing life admin (routine tasks).
- Receiving good service.

The results from this analysis are displayed in Figure 9. Although many significant differences are depicted in this graph, several notable patterns are worth drawing attention to:

- Having a reliable supply of power, saving money, and receiving good service were perceived by participants as being more important goals to fulfil than reducing CO_2 emissions, helping the community, and reducing life admin. All else being equal, energy-related product or service offerings that are better able to achieve the former outcomes are more likely to be adopted than energy-related product or service offerings that are better able to achieve the latter outcomes.
- Across each goal outcome, adopting DER and joining an aggregator were perceived to provide equivalent levels of goal attainment, with one exception: helping the community. Specifically, joining an aggregator was seen as being significantly more likely to help the community than adopting DER.
- Adopting DER and joining an aggregator were seen as inferior to participants' current power arrangements for achieving two goal outcomes: having a reliable power supply and receiving good service. This perceived inferiority was lessened, however, among participants with solar panels.
- Adopting DER and joining an aggregator were seen as being superior to participants' current power arrangements for achieving two goal outcomes: saving money and reducing CO_2 emissions. This perceived superiority was reduced, however, among participants with solar panels.

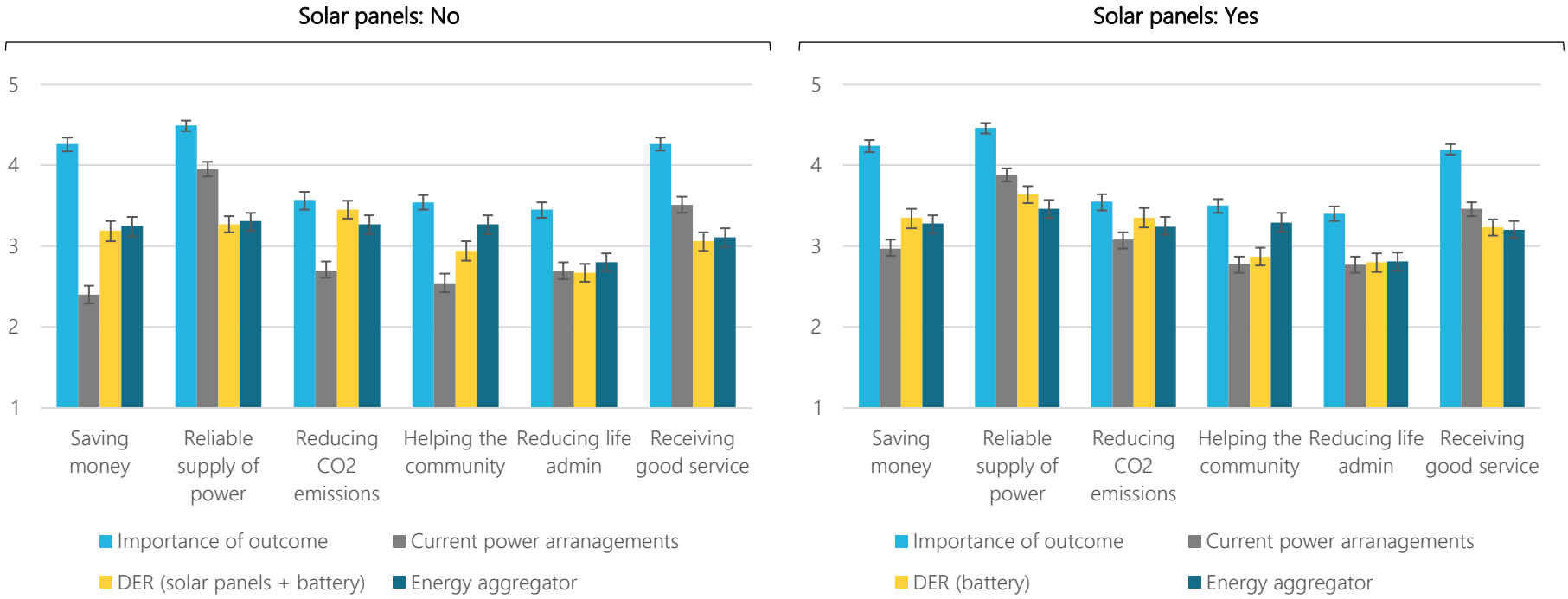

Figure 9 Perceived Goal Outcomes, Segmented by Participants Without Solar Panels (Left Panel) and With Solar Panels (Right Panel)

The error bars represent 95% confidence intervals. Columns with non-overlapping 95% confidence intervals significantly differ from each other. 'Importance of outcome' reflects the general importance of each outcome and was scored on a scale ranging from 1 (not at all desirable) to 5 (extremely desirable). 'Current power arrangements' reflect how well participants' current power arrangements help them achieve each outcome and was scored on a scale ranging from 1 (not well at all) to 5 (very well). The remaining dimensions (solar panels + battery, battery, energy aggregator) reflect participants' perceptions about how likely each product would help them achieve the various outcomes and were scored on a scale ranging from 1 (not at all likely) to 5 (very likely).

Key Take-Away: The value proposition for joining an aggregator over and above adopting DER is not clear to participants

Consumers must have DER before they can join an aggregator. From a goal attainment perspective, this nuance is critical because if adopting DER and joining an aggregator achieve equivalent goal outcomes, the motivational impetus for joining an aggregator is likely to be limited. After all, why join an aggregator when similar outcomes have already been achieved by adopting DER?

This was the dynamic observed in this study; participants perceived few differences in goal attainment between adopting DER and joining an aggregator. The one exception was helping the community, with participants perceiving that joining an aggregator would be better able to achieve this goal outcome over and above simply adopting DER.

Key Take-Away: Adopting DER and joining an aggregator are perceived as helping to achieve less valued goal outcomes

Adopting DER and joining an aggregator were seen as being superior to current power arrangements in achieving several goal outcomes, including reducing CO_2 emissions and helping the community. The challenge for motivating adoption of DER and aggregators is that the attainment of these goal outcomes was less valued by participants relative to achieving other goal outcomes, such as having a reliable supply of power and receiving good service. Moreover, current power arrangements were seen as being better able to deliver reliable power and deliver good service, at least relative to adopting DER and joining an aggregator. Put simply: the goal outcomes that DER and aggregators were perceived to perform well on were less valued by participants.

The exception to this general pattern of effects was saving money. Specifically, adopting DER and joining an aggregator was seen as being more likely to help save money than current power arrangements. At the same time, saving money was also identified by participants as a valued goal outcome. Sections 4.2.8 and 4.3.7 details the cost savings that different consumer segments expect from adopting DER and joining an aggregator, although whether these expectations can be satisfied remains to be seen. From a motivational perspective, however, these findings highlight that considerations around cost savings are likely to play a central role in whether consumers choose to adopt DER or join an aggregator.

Key Take-Away: Further marketing is required to build the competitive positioning of DER and aggregators

One of the broadly recognised benefits of combining DER like solar panels and a battery is the ability to enhance energy resilience, both at a household level and for the National Energy Market. The fact that adopting DER was perceived to provide a *less* reliable supply of power than current power arrangements is therefore noteworthy and highlights the need for marketing campaigns that can better explain the benefits and capabilities of DER and aggregators to the broader Australian community.

4.2 Adopting DER

4.2.1 Attitudes that Predict Interest in Adopting DER

In Section 4.1.2, we examined the magnitude of rational and emotional attitude for different DER combinations and found that DER (solar + battery, battery) elicited more positive rational attitude than emotional attitude. What this does not tell us is whether – and if so, to what extent – rational and emotional attitude predict interest in adopting DER. Linear regression was consequently conducted to test for these effects (see Table 4). Results indicated that both rational and emotional attitude predicted interest in adopting:

- DER (solar panels + battery) among participants without solar panels.
- DER (battery) among participants with solar panels.

More revealing was the relative strength of rational and emotional attitude in predicting adoption interest. Among participants without solar panels, rational attitude had a marginally significant stronger predictive influence on interest in adopting DER (solar panels + battery) than emotional attitude. However, no such differential influence was observed among participants with solar panels. For this second group of participants, both forms of attitude had equivalent predictive influence on interest in adopting DER (battery).

Table 4 Rational and Emotional Attitudes as Predictors of Interest in Adopting DER

Attitude dimension	**Solar panels + battery** Adoption interest	**Battery** Adoption interest
Rational attitude	β = 0.48	β = 0.43
Emotional attitude	β = 0.21	β = 0.28

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Rational outcomes may weigh more heavily than emotional outcomes when considering the adoption of DER (solar panels + battery)

While emotional benefits still exert a motivational 'pull', consumers who have yet to embark on the DER installation process may require greater rational arguments to motivate adoption. Conversely, among those who have commenced the DER installation journey (e.g., by having solar panels installed), rational and emotional arguments are equally likely to have some persuasive pull in motivating the adoption of additional DER (e.g., a household battery).

4.2.2 Goal Outcomes that Predict Interest in Adopting DER

Linear regression was used to identify the perceived goal outcomes that predicted interest in adopting DER (see Table 5). Across both DER combinations (solar panels + battery, battery), two goal outcomes were found to predict adoption interest: saving money and receiving a reliable supply of power.

Table 5 Perceived Goal Outcomes as Predictors of Interest in Adopting DER

Perceived goal outcomes	**Solar panels + battery** Adoption interest	**Battery** Adoption interest
Saving money	β = 0.17	β = 0.28
Receiving a reliable supply of power	β = 0.26	β = 0.34
Reducing CO_2 emissions	-	-
Helping the community	-	-
Reducing life admin (routine tasks)	-	-
Receiving good service	-	-

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Efforts to motivate the adoption of DER should accentuate savings and reliability

Saving money and having a reliable supply of power were the strongest predictors of interest in adopting DER, further highlighting the importance of developing offerings that deliver customer value on these outcomes. It should be noted, however, that the lack of predictive effects for the other goal outcomes does not mean that consumers are apathetic to them, only that they do not uniquely predict interest in adopting DER.

4.2.3 Goal Outcomes that Predict Attitude Towards Adopting DER

Given the role that rational and emotional attitude play in understanding participants' interest in adopting DER, a series of follow-up linear regressions were conducted to better understand which goal outcomes were seen as having rational vs. emotional outcomes. The results of this analysis are presented in Table 6.

Of note, saving money and receiving a reliable supply of power were significant predictors of both rational and emotional attitude across the two combinations of DER (solar panels + battery, battery), although these goal outcomes more strongly predicted rational than emotional attitude. Reducing CO_2 emissions also had a dual influence on rational and emotional attitude toward adopting DER (battery), whereas it only predicted rational attitude toward adopting DER (solar panels + battery). Finally, receiving good service predicted emotional attitude towards adopting DER (solar panels + battery), while reducing life admin predicted emotional attitude towards adopting DER (battery).

