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Australian householders' interest in the distributed energy market

National survey results

Report number EP133598

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Important disclaimer

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Executive summary

Across Australia, the current contribution of households in the solar distributed energy market is increasing. However, with an ever changing landscape in relation to rising electricity prices, government policies, and interest in reducing greenhouse gas emissions from electricity supply, there are opportunities for new models of energy generation from solar photovoltaic systems. To that end, the former Australian Solar Institute (ASI) now part of the Australian Renewable Energy Agency (ARENA) funded the collaborative research project 'Consumer & Utility Interest in Active Participation in the Distributed Energy Market'.

As part of this research the Australian Photovoltaic Association (APVA) commissioned the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to design and run a national survey to investigate Australian householders' perceptions of, and willingness to participate in the distributed solar photovoltaic (PV) energy market. The survey was informed by previous CSIRO research in this area, as well as from responses collected from six focus groups conducted across Brisbane, Melbourne and Sydney in October 2012.

In total six key options were examined which included:

1. Solar hot water systems
2. Grid connected solar PV systems
3. Grid connected solar PV systems with battery
4. Battery alone systems
5. Off-grid PV solar systems
6. Community PV systems

A total of 2,463 useable responses were collected that were reasonably representative of the Australian population in terms of age and gender. For each of the technology options a subsample, ranging from 816 to 827, were randomised across each of the options to ascertain individual responses to the technology. Of the full sample 26.3% of householders reported having already installed small scale solar technologies – either solar hot water or small solar PV panels. When questioned, the main motivation for their decision to install either technology was to save money on their power bills.

The survey results indicated that overall, there is general support by householders to participate in the distributed energy market, particularly through the installation of solar hot water heaters, solar photovoltaic systems connected to the grid for energy generation and with battery backup. Not surprising, the analysis shows that this support appears to be more likely in groups living in houses and those who own their own home. Home owners were also more likely to be supportive of solar PV with battery backup. However, the results suggest that householders' final decisions are mainly determined by individual trade-offs across different technology/service attributes, out of which cost savings is most valued. Although, householders who are more supportive of distributed technologies appear to be willing to give up some of the power reliability for additional environmental benefits.

When asked about their preferences for various financial models, householders found purchasing upfront as the most appealing financial option to install solar distributed energy technologies in their home. Packages provided by Energy Service Companies (ESCOs) were not widely supported by householders. However, around half of the sample indicated they may consider an ESCO package should reasonable cost savings be available.

In terms of informing potential future adopters of distributed energy systems, practical information is preferred through case studies about others who have already invested in solar energy, as well as solar industry websites, visits to houses with solar energy or having home energy experts visiting their home. Trusted information sources on this topic included the CSIRO and consumer organisations, along with engineers, scientists and relevant energy experts.

1 Introduction

With energy retail prices in Australia increasing on average by 40% over 2009-2012 (DRET, 2012), combined with a range of government incentives for energy efficiency and renewable energy (i.e. renewable energy certificates (RECS), rebates, feed in tariffs), there has been a significant increase in the installation of small scale solar PV systems (AEMO, 2012). For example, the installed capacity of solar PV increased from 123MW across 86,000 solar panel systems, between 2001 and 2009, to 305MW across 158,000 installations in 2010 (BREE, 2012), and then a far more substantial uptake between 2010 and 2011, reaching a capacity of 1,450MW by the end of February 2012. While uptake of small scale solar PV systems in Australia has increased rapidly, the overall amount of rooftop PV energy in Australia is still small.

The rapid increase in installed capacity, alongside the ever changing landscape of government reforms and interest in reducing greenhouse gas emissions, motivated the APVA in collaboration with CSIRO and the University of Arizona to respond to the ASI's call for projects under the United States - Australia Solar Energy Collaboration. This resulted in the APVA being awarded funds for the research project to investigate "Consumer and utility interest in active participation in the distributed energy market."

Key components of the project included:

- development of a peer reviewed set of solar PV distributed energy options through a literature review and desktop study
- report on the delivery of six focus groups to inform the development of a national survey;
- national survey design, pilot and delivery
- report on the analysis and synthesis of key results from the national survey
- conduct of interviews with key stakeholder of the Australian energy industry
- drafting of final report
- ongoing liaison with the University of Arizona to compare research findings
- conduct workshop with key stakeholders to disseminate overall project results

This report details the results of one of CSIRO's components of the overall project – a national survey to understand Australian householders' current perceptions of and preferences for participating in the PV distributed energy market.

The structure of the remainder of the report is as follows: the next section outlines the technology and financial options used in this study. Section 3 outlines the method including a brief description of the options, overall survey design, delivery and sample of respondents. Section 4 provides a description of the overall sample, while Section 5 presents the overall results. Finally Section 6 discusses key findings from the survey results and identifies areas for further research. A copy of the survey and overall results are detailed in the Appendices.

2 Technology and Financial Options

The starting point in eliciting people's willingness to participate in an emerging market is defining a set of specific technology options available, along with associated operational and financial alternatives and implications for households. This will help to ensure that respondents truly understand what their participation in this market entails. Participation in the distributed energy market can take different forms, but Australians are currently most familiar with installing solar PV panels to support their own household energy use and/or to sell their surplus solar electricity through feeding it back into the electricity grid/network. We outline the six technological options considered, along with four business models for households to own and operate or to contract distributed energy systems through ESCOs. These options were developed in the first component of the research by the APVA and peer reviewed by CSIRO. These options are referred to throughout the report by the bracketed abbreviations shown section 2.1 below.

2.1 Technology options

The following six options are considered for households to participate in the distributed energy market:

- **Solar hot water systems (SHW)** – panels installed on householders' premises to heat and store hot water for use in the household. Gas or electricity boosters can be also connected to the system.
- **Grid connected solar PV systems (SPV)** – solar PV panels installed on householders' premises to generate electricity for use in the household or to feed electricity into the electricity grid.
- **Grid connected solar PV systems with battery (SPVB)** – solar PV panels installed on householders' premises to generate electricity for use in the household or to feed into the electricity grid. The batteries can be used as a backup system or to export electricity at times of the day when electricity retail tariffs are highest.
- **Battery alone systems (BA)** – battery stacks are used to store electricity purchased from the electricity grid at low cost to then use at times of the day when electricity retail tariffs are most expensive, e.g. peak periods. The battery alone system is not connected to any solar PV or other distributed energy system.
- **Off-grid PV solar systems (OGPV)** – solar PV panels installed on householders' premises to generate electricity for own use in the household, with batteries as a backup system.
- **Community PV systems (CPV)** – solar PV systems installed on public or commercial buildings, such as public schools, and managed by not-for-profit organisations, local councils or private companies to sell the electricity generated onsite to the building tenants and/or to an electricity retailer. The profits generated are distributed among investors, who may include private householders.