Table 6 Perceived Goal Outcomes as Predictors of Attitude Towards Adopting DER

Perceived goal outcomes	Solar panels + battery		Battery	
	Rational attitude	Emotional attitude	Rational attitude	Emotional attitude
Saving money	β = 0.30	β = 0.14	β = 0.39	β = 0.17
Receiving a reliable supply of power	β = 0.29	β = 0.15	β = 0.31	β = 0.21
Reducing CO_2 emissions	β = 0.21	-	β = 0.12	β = 0.12
Helping the community	-	-	-	-
Reducing life admin (routine tasks)	-	-	-	β = 0.14
Receiving good service	-	β = 0.23	-	-

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Promotional activities should be sensitive to the rational and emotional 'fingerprints' of different goal outcomes

Goal outcomes are complex; some are perceived as having a rational dimension, some are perceived as having an emotional dimension, and some are perceived as having both. Where this becomes important is in understanding how best to frame goal outcomes for different consumer segments, particularly when those outcomes have both rational and emotional dimensions. Among participants without solar panels, for example, rational attitude is marginally more predictive of interest in adopting DER (solar panels + battery) than emotional attitude. A message highlighting the financial savings that can come from adopting DER and which is targeted at consumers without solar panels might therefore highlight how these savings could be used to pay down debt (rational attitude) rather than engage in exciting or pleasurable activities (emotional attitude).

4.2.4 Segmenting DER Adoption Interest and Attitude by Adopter Category

Among those who do not own solar panels, participants in the innovator/early adopter and early majority categories reported significantly stronger interest in adopting DER (solar panels + battery) than their counterparts in the late majority and laggard categories (see Figure 10). The same pattern of differences was also observed for emotional attitude toward adopting DER (solar panels + battery). In contrast, the innovator/early adopter, early majority, and later majority categories had statistically equivalent rational attitude towards adopting DER (solar panels + battery), all of which were more positive than the rational attitude that participants in the laggard category had toward adopting DER (solar panels + battery).

It should be noted that by virtue of the relatively small number of participants who self-selected into the innovator/early adopter and laggard categories, greater differences involving these groups needed to exist before those differences were identified as being statistically significant. For this reason, group differences that may appear visually sizeable in graphs may not necessarily translate into statistically significant differences. This point holds for all related analyses outlined in this report.

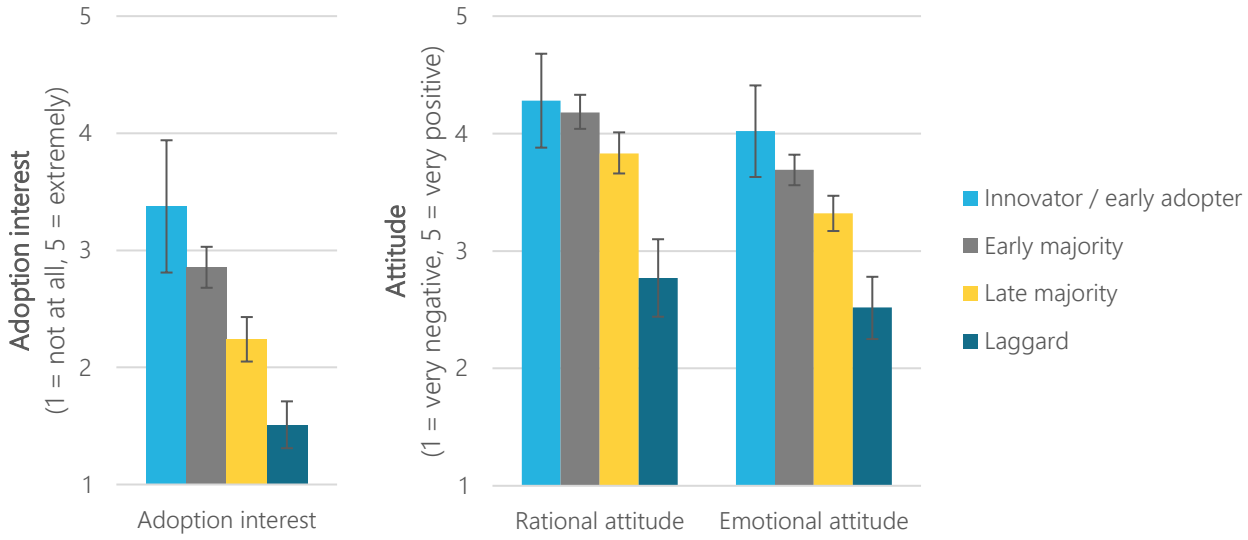

Figure 10 Interest in – and Attitude Toward – Adopting DER (Solar Panels + Battery), Segmented by Adopter Category

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

Broadly comparable findings were observed for intention to adopt DER (battery) among those with solar panels (see Figure 11). For example, participants in the innovator/early adopter and early majority categories reported greater interest in adopting DER (battery) than those in the late majority and laggard categories.

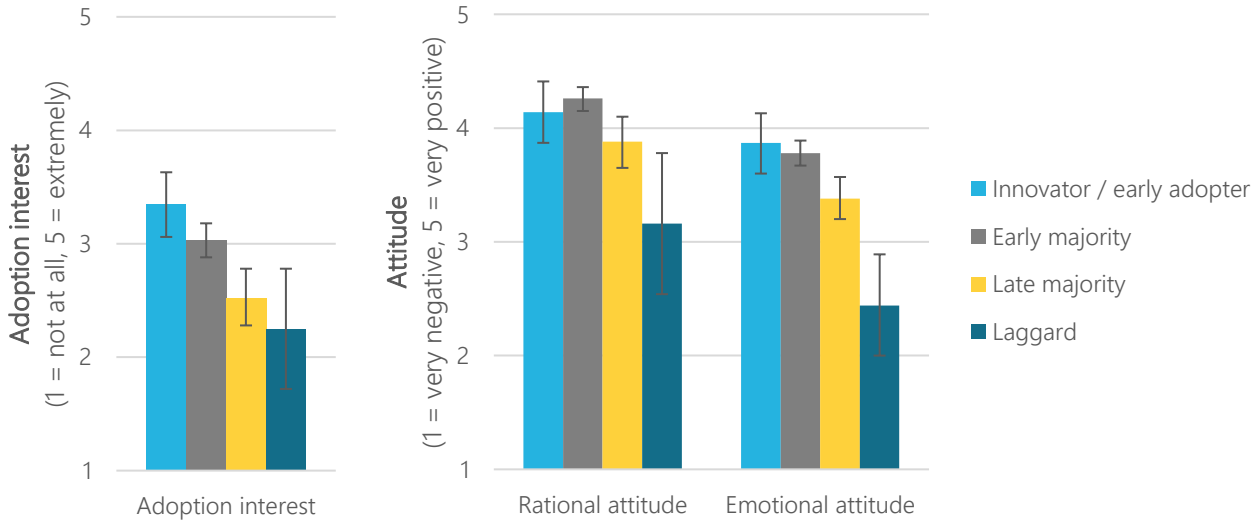

Figure 11 Interest in – and Attitude Toward – Adopting DER (Battery), Segmented by Adopter Category

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

Key Take-Away: Participants in the laggard and late majority categories have lower adoption interest and less positive attitude toward adopting DER

Consistent with how they are defined in the broader literature, participants in the laggard and late majority categories generally reported lower interest and attitude toward adopting DER, making them unlikely to be priority target consumer segments for organisations seeking to rapidly increase the uptake of this technology, at least in the first instance.

Key Take-Away: Emotional attitude tends to differentiate innovators/early adopters and the early majority from other adopter categories

Participants in the innovator/early adopter and early majority categories tend to be differentiated from participants in the late majority category more by their emotional attitude than by their rational attitude. This pattern suggests that building excitement and other positive emotional attitudes may be more persuasive among the earlier adopter categories.

4.2.5 Segmenting DER Goal Outcomes by Adopter Category

Perceived goal outcomes associated with adopting the DER combinations were also examined by adopter category. For adopting DER (solar panels + battery), the innovator/early adopter and early majority categories perceived statistically equivalent goal outcomes, with one exception: reducing life admin (see Figure 12). For this goal outcome, participants in the innovator/early adopter category reported a greater expectation that adopting DER (solar panels + battery) would reduce life admin than those in the early majority category. Conversely, participants in the laggard category perceived that adopting DER (solar panels + battery) would generate significantly lower goal outcomes than participants in the other adopter categories.

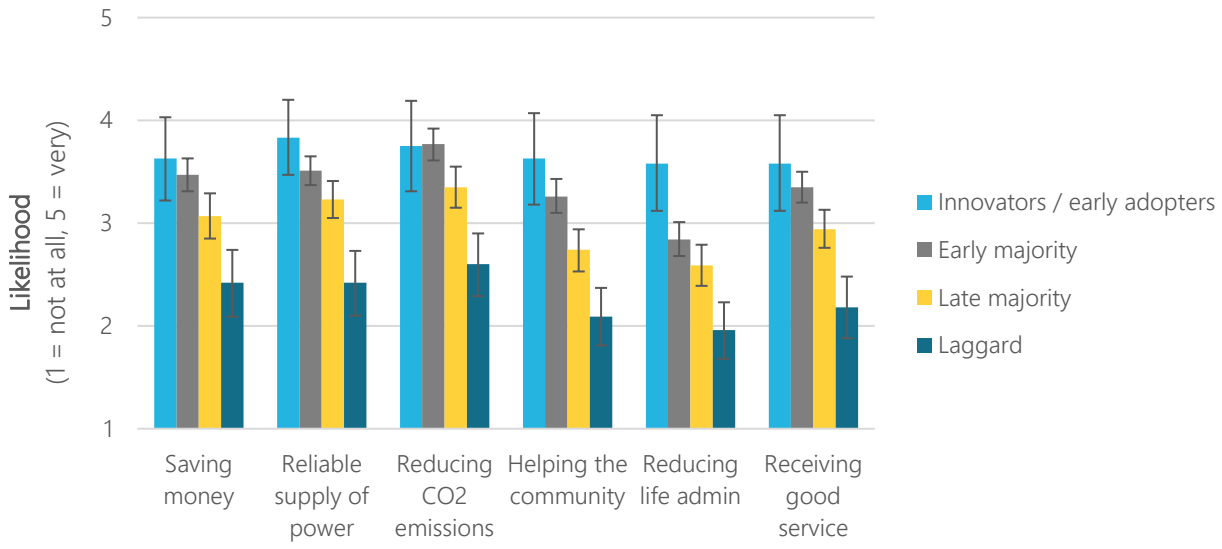

Figure 12 Perceived Goal Outcomes of Adopting DER (Solar Panels + Battery), Segmented by Adopter Category

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

With respect to adopting DER (battery), no statistical differences were observed between the innovator/early adopter and early majority categories with respect to the perceived likelihood of achieving the various goal outcomes (see Figure 13). Moreover, while the laggard category perceived the likelihood of achieving the various goal outcomes as being lower than the other adopter categories, these differences were only significant for three goal outcomes: reducing CO_2 emissions, helping the community, and reducing life admin.

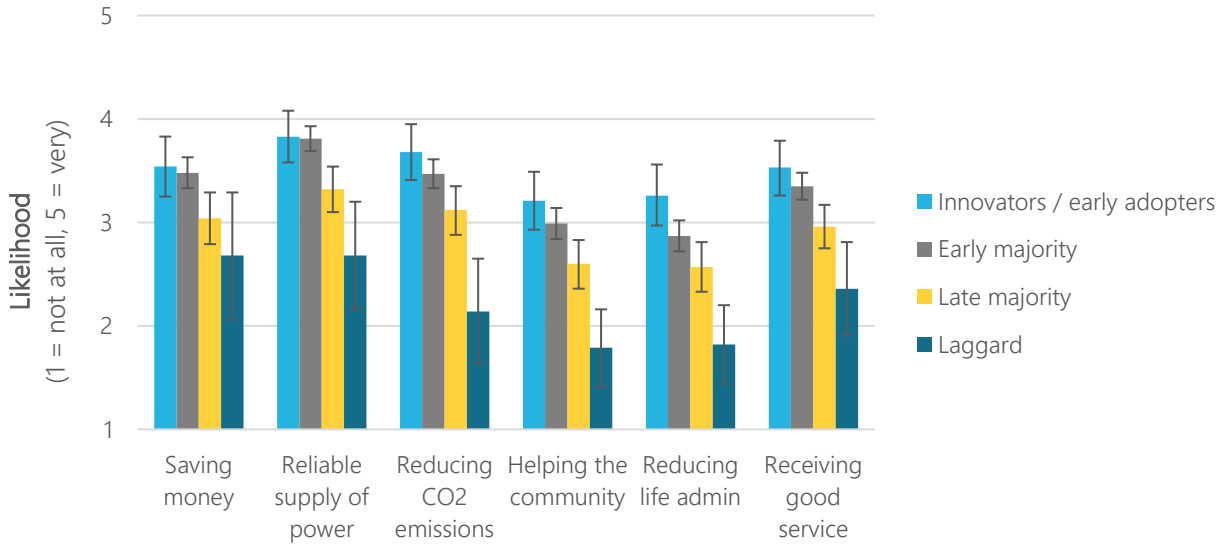

Figure 13 Perceived Goal Outcomes of Adopting DER (Battery), Segmented by Adopter Category

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

Key Take-Away: Innovators/early adopters and the early majority tend to be more optimistic about the benefits of DER

Although there was some variation across individual outcomes, participants in the innovator/early adopter and early majority categories had a general tendency to perceive more positive outcomes emerging from their adoption of DER than their counterparts in the other adopter categories. This general tendency suggests that the innovator/early adopter and early majority categories are ,pre optimistic about the potential of these technologies to increase achieve personally relevant outcomes.

4.2.6 Sociodemographic Predictors of Interest in Adopting DER

Linear regression was used to identify the sociodemographic profile of participants interested in adopting DER (see Table 7). Age emerged as a negative predictor for interest in adopting both DER (solar panel + battery) and DER (battery), indicating that younger participants reported stronger DER adoption interest. Having a university degree and holding progressive political views also positively predicted interest in adopting DER (solar panels + battery), while living in a household with three or more occupants also predicted interest in adopting DER (battery).

Table 7 Sociodemographic Predictors of Interest in Adopting DER

Sociodemographic predictors	**Solar panels + battery** Adoption intention	**Battery** Adoption intention
Age	β = -0.37	β = -0.19
Gender	-	-
Highest education (Reference: high school or less)		
Vocational	-	-
University	β = 0.13	-
Annual household income (Reference: $0- $39,999)		
$40,000 - $79,999	-	-
$80,000 - $119,999	-	-
$120,000 and more	-	-
Household occupants (Reference: 1 occupant)		
2 occupants	-	-
3 or more occupants	-	β = 0.16
Progressive political views	β = 0.30	-
Frequency/severity of power outages	-	-

B values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Younger university-educated progressives and younger people living in larger households reported greater interest in adopting DER

Participants with an interest in adopting DER (solar panels + battery) tended to be younger, politically progressive, and university educated. In contrast, those interested in adopting DER (battery) tend to be younger and live in larger households. There are several potential explanations for these varying sociodemographic profiles:

- Renewable energy has been politicised in recent years, which may explain why politically progressive views predict interest in adopting DER (solar panels + battery). If so, those who have installed solar panels may be more politically progressive than those who have not, which would also explain why politically progressive views did not explain interest in adopting DER (battery) among this cohort.
- All things being equal, power consumption tends to increase with the number of household occupants. Households with three or more occupants (such as families) may therefore be especially interested in opportunities for reducing their power bills, such as adopting DER (battery) among those who already have solar panels.

One final note: the average age of the study sample of 61.4 years, so 'younger' should be interpreted with this average age in mind.

4.2.7 Price Sensitivity for Adopting DER

The Van Westendorp (1976) price sensitivity meter was used to calculate two pricing metrics for solar panels and household batteries. These metrics were:

- Acceptable price range, which is the range of prices that consumers would be satisfied with.
- Optimal price point, which sits within the acceptable price range and reflects the price point at which an equal number of participants view a product as being 'too cheap' and 'too expensive'.

Note that the pricing metrics for solar panels were only captured among participants who did not currently have solar panels, while the pricing metrics for household batteries were captured among all participants.

Before interpreting the results of this analysis, it is important to appreciate that participants were evaluating solar panels and household batteries at the *product category level*. The acceptable price range and optimal price point emerging from this analysis consequently do not reflect product-specific attributes such as battery storage capacity (kWh), solar panel system size (kWh), product quality, warranty length etc.

The acceptable price range that participants were willing to incur when purchasing solar panels is reported in Table 8. Among participants without solar panels, the acceptable price range varied between $2,200 and $3,600, with the optimal price point ($2,200) sitting at the lower end of the acceptable price range. Also presented in this table are the acceptable price ranges and optimal price points for the various adopter categories.

Table 8 Price Sensitivity for Solar Panels

Consumer segment	Acceptable price range	Optimal price point
Overall	$2,200 - $3,600	$2,200
Adopter category		
Innovator / early adopter	$1,600 - $2,500	$1,800
Early majority	$2,200 - $4,100	$2,800
Late majority	$2,200 - $3,200	$2,200
Laggard	$2,000 - $2,500	$2,100

The Van Westendorp Price Sensitivity Meter was also used to identify the acceptable price range and optimal price point for household battery systems (see Table 9). This analysis was separately reported for participants with and without solar panels. For participants without solar panels, the acceptable price range varied between $900 and $1,300. Conversely, for participants with solar panels, the acceptable price range varied between $2,200 and $4,000. Also reported in Table 9 are the acceptable price ranges and optimal price points by adopter category.

Table 9 Price Sensitivity for a Household Battery

Consumer segment	Acceptable price range Solar panel: No	Optimal price point Solar panel: No	Acceptable price range Solar panel: Yes	Optimal price point Solar panel: Yes
Overall	$900 - $1,300	$1,100	$2,200 - $4,000	$3,000
Adopter category				
Innovator / early adopter	$800 - $1,500	$900	$2,600 - $3,200	$3,000
Early majority	$1,100 - $2,000	$1,200	$2,800 - $4,500	$3,100
Late majority	$800 - $1,100	$1000	$2,000 - $3,700	$2,200
Laggard	$700 - $1,100	$900	$1,000 - $1,200	$1,100

Key Take-Away: Participants tend to underestimate the price of DER

Participants with solar panels reported higher acceptable price ranges for household batteries than those without, which may reflect greater perceived financial value for installing batteries and/or greater experience in understanding the cost of DER. Nevertheless, acceptable price ranges for DER tended to fall below even the least expensive household batteries and solar installations. These findings suggest that personal sales interactions and other marketing activities – such as communicating how initial purchase costs may be 'paid back' over time or increasing awareness of the subsidies and programs that exist to help consumers offset the cost of DER – will likely be key to persuading the adoption of DER.

4.2.8 Reasonable Annual Savings from Adopting DER

The amount of savings that a consumer would receive from adopting DER is based on a complex set of factors, including the size of their solar panel system, the storage capacity of their household battery, their profile of household energy use, their pricing and tariff structure etc. Consumers may not consider this complexity when determining what they would consider to be *reasonable* annual savings from adopting DER, yet these expectations may still shape how they evaluate different product offerings.

Table 10 provides the average annual savings that the overall sample and the various adopter categories deemed reasonable for solar panels and a household battery. With several minor exceptions, solar panels were seen as delivering slightly higher annual savings than a battery, although these differences were not significant.

Table 10 Average Annual Savings Deemed Reasonable from Adopting Different DER

Consumer segment	**Solar panels**	**Battery** Solar panel: No	**Battery** Solar panel: Yes
Overall	$1,093	$933	$1,006
Adopter category			
Innovator / early adopter	$1,010	$870	$1,197
Early majority	$1,201	$1,029	$1,042
Late majority	$1,064	$856	$834
Laggard	$849	$809	$800

All values reported in this table were rounded to the nearest dollar. To minimise the effect of outliers, values ≥ $3,000 were truncated to $3,000.

Key Take-Away: The magnitude of savings that participants perceive as being reasonable provide context for the finding that cost savings drive interest in adopting DER

In Section 4.2.2, we reported that cost savings are an important predictor of interest in adopting DER. Moreover, Figure 9 showed that of the three goal outcomes valued most by participants, cost savings was the only one where adopting DER performed better than participants' current power arrangements. What these findings did not demonstrate, however, was the magnitude of cost savings that participants would expect from adopting DER. The findings reported in Table 10 are consequently useful in showing what relatively naïve participants perceive as reasonable cost savings. These cost savings are not likely to be cast in stone in that they may change with greater awareness of what is and is not possible. However, they also show where potential discrepancies may exist between what participants currently perceive as being reasonable and what level of savings are currently feasible.

4.3 Joining an Aggregator

Given the low levels of community awareness that currently exist for energy aggregators in Australia (Zenkić et al., 2022), participants were first presented with the following preamble:

> People with rooftop solar panels and a household battery can give a special type of company – called an energy aggregator – access to some of the power stored in their battery. The energy aggregator can then export this stored power back to the grid when demand for power is highest, generating more money for participating households. And because they have access to thousands of household batteries, an energy aggregator can control as much power as a power plant. This helps them:
>
> - Minimise power outages in the local community.
> - Negotiate better financial returns for participating households.
> - Reduce the need for power plants that run on fossil fuels.

After reading this preamble, participants completed the aggregator-specific questions included in the survey.

4.3.1 Attitudes that Predict Interest in Joining an Aggregator

Linear regression was used to determine the extent to which rational and emotional attitude predicted interest in joining an aggregator (see Table 11). Across participants with and without solar panels, both rational attitude and emotional attitude predicted joining interest. However, rational attitude was a significantly stronger predictor of joining interest than emotional attitude, and this pattern was observed for those both with and without solar panels.

Table 11 Rational and Emotional Attitude as Predictors of Interest in Joining an Aggregator

Attitude dimension	**Solar panels: No** Joining interest	**Solar panels: Yes** Joining interest
Rational attitude	β = 0.67	β = 0.59
Emotional attitude	β = 0.09	β = 0.21

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: When evaluating whether to join an aggregator, participants think more with the head than with the heart

While emotions play some role in shaping participants' interest in joining an aggregator, an even bigger role is played by a consideration of the rational benefits that would emerge from joining. Aggregators looking to increase the attractiveness of their customer value proposition should consequently consider how they can enhance the perceived rational benefits associated with joining.

4.3.2 Goal Outcomes that Predict Interest in Joining an Aggregator

Linear regression was used to determine the extent to which the various goal outcomes predicted interest in joining an aggregator (see Table 12). Consistent with the findings on interest in adopting DER products (see Section 4.2.2), pragmatic outcomes such as saving money and having a reliable power supply were both significant predictors of participants' interest in joining an aggregator, irrespective of their solar panel status.