As such, solar hot water systems and solar PV systems are likely to reduce the amount of electricity or gas householders need to purchase from energy retailers, provided their demand patterns remain unchanged.

2.2 Financial options for investing in distributed energy technologies

The technology options under consideration can be owned and operated by householders directly, or can be leased from an energy supplier, who operates and maintains these systems. Alternatively, an ESCO could offer a contract to householders for a bundle comprised of a home audit of the household electricity consumption and an energy package tailored for the household needs. This package could include the installation of devices, such as a solar PV or solar hot water systems, energy efficient appliances, as well as

electronic load control or demand management devices to reduce household electricity use at times of high demand and high cost. A comparison of these financial options is presented in more detail in Table 1 below.

Table 1 Financial options to participate in the distributed energy market described to households in the survey

	BUYING A SOLAR DEVICE UPFRONT	BUYING A SOLAR DEVICE WITH FINANCE	LEASING A SOLAR DEVICE FROM AN ENERGY SUPPLIER	SIGNING TO AN ENERGY SERVICE COMPANY PACKAGE
Ownership of technology	Yes	Yes, after the final installment is paid	No. The business that installs the system owns it	No. The energy service company owns it
Responsibility for managing the use of appliances	Household	Household	Household	Shared between the household and the energy service company
Payment for the system/service	Up front when system is bought	Through monthly payments	Through monthly payments	Through monthly payments
Billing	One bill from the electricity retailer	One bill from the electricity retailer	Two bills, one from the leasing company and one from the retailer	One bill from the energy service company
Operation and maintenance of the technology	Households are responsible for all maintenance and repairs outside the warranty period	Households are responsible for all maintenance and repairs outside the warranty period	The solar leasing company is responsible for all maintenance and repairs	The energy service company is responsible for all maintenance and repairs
Effect on current power bill	The electricity generated can be used to reduce households' current power bill	The electricity generated can be used to offset the monthly payments and/or households' current power bills	Households are offered electricity rates that are lower than current tariff for the duration of the contract (10 - 20 years)	Households' monthly payments to ESCOs should be lower than households' current power bill

3 Method

3.1 Survey Development

The final survey (refer to Appendix B) builds on CSIRO's earlier surveys applied to similar research on distributed energy technology acceptance, such as (Gardner, Carr-Cornish et al. 2008). The survey design was based on the findings from six focus group meetings held with 61 participants across Brisbane, Melbourne and Sydney documented in the report "Householder interest in active participation in the solar distributed energy market: Results from focus group meetings" (Ashworth, Van Kasteren, Romanach, Rodriguez, 2012). In these focus groups, participants were presented with the options outlined above. Pre- and post-questionnaires were used in the focus group meetings to test questions to elicit participants' current levels of knowledge and attitudes towards solar energy and their level of uptake to date.

The findings of the focus group sessions indicated that in addition to reducing electricity costs, for some participants, environmental impact, levels of self sufficiency, and levels of control and safety, are also important considerations when determining their preferences for accepting distributed energy options. The most important factors influencing these preferences appeared to be:

- ***Infrastructure related:*** tenancy and housing types, and structural issues (suitability of roofs)
- ***Lifestyle:*** mobility, aesthetics, household energy use and current bill value, being home during the day, age groups, and competing priorities
- ***Financial:*** return on investment (linked to age), competing priorities, and quality improvements
- ***Information:*** lack of clear material and trust in source of information
- ***Environmental considerations:*** environmental impacts
- ***Benefits for independence of service providers:*** options for energy self sufficiency.

3.2 Survey design

The final survey was comprised of items that collected respondents' demographic and socio-economic data, as well as information about their values, knowledge, beliefs and attitudes towards solar PV systems and their uptake. The survey investigated householders' motivation for investing in the six different distributed energy options presented and four models for financing.

The survey was structured into the following sections:

- **Subjective and objective knowledge** – self assessed knowledge was tested through four statements about how easy it would be to explain concepts about distributed energy systems to peers (assessed on a 5-point Likert scale with 1 representing 'strongly disagree' and 5 representing 'strongly agree'). A composite score was generated by summing respondents' responses to four statements. The reliability of the composite was checked through the Cronbach's alpha statistic (Cronbach, 1951). The Cronbach's alpha coefficient for subjective knowledge in our sample was 0.86, above the recommended level of 0.70.

  Objective knowledge was tested as a quiz with five statements about energy and the environment with only three response options allowed ('false', 'true', and 'don't know'). Scores were summed across all five question items, yielding an objective knowledge score ranging from 0 to 5.

- **Beliefs, values, attitudes and norms** – psychological variables included in the survey were pro-environmental beliefs, pro-environmental behaviours, pro-economic values (trade-off in environmental versus other economy related priorities), as well as attitudes and subjective norms

towards sustainable living and energy use. These variables were assessed over multiple statements using a 5-point Likert scale (with 1 representing 'strongly disagree' to 5 'strongly agree' – any negatively worded items were reverse-scored).

These variables were relevant to the survey, as the Values, Beliefs and Norms (VBN) Theory has been successful in explaining judgements of acceptability of energy policies (Steg et al., 2005). The survey conducted in this study included three measures from the VBN Theory, namely awareness of consequences (AC), ascription of responsibility (AR), and personal norms (PN). The reliability of the composite scores for each of these measures was generated through Cronbach's alpha statistic (Cronbach, 1951). The Cronbach's alpha coefficient in our sample was 0.87 for AC, 0.72 for AR and 0.88 for PN, indicating the composite scores can be reliably used.