Table 12 Perceived Goal Outcomes as Predictors of Interest in Joining an Aggregator

Perceived goal outcomes	**Solar panels: No** Joining interest	**Solar panels: Yes** Joining interest
Saving money	β = 0.46	β = 0.39
Receiving a reliable supply of power	β = 0.20	β = 0.23
Reducing CO_2 emissions	-	-
Helping the community	-	-
Reducing life admin (routine tasks)	-	-
Receiving good service	-	-

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Efforts to motivate joining an energy aggregator should accentuate savings and reliability

Saving money and having a reliable supply of power were not only among the most important general goals that participants were wanting to achieve (see Figure 9); they were also the strongest predictors of whether participants had an interest in joining an aggregator. Organisations must consequently be sensitive to how they structure their aggregator offerings such that the savings- and reliability-related outcomes associated with joining can be clearly discerned by consumers. It should be noted, however, that the lack of predictive effects for the other goal outcomes does not mean that they are not important, only that they did not predict interest in joining an aggregator.

4.3.3 Goal Outcomes that Predict Attitude Towards Joining an Aggregator

Linear regression was used to determine which goal outcomes predicted rational vs. emotional attitude toward joining an aggregator. The results of this analysis are presented in Table 13. Consistent with the equivalent findings for interest in adopting DER (see Section 4.2.3), saving money and receiving a reliable supply of power were significant predictors of both rational and emotional attitude toward joining an aggregator. Of the remaining goal outcomes, all but one (reducing CO_2 emissions) predicted emotional attitude towards joining an aggregator. Conversely, the only additional goal outcome that predicted rational attitude was helping the community.

Table 13 Perceived Goal Outcomes as Predictors of Attitude Towards Joining an Aggregator

Perceived goal outcomes	Rational attitude	Emotional attitude
Saving money	β = 0.40	β = 0.22
Receiving a reliable supply of power	β = 0.26	β = 0.15
Reducing CO_2 emissions	-	-
Helping the community	β = 0.14	β = 0.14
Reducing life admin (routine tasks)	-	β = 0.16
Receiving good service	-	β = 0.16

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Promotional activities should be sensitive to the rational and emotional 'fingerprints' of different goal outcomes

As with the Key Take-Away from Section 4.2.3, organisations should carefully consider how goal outcomes can best be framed to leverage the rational and emotional 'fingerprints' of those outcomes. This is particularly true for interest in joining an aggregator, which is more strongly predicted by rational than emotional attitude.

4.3.4 Segmenting Aggregator Joining Interest and Attitude by Adopter Category

Interest in joining an aggregator and participants' rational and emotional attitude toward joining an aggregator were also examined by adopter category. Participants in the laggard category reported lower interest in joining an aggregator and less positive emotional and rational attitude toward joining than their counterparts in the other categories (see Figure 14). Conversely, participants in the innovator/early adopter and early majority categories did not statistically differ with respect to their interest or rational and emotional attitude toward joining an aggregator.

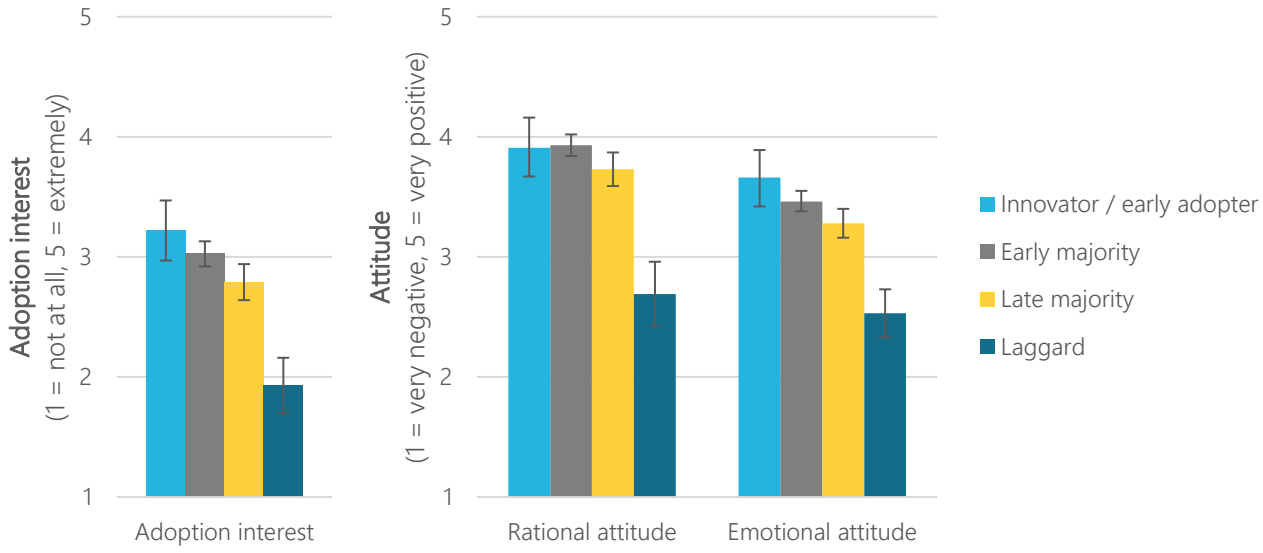

Figure 14 Interest in – and Attitude Toward – Joining an Aggregator, Segmented by Adopter Category

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

Key Take-Away: Interest in and attitude toward joining an energy aggregator is similar across the innovator/early adopter and early majority categories

Participants in the innovator/early adopter and early majority categories did not statistically differ with respect to their interest in joining an energy aggregator or in their rational and emotional attitude toward joining. Both categories therefore represent a potentially appealing target for aggregators seeking to attract customers to their service offerings.

4.3.5 Segmenting Aggregator Goal Outcomes by Adopter Category

Perceived goal outcomes associated with interest in joining an aggregator were examined by adopter category (see Figure 15). The innovator/early adopter and early majority categories perceived statistically equivalent goal outcomes for joining an aggregator, with one exception: reducing CO_2 emissions. For this outcome, participants in the innovator/early adopter category perceived that joining an aggregator would be more likely to reduce CO_2 emissions than their early majority counterparts. Conversely, those in the laggard category perceived that joining an aggregator would deliver significantly lower outcomes across all goal dimensions relative to participants in the other adopter categories. Finally, participants in the late majority category held indeterminant views. On the one hand, they were statistically indistinguishable from the innovator/early adopter and early majority categories on some outcomes (saving money, reliable source of power, receiving good service). On the other, they varied with the innovator/early adopter and/or early majority categories with respect to the remaining outcomes.

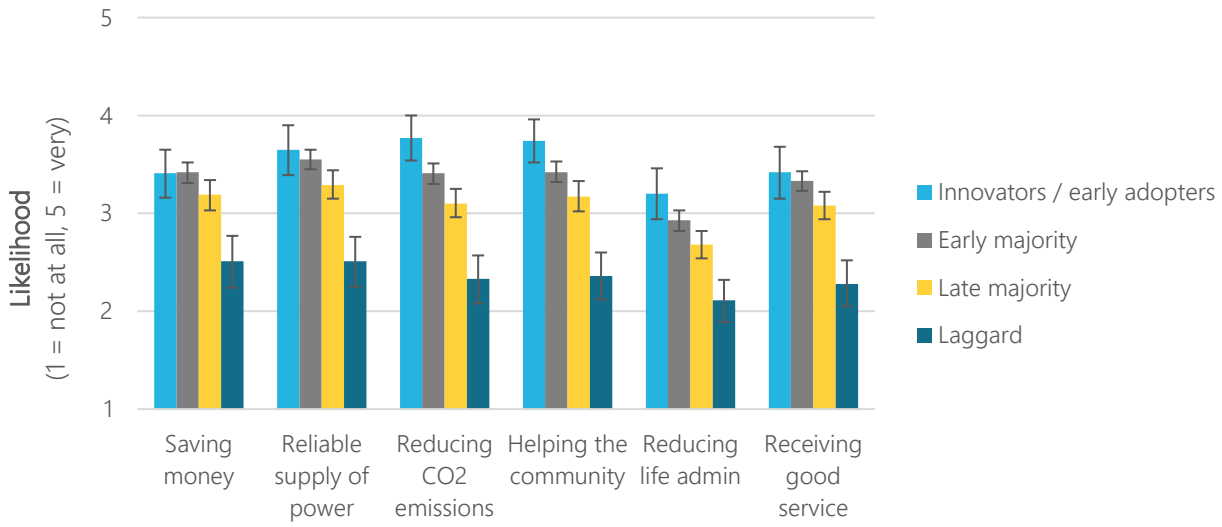

Figure 15 Perceived Goals Outcomes of Joining an Aggregator, Segmented by Adopter Category

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

Key Take-Away: Earlier adopter categories tend to view the outcomes of joining an aggregator with more optimism than later adopter categories

Although there was some variation across goal outcomes, the general tendency was for earlier adopter categories to perceive more favourable outcomes from joining an aggregator than later adopter categories. This tendency, which was also identified with perceptions of DER adoption (see Section 4.2.5), is consistent with the sense of optimism that earlier adopter categories typically approach new innovations. Put differently, earlier adopter categories are more likely than later adopter categories to appreciate how innovations can deliver benefits.

4.3.6 Sociodemographic Predictors of Interest in Joining an Aggregator

Linear regression was used to identify the sociodemographic profile of participants interested in joining an aggregator (see Table 14). Participants reporting an annual household income of $80,000 - $119,999 were more likely to indicate an interest in joining an aggregator relative to those in the reference group (annual household income up to $39,999), and this was observed across participants both with and without solar panels. Among participants with did not already have solar panels, holding progressive political views also predicted interest in joining an aggregator.

Table 14 Sociodemographic Predictors of Interest in Joining an Aggregator, Segmented by Solar Panel Status

Sociodemographic predictors	**Solar panels: No** Joining interest	**Solar panels: Yes** Joining interest
Age		
Gender		
Highest education (Reference: high school or less)		
Vocational		
University		
Annual household income (Reference: $0- $39,999)		
$40,000 - $79,999		
$80,000 - $119,999	β = 0.20	β = 0.14
$120,000 and more		
Household occupants (Reference: 1 occupant)		
2 occupants		
3 or more occupants		
Progressive political views	β = 0.26	
Frequency/severity of power outages		

β values are displayed for all significant effects and are used to denote the relative strength of those effects.

Key Take-Away: Progressives (for those without solar panels) and middle-income participants show greater interest in joining an aggregator

Relative to the reference group (annual household income up to $39,999), participants reporting an annual household income between $80,000 and $119,999 indicated having a stronger interest in joining an aggregator. One possibility for this finding is that participants in this income band perceive purchasing the necessary DER to be achievable, but only with the assistance of additional income from an aggregator. Interest in joining an aggregator was also more likely to resonate with politically progressive participants who do not currently have solar panels.

4.3.7 Reasonable Annual Savings from Joining an Aggregator

In Section 4.1.3, cost savings were identified as a key expectation of participants evaluating the potential outcomes associated with joining an aggregator. Against this backdrop, Table 15 provides the annual savings from joining an aggregator that participants deemed reasonable. Notably, these estimates did not significantly differ by solar panel status or adopter category.