- **Acceptance of specific distributed solar PV generation options** – assessed by providing a detailed description of each of the technology options and then asking for reactions to the following four items on a 5-point Likert scale (1 representing 'strongly disagree', 5 representing 'strongly agree'):
  - The technology sounds like a good idea
  - My friends and family are likely to support it
  - I would consider installing this in my home
  - This sort of technology is not suitable for my home (reverse scored)

  The average of these four measures was used as the acceptance score and classified as follows: support for technologies (>3.5), neutral (2.5-3.5), and no support for the technologies (< 2.5). The Cronbach's alpha coefficients for the support measures in each of the technological options were: SHW (0.75), SPV (0.78), SPVB (0.77), OGPV (0.78), BA (0.78) and CPV (0.75), all above the recommended level of 0.70.
- **Preferences for distributed solar PV options' attributes** – nine attributes or features identified in focus groups were assessed using best-worst scaling with the purpose of understanding the relative value individuals place on them. The nine attributes tested were:
  - Reduces electricity costs
  - Meets my current electricity needs
  - Provides uninterrupted power
  - Technology is reliable and durable
  - Reduces reliance on energy retailers
  - Benefits the environment
  - Increased safety levels
  - Easy to install and maintain
  - It has visual appeal

  Nine sets of these features were randomly presented to respondents, who were asked to choose the 'most important' and the 'least important' feature from each set. A normalised score for each attribute was obtained for the analysis by calculating the average score, in which 'least important' choices are given a value of -1 and 'most important' choices are given a value of 1.
- **Ranking of finance options for distributed generation options** – the survey introduced the concept of package options through energy service companies (ESCOs) for operating and maintaining a household's energy system, followed by questions about acceptance (similar to those outlined for the technology options) and appliances that households would be willing to let ESCOs automatically turn on or off. Then, the four payment options (including ESCOs' packages) were presented in a comparison table and ranked from 1 'most interested' to 4 'least interested' – allowing an option

for not ranking all payment options. A number of statements about the motivation for different payments options were also presented and ranked from 1 'most interested' to 10 'least interested'.

- **Household infrastructure, appliances and current energy consumption** – included information about energy sources used, household appliances, electricity bills and green power use, type of property, ownership of property.
- **Demographic and socio-economic information** – included place of residence (state and postcode), age group, gender, education, employment type, household income, household size and household type.

The survey questionnaire was tested through a pilot (using over 200 participants), with the national survey launched in early March 2013. The data were collected over two weeks to ensure control of the sampling process described below.

3.3 Sampling strategy

The recruitment process was undertaken by a market research company using a national panel of respondents to obtain a representative sample of the Australian population, in terms of gender, age and state of residence. Although, the aim of the survey was to elicit householders' willingness to participate in the distributed energy market through the six technology options previously described, asking each respondent for their interest in all six options was not feasible. This was due to the large time and effort required from participants which would compromise the quality of survey responses. Thus, in order to simplify the questionnaire for each respondent, a randomisation process was used, allowing only pairs of a set of the technologies to be presented to each respondent but still maintaining overall requirements for representation across age, gender and place of residence.

3.4 Data analysis

The analysis presented in the report consists of summary statistics reported for the full sample and, where appropriate, summarised across relevant subsamples. As previously mentioned, knowledge, psychological and acceptance composite scores use the Cronbach's alpha statistic to estimate whether the level of reliability and consistency across different statements measuring the same construct of interest are acceptable (Cronbach, 1951; Nunnaly, 1978). This was generally for all variables using multiple statements in the national survey. Thus, the discussion in this report is based on the analysis of composite scores only.

Paired sample t-tests were conducted to determine whether there were significant differences in the mean values of two subsamples. Analysis of variance (ANOVA) statistics are used for a comparison of the relative variation in the data among multiple groups. For instance, measure of acceptance can be compared across three groups of respondents reflecting support, neutral, or no support of distributed energy technologies. Correlation tests were used to identify linear relationships between some key variables that might predict households' acceptance measures or willingness to install specific distributed energy technologies. For example, the importance scores for the nine technology attributes or features can be correlated with some of the technology options presented – note that this report does not include any multivariate regression analysis.

4 Sample characteristics

After removing inconsistent data where respondents misreported their age, gender or postcode, the working sample resulted in 2,463 observations. These were relatively evenly spread across each of the technology options resulting in a subsample size (n) of 816 for SHW; 823 for SPV; 822 for SPVB; 819 for BA; 819 for OGPV; and 827 for CPV.

4.1 Gender, age and place of residence

In terms of gender, the sample showed a reasonably balanced proportion between male and female participation in the survey (refer to Appendix A). When compared with the population sample (ABS, 2011), males were slightly under-represented at 46.4% compared with 48.7% while females were over-represented at 53.6% compared with 51.2% (Table 2). The sample ages were also comparable to population statistics across most age groups. The main differences were in the 65 - 69 years, which were over-represented in the survey sample and in the 75 years and over, which were markedly under-represented in the sample. This latter group is possibly less surprising given that it was an Internet survey and the numbers who access the Internet in this age group might be more limited.

Table 2 Age and gender percentages in the survey sample and in 2011 population statistics

	2011 CENSUS DATA			SURVEY DATA		
AGE GROUPS	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
18-24 years	6.2%	6.0%	12.2%	3.1%	5.2%	8.4%
25-29 years	4.6%	4.6%	9.2%	3.8%	4.8%	8.5%
30-34 years	4.4%	4.4%	8.8%	4.2%	5.0%	9.2%
35-39 years	4.5%	4.7%	9.2%	4.4%	5.2%	9.6%
40-44 years	4.6%	4.8%	9.3%	4.8%	5.2%	10.1%
45-49 years	4.5%	4.6%	9.1%	4.2%	5.2%	9.5%
50-54 years	4.3%	4.5%	8.8%	4.7%	4.9%	9.5%
55-59 years	3.9%	4.0%	7.9%	4.2%	4.2%	8.4%
60-64 years	3.6%	3.7%	7.3%	4.0%	4.1%	8.1%
65-69 years	2.8%	2.8%	5.6%	5.1%	6.1%	11.2%
70-74 years	2.1%	2.2%	4.3%	2.8%	2.8%	5.5%
75+ years	3.5%	4.9%	8.4%	1.1%	0.9%	1.9%
Total rounded	**48.8%**	**51.2%**	**100.0%**	**46.4%**	**53.6%**	**100.0%**

As shown in Figure 1, the survey sample was well spread across all State and Territories to ensure that responses were representative of the Australian population. The majority of respondents (77%) in the sample lived in three States, which included New South Wales (31.1%), Victoria (26.5%) and Queensland (19.7%). A minority of respondents resided in Western Australia (11%), South Australia (8%), Tasmania (2%), Australian Capital Territory (1.%) and the Northern Territory (0.5%) – see Table A.1 for further detail.