Table 15 Average Annual Savings Deemed Reasonable from Joining an Aggregator

Consumer segment	Aggregator
Overall	$970
Solar panel status	
Solar panels: No	$945
Solar panels: Yes	$992
Adopter category	
Innovator / early adopter	$998
Early majority	$961
Late majority	$970
Laggard	$986

All values reported in this table were rounded to the nearest dollar. To minimise the effect of outliers, values ≥ $3,000 were truncated to $3,000.

Key Take-Away: Participants across consumer segments have similar expectations on what a reasonable financial return from joining an aggregator would be

No marked differences were observed in what was deemed a reasonable financial return from joining an aggregator. These values provide important context for interpreting earlier findings, including the importance of saving money in predicting interest in joining an aggregator (see Section 4.3.2) and the expectation that joining an aggregator would save money (see Figure 9).

4.4 Trust in Aggregators

4.4.1 General Trust in an Aggregator

When asked whether they would trust an aggregator to access and export some of the power stored in their battery, almost one in four participants answered in the affirmative (see Figure 16). More common, however, was a state of uncertainty, with approximately three in five participants indicating that they were unsure about whether they would trust an aggregator to access and export their stored power. Thus, for most participants, while trust was not necessarily being withheld, it was also not being granted.

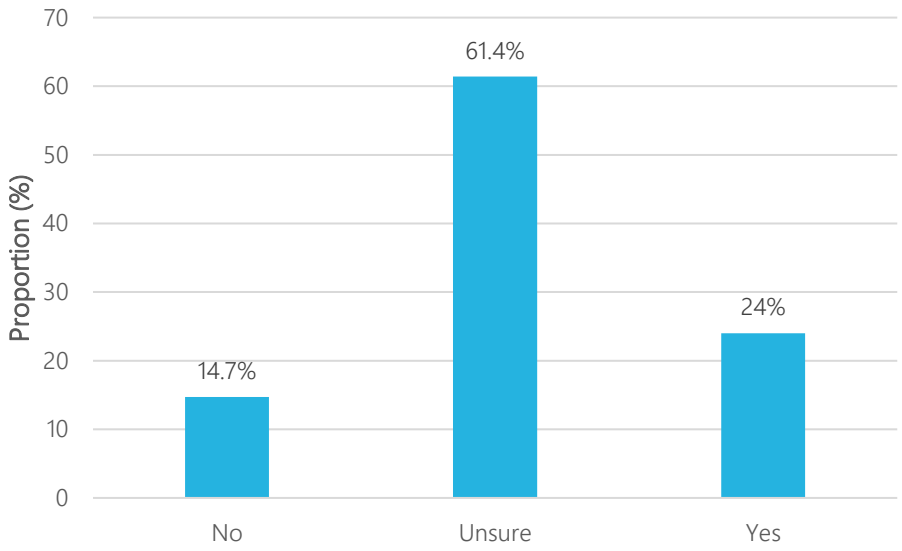

Figure 16 Trust in an Aggregator to Access and Export Power Stored in One's Battery (All Participants)

General trust in an aggregator was then examined across the two consumer segmentation variables: solar panel status and adopter category. No significant differences were observed across participants with and without solar panels (see Table 16), suggesting that experience with rooftop solar panels has neither a positive nor a negative influence on whether an external party would be trusted to actively manage other forms of DER.

Table 16 Aggregator Trust, Segmented by Solar Panel Status

Trust aggregator to access and export stored energy	Solar panels: No	Solar panels: Yes
No	14.6%	14.7%
Unsure	63.8%	59.2%
Yes	21.6%	26.1%

Significant differences were, however, observed across the adopter categories (see Table 17). Most particularly, innovators/early adopters were more likely to indicate being prepared to trust an aggregator, while those in the early majority category were more likely to indicate being unsure about whether they would trust an aggregator. Finally, those in the laggard category were significantly more likely to indicate that they would not trust an aggregator.

Table 17 Aggregator Trust, Segmented by Adopter Category

Trust aggregator to access and export stored energy	Innovator / early adopter	Early majority	Late majority	Laggard
No	11.5%	10.8%	11.8%	44.2%
Unsure	49.0%	64.5%	65.5%	48.4%
Yes	39.6%	24.7%	22.7%	7.4%

Red and green highlighting is used to indicate if an adopter category is over-represented (green; standardised residual ≥ 1.96) or under-represented (red; standardised residual ≥ -1.96) in their aggregator trust relative to the other adopter categories.

Key Take-Away: Most participants are currently withholding judgement about whether they can trust an aggregator

As a market offering, energy aggregation is a relatively new service, and one that most Australian consumers have little awareness about (Zenkić et al., 2022). Moreover, relatively few Australian households have the DER necessary to permit dispatchable energy, so the features of an aggregation service that signal a reputable aggregation provider are not likely to be widely known. The Australian energy aggregation sector consequently finds itself in a relatively unique period, with many participants currently unsure whether they can trust aggregators to actively manage their stored power. The Australian energy aggregation sector could therefore use this time to establish formal or informal industry standards aimed at safeguarding consumers so that as more Australian households begin to adopt DER with dispatchable energy capabilities, they will find a set of offerings that have been designed from the ground up with settings aimed at maximising consumer trust.

4.4.2 Strategies for Enhancing Aggregator Trust (All Participants)

Participants were then asked to evaluate the extent to which different strategies would increase or decrease their trust in an energy aggregator (see Figure 17). The following strategies – in order of endorsement – were identified by more than half of participants as being something that would increase their trust in an aggregator:

- Consumer controls how much stored power an aggregator can export (66.2%)
- Aggregator guarantees earnings (65.3%)
- Consumer controls when aggregator can export stored power (62.8%)
- Consumer notified before every export takes place (59.0%)
- Consumer notified after every export has taken place (54.2%)
- Aggregator endorsed by a government agency (50.3%)

Not all strategies had a universally positive influence on trust, however. For example, two factors were identified by more than 10% of participants as being something that would reduce their trust in an aggregator:

- Aggregator owned by a commercial company (24.1%)
- Aggregator has a lock-in contract (17.7%)

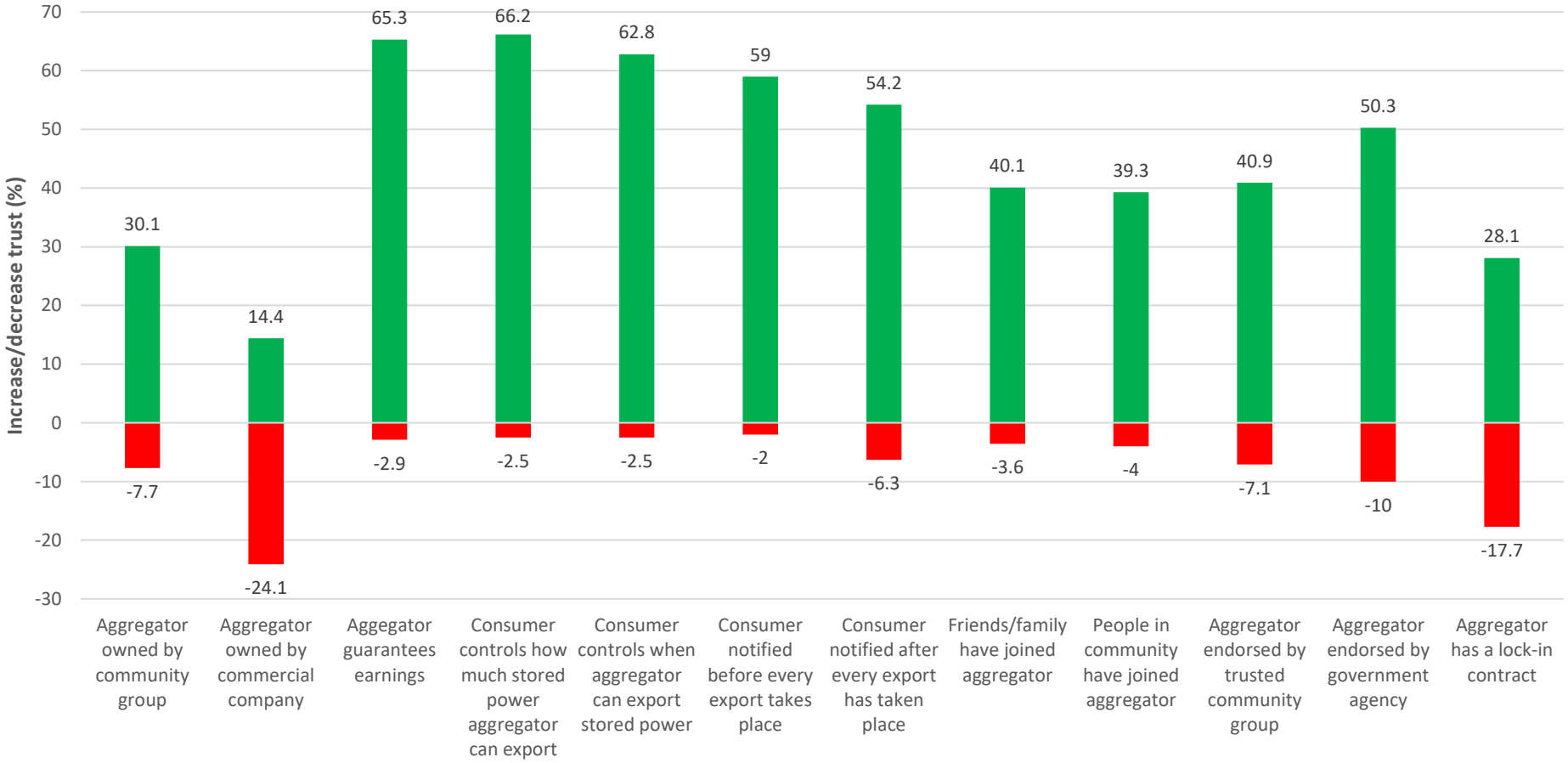

Figure 17 Strategies for Enhancing Trust in an Aggregator (All Participants)

Red and green are used to indicate the proportion of participants who believed that a given strategy would increase (green) or decrease (red) their trust in an aggregator. Neutral responses – that is, participants who indicated that a given strategy would have a neutral effect on their trust – are not displayed here.

Key Take-Away: Trust is built on a foundation of consumer control, transparency, and consumer safeguards

Examined collectively, the six most endorsed strategies for maximising trust share at least one of the following features: *consumer control*, *transparency*, and *consumer safeguards*. From a *consumer control* perspective, participants were looking to exert some degree of control over when and how their stored power would be exported by an aggregator. From a *transparency perspective*, participants were looking to be kept appraised of when and how their DER asset would be used by the aggregator. Finally, from a *consumer safeguard* perspective, participants were wanting some assurances around the financial returns they could expect to receive from joining an aggregator.

While participants were clear about *what* strategies might increase their trust, *how* these strategies are implemented is likely to be key. For example, an extensive body of literature has identified that choice overload, which occurs when consumers are presented with too many choices, can undermine consumer wellbeing (Chernev et al., 2016; Reutskaja et al., 2022). Choice overload consequently sits uncomfortably with consumers' stated desire for control. A key challenge for aggregator will be in how to design systems and processes that honour the stated desires of consumers without creating an ungainly customer experience.

4.4.3 Strategies for Enhancing Aggregator Trust (Consumer Segments)

Strategies for enhancing trust were then examined across the two consumer segmentation variables. From the outset, it should be noted that the presence or absence of significant differences across these strategies does not necessarily negate the importance of a given strategy for enhancing trust; it just highlights which consumer segments may be more (or less) influenced by these strategies. Thus, the presence or absence of significant differences should be examined alongside the total proportion of participants in each consumer segment who indicated that the implementation of a given strategy would influence their trust in an aggregator.

For solar panel status, only one strategy significantly differed across those with and without solar panels: having an aggregator guarantee earnings (see Table 18). Specifically, participants with rooftop solar were more likely to endorse this strategy (68.7%) as something that would increase their trust relative to their counterparts without rooftop solar (61.4%). Given the gradual erosion in solar feed-in tariffs over the last couple of decades, the fact that solar panel owners were more likely to endorse this strategy is perhaps unsurprising and points to a preference for certainty about the financial returns they could expect to receive from joining an aggregator.

Table 18 Strategies for Enhancing Trust in an Aggregator, Segmented by Solar Panel Status

Potential ways to enhance trust in an aggregator	Solar panels: No	Solar panels: Yes
Aggregator owned by community group	31.4%	29.1%
Aggregator owned by commercial company	14.2%	14.7%
Aggregator guarantees earnings	61.4%	68.7%
Consumer controls how much stored power aggregator can export	64.3%	67.9%
Consumer controls when aggregator can export stored power	63.1%	62.7%
Consumer notified before every export takes place	61.5%	57.1%
Consumer notified after every export has taken place	53.0%	55.3%
Friends/family have joined aggregator	42.2%	38.3%
People in community have joined aggregator	38.6%	40.0%
Aggregator endorsed by trusted community group	43.4%	38.7%
Aggregator endorsed by government agency	50.6%	50.0%
Aggregator has a lock-in contract	26.1%	30.0%

Trust was recoded from three categories (increase trust; neutral; decrease trust) to two categories (increase trust; not increase trust) to ensure sufficient minimum cell sizes were present to run chi-square analyses. Only the 'increase trust' proportions are reported here. Red and green highlighting is used to indicate if solar panel status is over-represented (green; standardised residual ≥ 1.96) or under-represented (red; standardised residual ≥ -1.96) in their preference for trust-enhancing strategies.

Significant differences were also observed across the adopter categories (see Table 19). For example, participants in the early majority category were more likely than their counterparts across the other categories to endorse the following strategies as potentially influencing their trust in an aggregator:

- Consumer controls how much stored power an aggregator can export (71.0%)
- Aggregator guarantees earnings (69.8%)
- Consumer notified before every export takes place (63.6%)
- Consumer notified after every export has taken place (57.7%)
- Aggregator endorsed by trusted community group (44.2%)

Conversely, participants in the late majority group were more likely to indicate that their trust in an energy aggregator would increase if friends or family had already joined the aggregator. This finding is consistent with the definition of the late majority adopter group in that they rely on others to help decide whether to adopt a given technology. Finally, laggards were consistently less likely than the other adopter groups to indicate that the various strategies would increase their trust in an aggregator, suggesting once again that laggards are not likely to be a desirable consumer segment to actively target, at least in the immediate future.

Table 19 Strategies for Enhancing Trust in an Aggregator, Segmented by Adopter Category

Strategy for enhancing trust in an aggregator	Innovator / early adopter	Early majority	Late majority	Laggard
Aggregator owned by community group	36.5%	32.6%	28.5%	15.8%
Aggregator owned by commercial company	25.0%	14.2%	13.2%	8.4%
Aggregator guarantees earnings	59.4%	69.8%	68.1%	42.1%
Consumer controls how much stored power aggregator can export	63.5%	71.0%	65.1%	47.4%
Consumer controls when aggregator can export stored power	59.4%	66.6%	60.1%	54.7%
Consumer notified before every export takes place	54.2%	63.6%	56.8%	47.4%
Consumer notified after every export has taken place	52.1%	57.7%	54.1%	38.9%
Friends/family have joined aggregator	32.3%	42.3%	46.9%	21.1%
People in community have joined aggregator	38.5%	41.7%	43.2%	18.9%
Aggregator endorsed by trusted community group	41.7%	44.2%	42.5%	20.0%
Aggregator endorsed by government agency	54.2%	52.6%	53.3%	27.4%
Aggregator has a lock-in contract	33.3%	29.7%	27.6%	16.8%

Trust was recoded from three categories (increase trust; neutral; decrease trust) to two categories (increase trust; not increase trust) to ensure sufficient minimum cell sizes were present to run chi-square analyses. Only the 'increase trust' proportions are reported here. Red and green highlighting is used to indicate if an adopter category is over-represented (green; standardised residual ≥ 1.96) or under-represented (red; standardised residual ≥ -1.96) in their preference for trust-enhancing strategies relative to the other adopter categories.

Key Take-Away: Consumer control, transparency, and consumer safeguards are trust-enhancing strategies that particularly resonate with the early majority

Participants in the early majority category were especially likely to identify consumer control, transparency, and consumer safeguards as factors that would enhance their trust in an aggregator. Strategies aimed at ensuring *consumer control* (when and how much energy is exported), *transparency* (notifications for how and when DER is being used for export), and *consumer safeguards* (guaranteed earnings) may therefore be especially helpful at building trust among the early majority.

4.5 Information Needs

4.5.1 General Information Needs

Participants were presented with a list outlining different categories of information and were asked to indicate which information categories would help them decide whether to join an aggregator. All categories were perceived as being useful in that they were identified by more than half of the sample as something that would help to evaluate whether to join an aggregator (see Figure 18). However, four categories were perceived as being especially useful in that, across the entire sample, they were nominated by at least two-thirds of participants:

- Amount of money I could expect to make each year (77.0%)
- How my battery would be protected (76.0%)
- How an aggregator works (72.5%)
- How my privacy would be protected (68.5%)

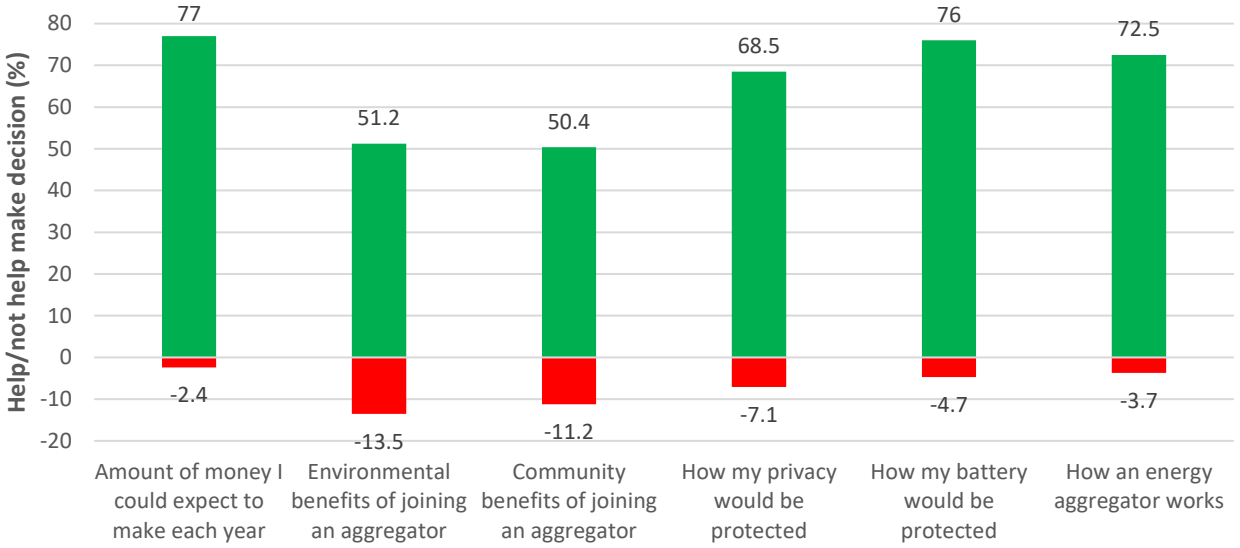

Figure 18 Information That Would Help in Deciding Whether to Join an Aggregator (All Participants)

Red and green are used to indicate the proportion of participants who believed that a given type of information would help (green) or not help (red) them decide whether to join an aggregator. Uncertain responses – that is, participants who indicated that they were unsure whether a given type of information would help them decide – are not displayed here.

Key Take-Away: Participants seek information about consumer safeguards and financial benefits

Information that clarified consumer safeguards (privacy, battery protection) and outlined likely monetary earnings were identified by participants as something that would help them decide whether to join an aggregator. This stated desire for information about likely monetary earnings is consistent with our earlier findings about the general value that participants attached to monetary savings as well as the perception that joining an aggregator would generate monetary savings (see Figure 9).

4.5.2 Information Needs by Consumer Segment

Desired categories of information were also examined across the two consumer segmentation variables. Notably, no significant differences were observed by solar panel status (see Table 20). Thus, experience with one form of DER did not necessarily alter participants' *general* information needs, although differences could conceivably exist with respect to more *specific* informational requirements.

Table 20 Information That Would Help in Deciding Whether to Join an Aggregator, Segmented by Solar Panel Status

Type of information	Solar panels: No	Solar panels: Yes
Amount of money I could expect to make each year	74.8%	79.0%
Environmental benefits associated with joining an aggregator	52.5%	50.0%
Community benefits associated with joining an aggregator	51.0%	50.0%
How my privacy would be protected	67.6%	69.3%
How my battery would be protected	73.1%	78.6%
How an energy aggregator works	70.7%	73.9%

Information was recoded from three categories (help make decision; unsure; not help make decision) to two categories (help make decision; not help make decision) to ensure sufficient minimum cell sizes were present to run chi-square analyses. Only the 'help make decision' proportions are reported here.

Significant differences were observed across the various adopter categories (see Table 21). Notably, while information about expected financial returns was considered an important informational need by all groups (ranging from 55.8% to 82.8% endorsement), this information was relatively less sought out by the innovator/early adopter and laggard categories. By contrast, the early majority category was significantly more likely to believe that each of the examined informational categories would help them decide whether to join an aggregator.

Table 21 Information That Would Help in Deciding Whether to Join an Aggregator, Segmented by Adopter Category

Type of information	Innovator / early adopter	Early majority	Late majority	Laggard
Amount of money I could expect to make each year	68.8%	82.8%	78.6%	55.8%
Environmental benefits associated with joining an aggregator	53.1%	56.9%	48.9%	26.3%
Community benefits associated with joining an aggregator	59.4%	55.4%	46.1%	27.4%
How my privacy would be protected	64.6%	73.8%	68.6%	46.3%
How my battery would be protected	71.9%	82.0%	77.7%	46.3%
How an energy aggregator works	69.8%	78.0%	72.9%	46.3%

Information was recoded from three categories (help make decision; unsure; not help make decision) to two categories (help make decision; not help make decision) to ensure sufficient minimum cell sizes were present to run chi-square analyses. Only the 'help make decision' proportions are reported here. Red and green highlighting is used to indicate if an adopter category is over-represented (green; standardised residual ≥ 1.96) or under-represented (red; standardised residual ≥ -1.96) in the perceived helpfulness of information relative to the other adopter categories.

Key Take-Away: The early majority are especially eager for information to help them decide whether to join an aggregator

While participants in the early majority category may be more willing to embrace innovations than the late majority and laggards, they may look to offset the uncertainty of adopting a relatively new and less widespread technology offering – such as joining an aggregator – by seeking more information about those offerings. Thus, increasing information availability may help the early majority decide whether to join an aggregator.