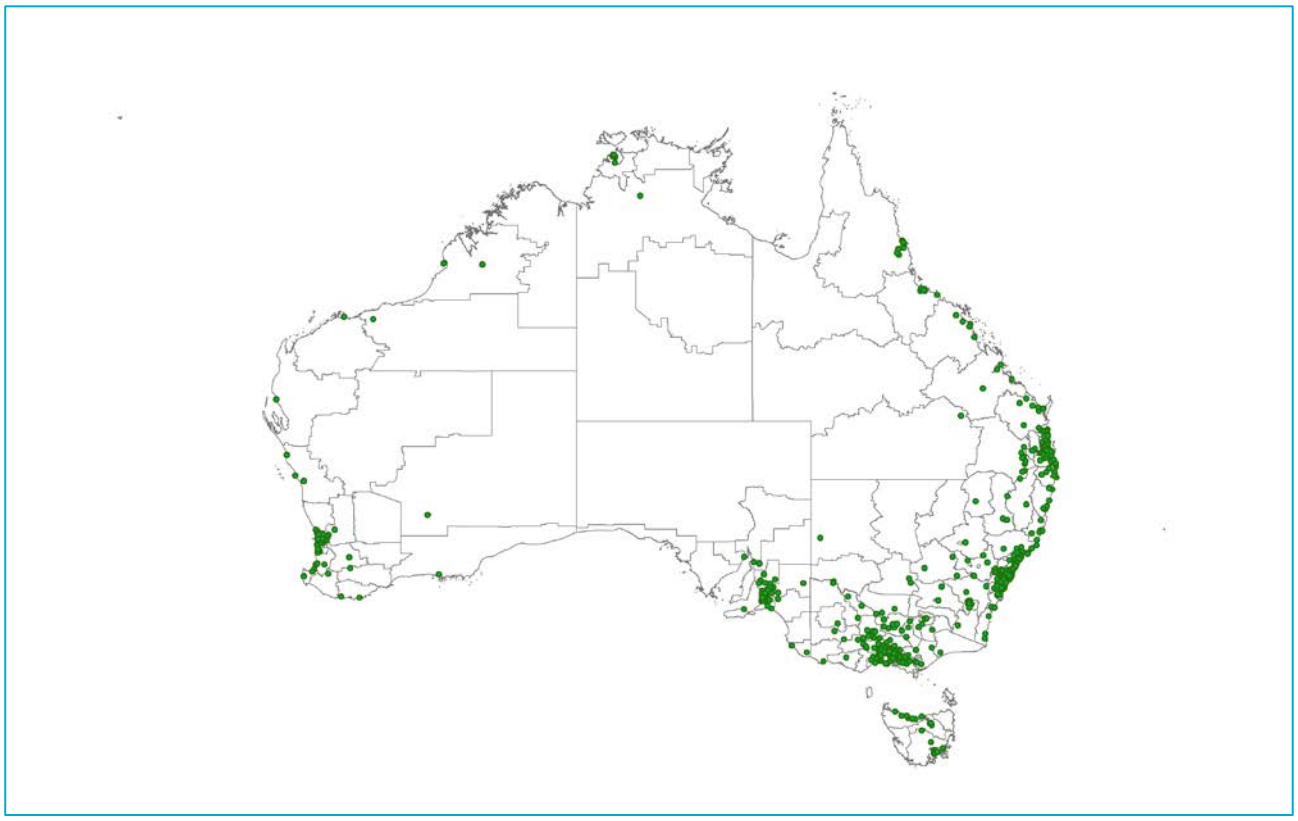
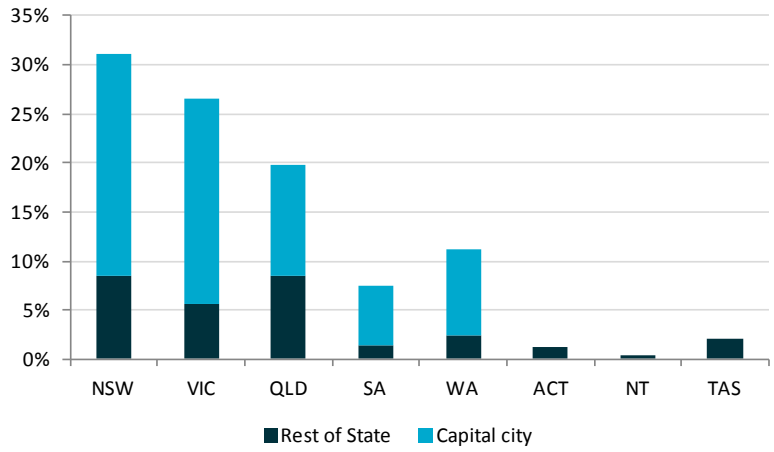


Figure 1 Place of residence of survey respondents

The survey was delivered to population in both Australian capital cities and regional areas, with 71% of respondents based in capital cities, as depicted in Figure 2.



Note: location, in terms of capital cities and rest of state, are not differentiated for ACT, TAS and NT

Figure 2 Percentage of regional and urban survey respondents

Figure 3 shows the number of survey participants in each State that responded to each technology option. The number of respondents is similar across the subsamples obtained for each technology option in terms of place of residence. Females typically accounted for 49-55% in each subsample, while males were about 45-51% (see Table A.1 for further detail).