4.6 Policy Evaluation

4.6.1 Background

Asking participants to evaluate the fairness of different energy export policy settings is complicated by two issues: energy policy is complex, and most consumers have limited awareness of the underlying issues that motivate the need for new energy policies. For these reasons, participants were first presented with a brief introduction that used the metaphor of 'pipes' to provide a more accessible introduction to the challenges of integrating DER into the National Energy Market:

> The power grid can be thought of as a series of 'pipes': big pipes connect power plants to towns, and then within towns, smaller pipes connect households.
>
> As more households gain the ability to export power through solar panels and batteries, the capacity of these smaller pipes can quickly be exceeded, which can threaten the safety and stability of the grid. This issue will become more common as more households install solar panels and batteries.

After reading this brief preamble, participants were presented with four scenarios outlining different policy settings that could be used to integrate DER into the National Energy Market:

> **Scenario 1:** The capacity of the smaller pipes is not increased, so there are no upgrade costs. This means that as more households install solar panels, pipe capacity is reached more quickly, limiting the amount of power households can export and increasing the price of power for everyone.
>
> **Scenario 2:** The capacity of the smaller pipes is not increased, so there are no upgrade costs. Instead, households are allowed to export more than they currently can when demand for power is high, but less than they currently can once the pipes come close to capacity.
>
> **Scenario 3:** The capacity of the smaller pipes is increased so that more households can export more power. The cost of these upgrades is shared by all households (including those without solar panels or batteries).
>
> **Scenario 4:** The capacity of the smaller pipes is increased so that more households can export more power. The cost of these upgrades is covered by export charges, which are only applied to households that export power to the grid.

Scenarios 1, 3, and 4 were based on different options identified by the Australian Energy Market Commission (2021) in their 'Access, pricing and incentive arrangements for distributed energy resources' rule change determination (see p. 161). Conversely, Scenario 2 was based on the experience of the ARENA (2021) Dynamic Limits DER Feasibility Study and the policy settings that might be required to implement the associated dynamic operating envelopes.

Participants were then asked to evaluate the perceived fairness of each scenario.

4.6.2 Perceptions of Policy Fairness (All Participants)

Across all participants, two scenarios were seen as being equally fair: Scenario 2 and Scenario 4 (see Figure 19). Importantly, the average evaluations of both scenarios were above the scale mid-point (3 = neither unfair nor fair), suggesting that the associated policies were seen by most participants as being at least somewhat fair.

With respect to the other scenarios:

- Scenario 3 was perceived as being significantly less fair than Scenarios 2 and 4, but fairer than Scenario 1. The average evaluation of Scenario 3 was also below the scale mid-point, suggesting that most participants saw this policy setting as somewhat unfair.
- Scenario 1 was perceived as being significantly less fair than the other scenarios. Scenario 1 was also evaluated below the scale mid-point, indicating that for most participants, this policy setting was perceived as somewhat unfair.

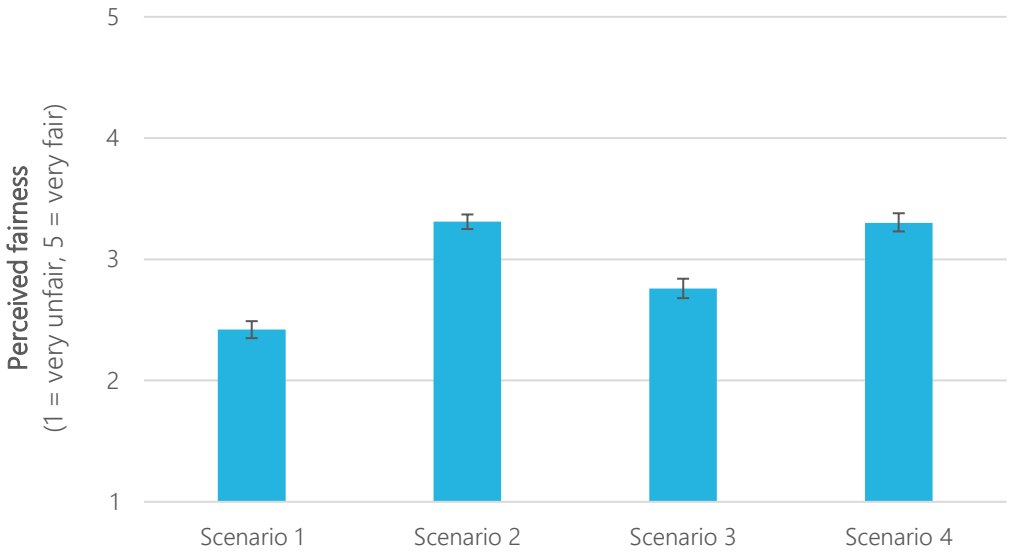

Figure 19 Perceived Fairness of Policy Scenarios (All Participants)

The error bars represent 95% confidence intervals and can be interpreted such that columns with non-overlapping 95% confidence intervals significantly differ from each other.

Key Take-Away: A 'fair' policy is one where solutions for integrating DER into the National Energy Market only affect DER owners

The two policy scenarios that were seen by participants as being equally fair (Scenarios 2 and 4) shared an attribute in common: the proposed policy solution for overcoming current DER export constraints was borne by DER owners. In Scenario 2, for example, dynamic operating envelopes would see the amount of power that DER owners could export to the National Energy Market being adjusted based on network conditions. Similarly, in Scenario 4, the infrastructure upgrade costs that would allow DER owners to export more power to the National Energy Market would be paid for by households with DER. Conversely, when the proposed policy options were seen to negative impinge on non-DER owners, those policy options were perceived as being unfair.

4.6.3 Perceptions of Policy Fairness (Consumer Segments)

Perceptions of policy fairness were then examined across the two consumer segmentation variables (see Table 20). When examined by solar panel status, differences in perceived fairness were observed across two scenarios:

- Participants with solar panels perceived Scenario 3 as being significantly fairer than participants without solar panels.
- Participants with solar panels perceived Scenario 4 as being significantly less fair than participants without solar panels.

This pattern of effects is understandable, given that consumers have a general bias towards minimising their own costs. In Scenario 3, for example, the upgrade costs that would allow households with DER (including solar panels) to export more power to the National Energy Market would be borne by all consumers, whereas in Scenario 4, these upgrade costs would be borne by only those with DER. By contrast, the perceived fairness of Scenarios 1 and 2 did not differ by solar panel status.

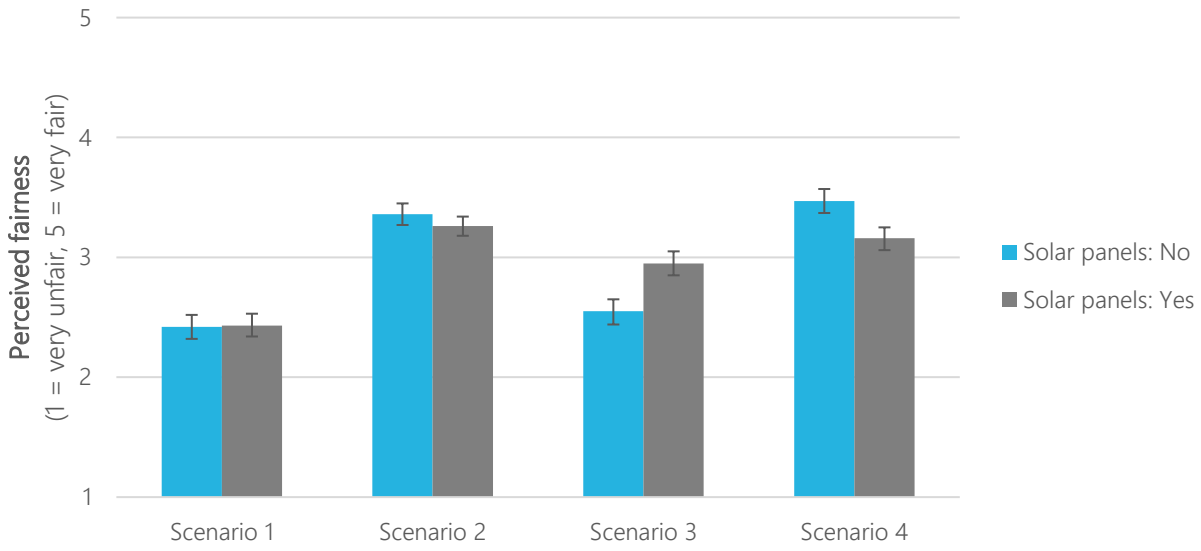

Figure 20 Perceived Fairness of Policy Scenarios, Segmented by Solar Panel Status

The error bars represent 95% confidence intervals and can be interpreted such that columns with non-overlapping 95% confidence intervals significantly differ from each other.

When the policy scenarios were examined by adopter category, differences in perceived fairness were only observed for Scenario 3 (see Figure 21). Specifically, innovators/early adopters perceived Scenario 3 to be significantly fairer than participants in the other adopter categories, perhaps because they could conceive of themselves owning DER and benefitting from having access to community-subsidised improvements to export infrastructure. However, and perhaps because many in this adopter category do not necessarily have current DER, they were not averse to Scenario 4.

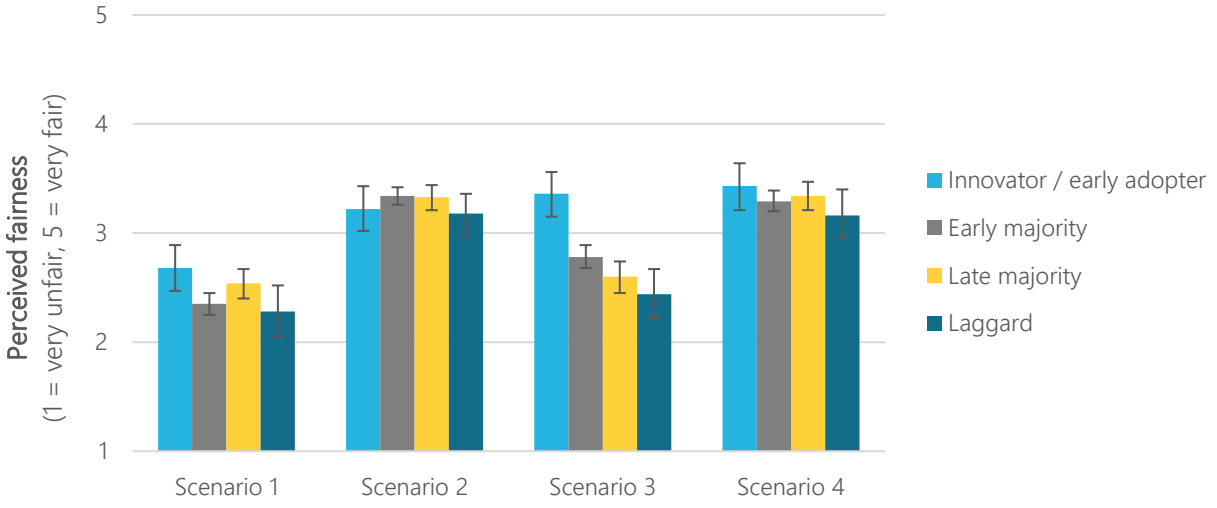

Figure 21 Perceived Fairness of Policy Scenarios, Segmented by Adopter Category

The error bars represent 95% confidence intervals and can be interpreted such that columns with non-overlapping 95% confidence intervals significantly differ from each other.