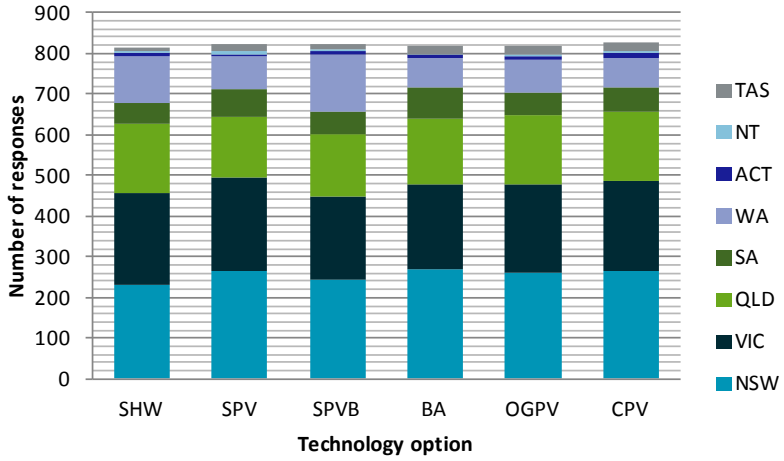


Figure 3 Place of residence across subsamples

While great effort was placed in achieving a representative sample across each technology options, there are some differences in the age spread across the subsamples (Figure 4). For instance, the subsample of the battery alone system, relative to the other technologies, had a larger number of respondents aged 65 to 69, and a smaller number of respondents aged 18 to 24. By contrast, a larger proportion of respondents in the community solar PV sample are in the youngest group age.

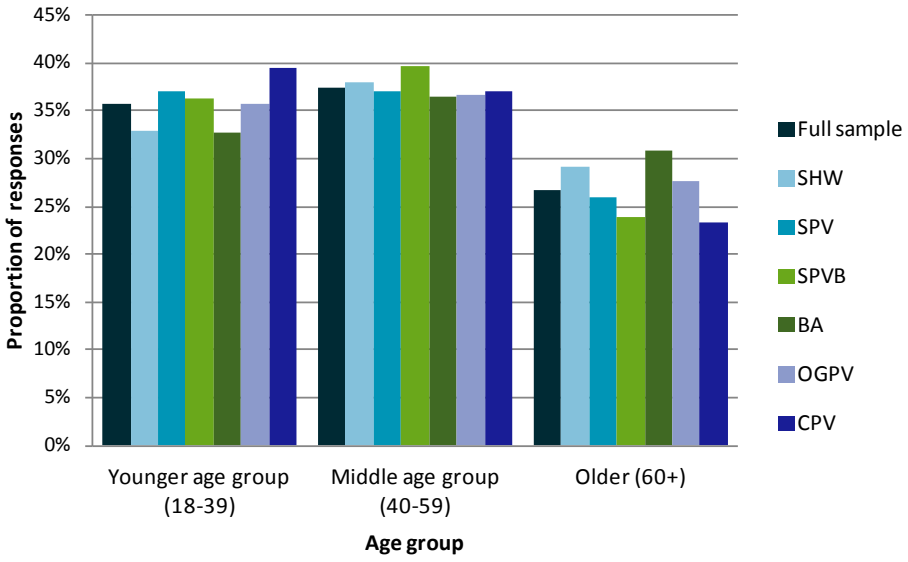


Figure 4 Histogram of age distribution across the sample

4.2 Household type and decision making

From across the sample, the largest number of respondents reported living in households comprised of couples with children (33.6%) or couples without children (29.7%) (Figure 5). The proportion is similar to that of the Australian population, which has 36.1% of the population aged 18 and over living in households comprised of couples with children and 25.1% living in households comprised of couples with no children (ABS, 2011). The survey sample was also comprised of 13.6% of people living in single person households, which is also similar to the Australian population aged 18 and over where 12.0% of the population live in single person households. The survey sample had a higher proportion of people living in shared households (11.7%) when compared to the Australian population (4.4%).

The average household size across the sample was 2.8 persons (see Appendix A, Section A.6, Table A.36). About 75% of those surveyed lived in households with less than five members, with two person households

accounting for 38.2% of the sample, followed by three-person household (18.8%) and four-person household (17.4%).

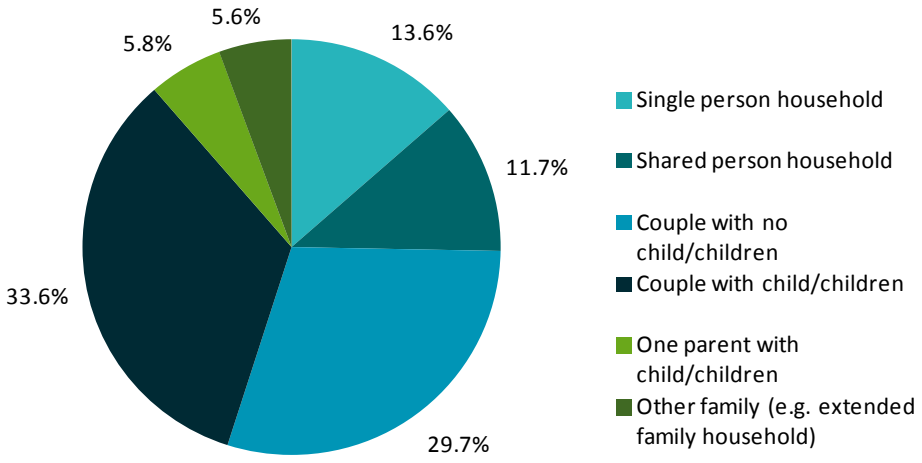


Figure 5 Household type

A total of 70.9% of respondents in the sample, reported being part of the decision-making process in the household in relation to energy matters. A total of 33.2% of respondents stated they have sole responsibility for the decisions, while 37.7% discuss such decision with another member of the household (see Appendix A, Section A.4, Table A.9). The opinion of decision-makers and non-decision makers will be further discussed in the report.

4.3 Employment and household income

Similarly to the Australian population (ABS, 2011), most respondents in the sample are employed, with 32% of survey respondents' employed full-time (compared to 38.4 %of the Australian population), and 13.4% of survey respondents are employed part-time (compared to 17.4% of the Australian population). In addition, a higher proportion of survey respondents were not in the labour force (41.3%) when compared to the Australian population (31.6%) (see Appendix A, Section A.7, Table A.40).

Survey respondents also reported similar household incomes when compared to the Australian population. According to the 2011 Census Data (ABS, 2011), 10.25% of the Australian population has a household income below $20,799, while in our sample 6.9% of survey respondents reported a similar income (below $20,000). In addition, 14.4% of respondents reported an income between $20,000 and $39,999 compared to 15.33% of the Australian population that has a household income between $20,800 and 41,599. In addition, 22.16% of the population in Australia has an income above $104,000 and 25.2% of the sample reported incomes above $100,000 (see Appendix A, Section A.7, Table A.41). Figure 6 below shows the distribution of household income across respondents.

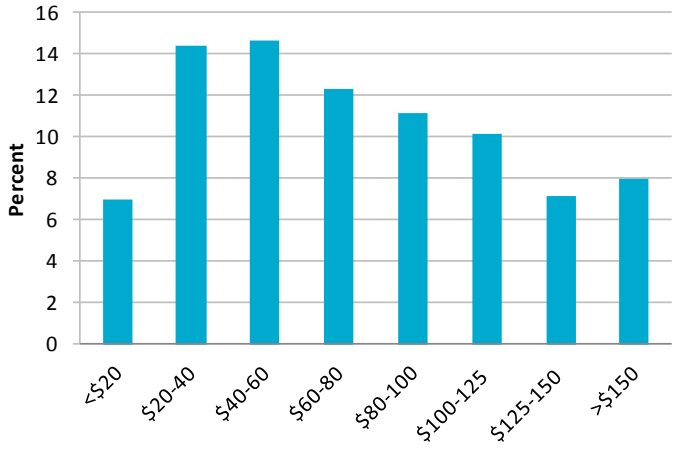


Figure 6 Household income ('000)

4.4 Education

Householders that responded to the online survey have, in general, higher educational qualifications than the Australian population. Figure 7 shows respondents' highest level of education attained. 17% of survey respondents have completed Year 12. A third of survey respondents have had access to tertiary education, as opposed to 20% of the Australian population – based on own estimates from the 2011 Census Data (ABS, 2011). In addition, 20% of survey respondents have completed a diploma/advanced diploma, as opposed to 8% of Australians. On the other hand, the survey sample had a lower percentage of respondents with trade certificates or apprenticeships (13%) when compared to the Australian population (19%).

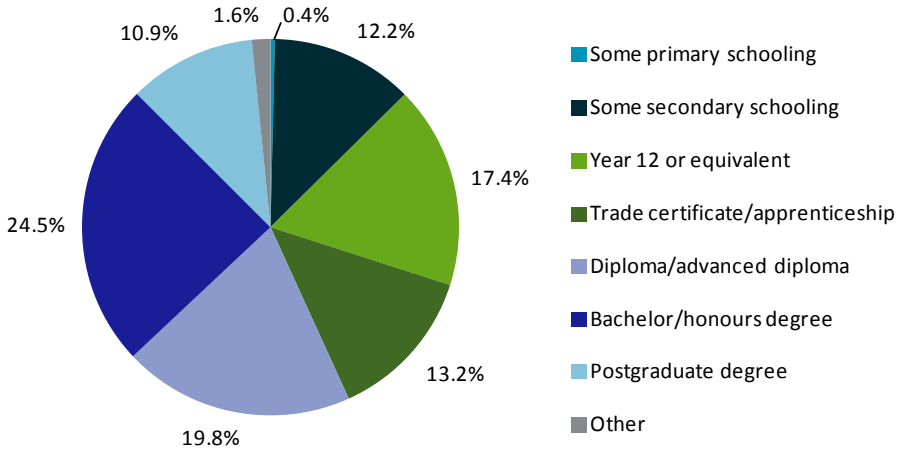


Figure 7 Highest level of education attained

4.5 Home ownership and property type

Based on the 2011 Census Data (ABS, 2011), the proportions of property types reported by survey respondents is very similar to those of the overall Australian population. Most householders live in a separate house (74.3% of the Australian population compared to 72.9% of the survey respondents), while the remainder of the householders live in flats, units or apartments (11.4% of Australian population compared to 17.7% of survey respondents), or in terrace houses/townhouses and semi-detached houses (8.5% in the sample, similar to 8.4% in the Australian population).

In terms of home ownership, the proportion of respondents who either own their properties with mortgage or outright (68.7%) is slightly higher than the overall Australian population (63.7%) (ABS, 2011). Results showed that 34.5% of the survey respondents own their property with a mortgage and 34.2% own

it outright. In comparison, 34.3% of the Australian population own their properties with a mortgage while 29.4% of the Australian population own their properties outright. A quarter of the households live in rented properties (25.3% respondents of the survey and 25.7% of Australians) and only a small fraction of the respondents in the sample live in public (2.5%) or shared housing (2.0%). The survey summary statistics are reported in Appendix A, Section A.6, Table A.32 and Table A.33.

4.6 Electricity bills

Approximately 78% of the respondents (n=1,920) reported the value of their last electricity bill with 75.7% of those paying up to $200 per month (Figure 8). Just over a quarter of those spend somewhere within the range of $50-99 per month (27.5%) or $100-149 per month (27.9%), while 18.6% of the households who reported their bill amount spend between $200-500 per month. A further 5.6% of them reported electricity bills above $500 per month. The average household electricity bill was $130 per month (based on 95% of the responses, with those greater than $500 per month treated as outliers).

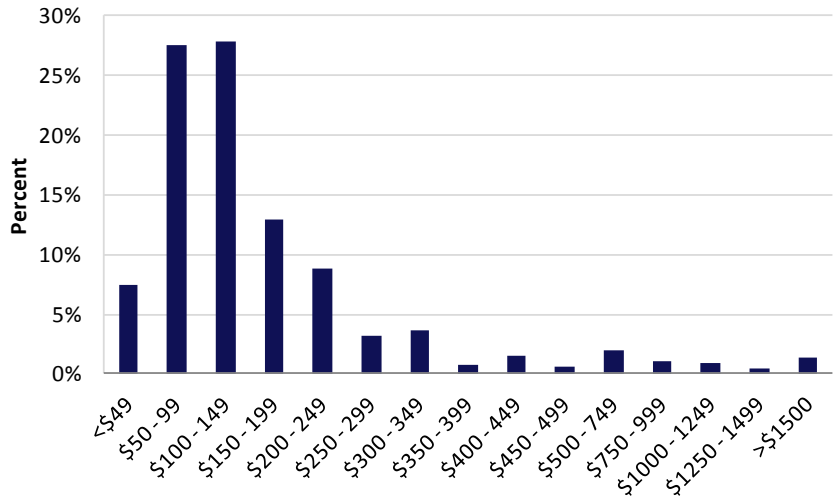


Figure 8 Electricity bills across survey respondents (AUD$ per month)

It is important to note that the value of electricity bills may not directly reflect a household's total energy consumption, as households using solar PV systems could partly or fully offset their energy use and associated costs. Seasonality issues may arise according to the period of the last billing cycle reported by households, particularly for households paying on a half-yearly or annual basis (less than 1% of the sample), implying that the electricity bill amounts should be taken as indicative only.