Key Take-Away: Current or likely future DER owners prefer policy settings that permit greater exports with no upfront personal costs

The two scenarios perceived as most fair by the broader sample (Scenario 2 and Scenario 4) would both pose potential financial implications for participants with DER. However, solar panel status only influenced the perceived fairness of Scenario 4; no difference was observed for Scenario 2. Deeper examination of the substantive differences between the two scenarios sheds potential light on why. In Scenario 4, participants with DER would have been required to pay upfront fees in the form of export charges. Conversely, in Scenario 2, temporary export restrictions (and with it, a reduced ability to generate financial earnings) would have been balanced by an ability to export greater amounts of power at certain times of the day/year than is currently possible, representing something of a compromise in that potential losses would be balanced by potential gains. Moreover, in Scenario 4, the financial implications would be upfront and represented in the form of fees, while in Scenario 2, the financial implications would be more diffuse and represented in the form of potential changes in earnings. These differences potentially explain why the perceived fairness of Scenario 4 varied by solar panel status whereas in Scenario 2, it did not.

5. Conclusion

A range of substantive consumer insights were identified through this study:

- Interest in adopting DER and joining an aggregator was lukewarm.
- The value proposition for joining an aggregator – over and above adopting DER – was seen as unclear.
- Rational outcomes were valued more strongly than emotional ones, particularly in considering whether to join an aggregator.
- Saving money and having a reliable supply of power shaped interest in adopting DER and joining an aggregator.
- Costs of adopting DER tended to be underestimated.
- Most participants were reserving judgment about whether they could trust an aggregator to access and export their stored power.
- Providing consumer control, transparency, and consumer safeguards were seen as ways to enhance trust in an aggregator.
- Information about consumer safeguards and likely financial benefits were deemed useful in helping decide whether to join an aggregator.
- Perceptions of policy fairness were influenced by solar panel status.

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A1. Survey Questions

[Screener criteria]

What type of property is your primary place of residence?

- [1] Free standing house
- [2] Townhouse or duplex
- [3] Unit, flat, or apartment

Which of the following describes your primary place of residence?

- [1] I own it outright or with a mortgage
- [2] I rent it
- [3] I live rent-free with family, friends etc.

What is your gender?

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

Which state/territory do you currently reside in?

- [1] Australian Capital Territory
- [2] New South Wales
- [3] Northern Territory
- [4] Queensland
- [5] South Australia
- [6] Tasmania
- [7] Victoria
- [8] Western Australia

Which of the following do you currently have at your primary place of residence?

- [1] Rooftop solar panels
- [2] Household battery storage
- [3] Solar hot water or heat pump hot water
- [4] Electric vehicle
- [5] None of the above

[Section 1: General energy questions]

In general, how desirable are the following outcomes?
[1 = Not at all desirable; 5 = Extremely desirable]

- Saving money
- Receiving a reliable supply of power
- Reducing CO_2 emissions
- Helping the community
- Reducing life admin (routine tasks)
- Receiving good service

---new page---

How well do your current power arrangements (power company; any products that use or consume power) help you achieve the following outcomes?
[1 = Not well at all; 5 = Extremely well]

- Saving money
- Receiving a reliable supply of power
- Reducing CO_2 emissions
- Helping the community
- Reducing life admin (routine tasks)
- Receiving good service

---new page---

Energy technologies include things like rooftop solar panels, household batteries, and electric vehicles.

Which of the following best describes you?

- [1] I like to be one of the very first to try new energy technologies.
- [2] I like to be a leader in trying new energy technologies.
- [3] I like to hear about other peoples' experiences before I try new energy technologies.
- [4] I only try new energy technologies when the people I trust have already done so.
- [5] I don't see much need for trying new energy technologies.

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Which of the following best describes power outages at your primary place of residence?

- [1] Rare, and usually a minor nuisance when they happen
- [2] Rare, but usually a major disruption when they happen
- [3] Common, but usually a minor nuisance when they happen
- [4] Common, and usually major disruption when they happen

[Section 2: Intended DER adoption]
[Question variants for participants without solar panels]

Australian companies are increasingly selling energy systems that include both rooftop solar panels and a household battery.

How interested are you in purchasing both rooftop solar panels and a household battery?

- [1] Not at all interested
- [2] Slightly interested
- [3] Moderately interested
- [4] Very interested
- [5] Extremely interested

---new page---

To me, having rooftop solar panels and a household battery would be:

- [1] Useless --- [5] useful
- [1] Foolish --- [5] wise
- [1] Boring --- [5] exciting
- [1] Unenjoyable --- [5] enjoyable

---new page---

How likely is it that having rooftop solar panels and a household battery would help you achieve the following outcomes?
[1 = Not at all likely; 5 = Extremely likely]

- Saving money
- Receiving a reliable supply of power
- Reducing CO_2 emissions
- Helping the community
- Reducing life admin (routine tasks)
- Receiving good service

---new page---

At what price would you consider rooftop solar panels to be:

- Priced so low that you feel the quality couldn't be very good? $_____
- A bargain – a great buy for the money? $_____
- Starting to get expensive so that it is not out of the question, but you would have to give some thought to buying it? $_____
- So expensive that you would not consider buying it? $_____

---new page---

At what price would you consider a household battery to be:

- Priced so low that you feel the quality couldn't be very good? $_____
- A bargain – a great buy for the money? $_____
- Starting to get expensive so that it is not out of the question, but you would have to give some thought to buying it? $_____
- So expensive that you would not consider buying it? $_____

---new page---

If you had rooftop solar panels, how much money do you think would be a reasonable amount to save each year? $_____

If you had a household battery, how much money do you think would be a reasonable amount to save each year? $_____

[Section 2: Intended DER adoption]
[Question variants for participants with solar panels]

Australian companies are increasingly selling energy systems that include a household battery.

How interested are you in purchasing a household battery?

- [1] Not at all interested
- [2] Slightly interested
- [3] Moderately interested
- [4] Very interested
- [5] Extremely interested

---new page---

To me, having a household battery would be:

- [1] Useless --- [5] useful
- [1] Foolish --- [5] wise
- [1] Boring --- [5] exciting
- [1] Unenjoyable --- [5] enjoyable

---new page---

How likely is it that having a household battery would help you achieve the following outcomes?
[1 = Not at all likely; 5 = Extremely likely]

- Saving money
- Receiving a reliable supply of power
- Reducing CO_2 emissions
- Helping the community
- Reducing life admin (routine tasks)
- Receiving good service

---new page---

At what price would you consider a household battery to be:

- Priced so low that you feel the quality couldn't be very good? $_____
- A bargain – a great buy for the money? $_____
- Starting to get expensive so that it is not out of the question, but you would have to give some thought to buying it? $_____
- So expensive that you would not consider buying it? $_____

---new page---

If you had a household battery, how much money do you think would be a reasonable amount to save each year? $_____

[Section 3: Joining a DER aggregator]

People with rooftop solar panels and a household battery can give a special type of company – called an energy aggregator – access to some of the power stored in their battery. The energy aggregator can then export this stored power back to the grid when demand for power is highest, generating more money for participating households. And because they have access to thousands of household batteries, an energy aggregator can control as much power as a power plant. This helps them:

- Minimise power outages in the local community.
- Negotiate better financial returns for participating households.
- Reduce the need for power plants that run on fossil fuels.

If you had solar panels and a household battery, how interested would you be in joining an energy aggregator?

- [1] Not at all interested
- [2] Slightly interested
- [3] Moderately interested
- [4] Very interested
- [5] Extremely interested

---new page---

If I had solar panels and a household battery, joining an energy aggregator would to me be:

- [1] Useless --- [5] useful
- [1] Foolish --- [5] wise
- [1] Boring --- [5] exciting
- [1] Unenjoyable --- [5] enjoyable

---new page---

If you had solar panels and a household battery, how likely is it that joining an energy aggregator would help you achieve the following outcomes?
[1 = Not at all likely; 5 = Extremely likely]

- Saving money
- Receiving a reliable supply of power
- Reducing CO_2 emissions
- Helping the community
- Reducing life admin (routine tasks)
- Receiving good service

---new page---

Energy aggregators pay households to access and export some of their stored power.

If you had solar panels and a household battery, what would you expect to be paid each year for letting an energy aggregator access and export some of your stored power?

$_____ each year

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If you had solar panels and a household battery, would you trust an energy aggregator to access and export some of the power stored in your battery?

- [1] No
- [2] Unsure
- [3] Yes

---new page---

If you had solar panels and a household battery, what factors would increase or decrease your trust in an energy aggregator? [1 = Decrease trust; 2 = Neutral; 3 = Increase trust]

- If the aggregator was owned by a community group
- If the aggregator was owned by a commercial company
- If the aggregator guaranteed a certain amount of earnings
- If I could control how much of my stored power the aggregator was allowed to export
- If I could control when the aggregator was allowed to export my stored power
- If I was notified before every export took place
- If I was notified after every export had taken place
- If my friends or family had also joined the aggregator
- If people in my community had also joined the aggregator
- If the aggregator was endorsed by a trusted community group
- If the aggregator was endorsed by a government agency
- If the aggregator had a lock-in contract

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If you had solar panels and a household battery, which of the following types of information would help you decide whether to join an energy aggregator?
[1 = No; 2 = Unsure; 3 = Yes]

- The amount of money I could expect to make each year
- The environmental benefits associated with joining an energy aggregator
- The community benefits associated with joining an energy aggregator
- Please select unsure to show you are paying attention
- How my privacy would be protected
- How my battery would be protected
- How an energy aggregator works

[Section 4: DER export perceptions]

The power grid can be thought of as a series of 'pipes': big pipes connect power plants to towns, and then within towns, smaller pipes connect households.
As more households gain the ability to export power through solar panels and batteries, the capacity of these smaller pipes can quickly be exceeded, which can threaten the safety and stability of the grid. This issue will become more common as more households install solar panels and batteries.

There are several solutions for addressing this issue. On the coming pages, we would like you to rate how fair you think some of these solutions are. [1 = Very unfair; 5 = Very fair]

- The capacity of the smaller pipes is not upgraded, so there are no upgrade costs. However, pipe capacity is reached more quickly as more households install solar panels and batteries, which limits the amount of power that households can export and increases the overall price of power.
- The capacity of the smaller pipes is not upgraded, so there are no upgrade costs. However, variable caps are introduced, with higher exports allowed during periods of high power demand (such as in the evening) and lower exports allowed during periods of high power supply (such as on bright sunny days).
- The capacity of the smaller pipes is upgraded so that more households can export more power. The cost of these upgrades is shared by all households (including those without solar panels or batteries).
- The capacity of the smaller pipes is upgraded so that more households can export more power. The cost of these upgrades is covered by export charges, which are only applied to households that export power to the grid.

[Section 5: Demographics]

What is your age in years? _____

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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

How many people usually live in your house? _____

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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

How would you describe your political views?

- [1] Very conservative
- [2] Somewhat conservative
- [3] Neither conservative nor progressive
- [4] Somewhat progressive
- [5] Very progressive
- [6] Prefer not to say

What is your postcode? _____