Householders' self-assessment of their electricity bill is presented in Figure 9 below. The self-assessment indicates that 43% of the respondents perceive their electricity bill as average, while 36.1% consider it to be high or very high. Only 20.6% of the respondents believe their bills to be either low or very low.

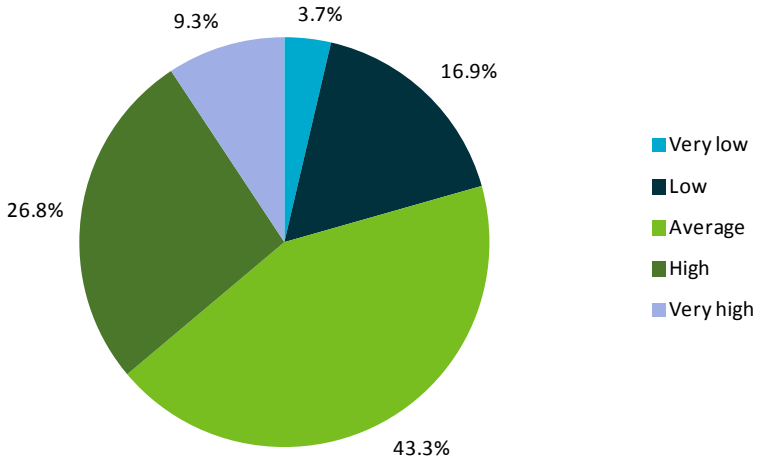


Figure 9 Perception of household energy bill

4.7 Accredited renewable energy (GreenPower)

Apart from those respondents who have already installed solar PV panels, 12% of respondents (n=301) indicated that they purchase accredited renewable energy (also known as 'GreenPower'). However, 224 out of the 301 respondents that sign to accredited renewable energy could not specify what percentage of their electricity bill was accredited renewable energy. Of those who could specify, 35 participants indicated that they paid for less than 20% of accredited renewable energy, and only 12 of them paid between 80 – 100% of their electricity bill. The breakdown of respondents with accredited renewable energy is presented in Table 14 below.

Table 3 Number subscribing to Green Power

PERCENT OF ACCREDITED RENEWABLE ENERGY ('GreenPower')	FREQUENCY	PERCENT OF FULL SAMPLE
Less than 20%	35	1.42%
20-40%	24	0.97%
40-60%	4	0.16%
60-80%	2	0.08%
80-100%	12	0.49%
Don't know	224	9.09%

5 Survey results

This section presents the key findings from the survey. Where relevant, a preliminary analysis of the robustness of measures used along with a comparison of results across relevant subsamples has been included. Detailed summary statistics of the responses provided to each question in the survey are provided in Appendix A.

5.1 Experience with and preferences for solar PV distributed energy

Across the full sample, 18.3% of householders reported having already installed small scale solar PV panels, while 11.9% reported having solar hot water systems (see Apx Table A.24). As part of the survey design, only about a third of these households were randomly matched and asked about the experience with these two technology options, as follows. Thirteen and a half percent (13.5%,n=110) of respondents of the 816 SHW subsample had already installed solar hot water in their homes (or 4.5% of total survey sample), while 19.7% (n=162) of the grid-connected solar PV subsample (N=823) indicated they had solar PV installed (or 6.6% of total survey sample). When questioned, the main motivation for their decision to install either technology was to save money on their power bills, as shown in Figure 10 below.

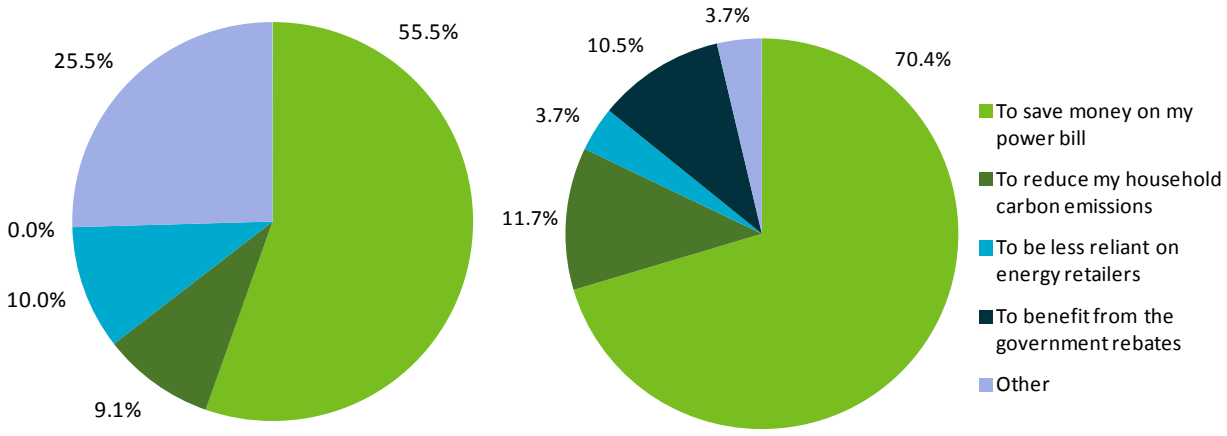


Figure 10 Motivation for distributed energy systems by households already using SHW (left) and SPV (right)

Among respondents who had not installed any distributed technologies, the composite score for acceptance (whether it sounds like a good idea, is feasible and suitable to have at home, and has the support of family and peers) shows that householders are on average supportive towards solar PV technologies. Note the acceptance score or *support* towards distributed solar energy is defined as scores significantly above the neutral scale on a 5-point Likert scale, i.e. 3.5 or higher (where 1 represents 'strongly disagree' and 5 represents 'strongly agree'). By contrast, respondents were neutral to installing battery alone systems or investing in community PV systems (details are provided in Appendix A, Section A.3, Table A.5).The mean score for the individual acceptance measures is presented in Figure 11.

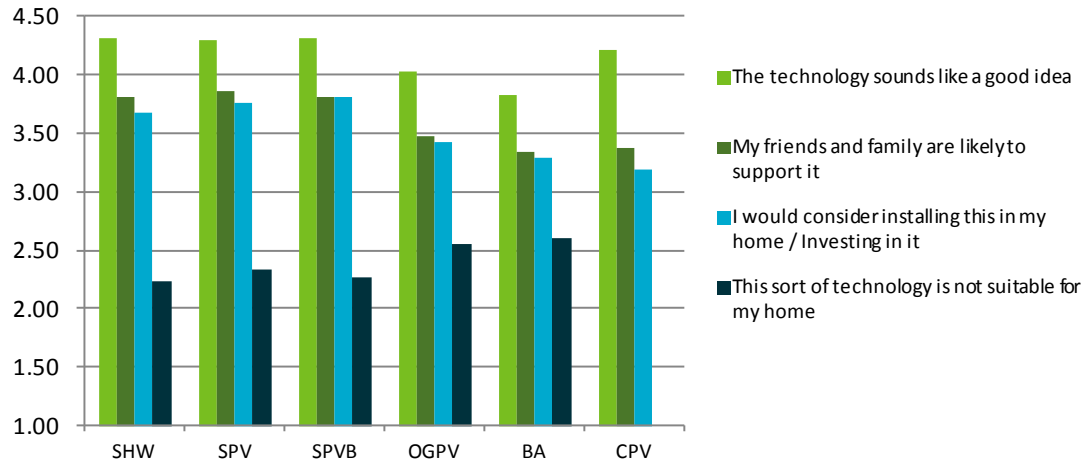


Figure 11 Acceptance towards distributed energy technologies (households not having these technologies at home)

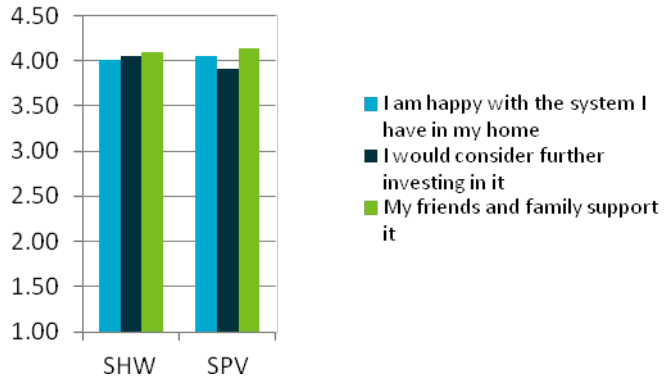


Figure 12 Acceptance towards distributed energy technologies (households having these technologies at home)

A comparison of the support composite scores between decision-makers and the other respondents in the sample is presented in Table 4 below. This table shows that, except for respondents in the SHW and SPVB subsamples, there is no statistical difference in the support score provided by respondents who are more or less involved in the decision-making process in energy matters (this is particularly relevant for the groups of respondents already using SHW or SPV in their households). In the subsamples of SHW and SPVB (in households not having the technology), decision-makers appear to score the technologies somewhat higher than the other respondents.

Table 4 Household decision makers and support for distributed energy market technologies

TECHNOLOGY OPTION		DECISION-MAKERS			NON-DECION MAKERS			FULL SAMPLE		
		N	Mean	SD	N	Mean	SD	N	Mean	SD
SHW	Current users	81	4.06	0.959	29	4.02	0.648	110	4.05	0.885
	Not having the technology*	489	3.94	0.793	215	3.78	0.814	704	3.89	0.802
SPV	Current users	132	4.06	0.844	30	3.91	0.963	162	4.03	0.866
	Not having the technology	443	3.94	0.884	218	3.82	0.821	661	3.90	0.865
SPVB	Not having the technology**	566	3.98	0.837	244	3.78	0.842	810	3.92	0.843
OGPV	Not having the technology	574	3.61	0.910	229	3.56	0.820	803	3.60	0.885
BA	Not having the technology	588	3.49	0.870	219	3.41	0.757	807	3.46	0.841
CPV	Not currently involved in CPV	577	3.61	0.855	220	3.54	0.858	797	3.59	0.856

Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'. Standard Deviation (SD).
***Statistically significant at p<0.001, **p<0.01, *p<0.05.

The composite score of acceptance or support for distributed energy technologies was further subjected to a two-way analysis of variance across age groups (18-39 years old, 40-59 years old, and 60 years or older) and gender (see Appendix A, Section A.3, Table A.7), as well as income groups (below $60,000, between $60,000 and $100,000, and above $100,000) (see Appendix A, Section A.3, Table A.8) to establish whether there were any significant differences across them. However none of the tests were significant which suggests support did not differ across any of these variables. Table 5 summarises support for distributed energy technologies by respondents' age category.

Table 5 Support for distributed energy market technologies across demographic groups

TECHNOLOGY OPTION		YOUNGER AGE GROUP			MIDDLE AGE GROUP			OLDER AGE GROUP			FULL SAMPLE		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
SHW	Current users	228	3.95	0.741	275	3.89	0.835	201	3.82	0.821	704	3.89	0.802
	Not having the technology	40	3.90	0.789	33	4.13	1.017	37	4.14	0.859	110	4.05	0.885
SPV	Current users	267	3.92	0.846	241	3.93	0.827	153	3.80	0.950	661	3.90	0.865
	Not having the technology	38	3.96	0.992	64	4.11	0.744	60	4.00	0.910	162	4.03	0.866
SPVB	Not having the technology	292	3.96	0.811	323	3.91	0.860	195	3.87	0.861	810	3.92	0.843
OGPV	Not having the technology	260	3.65	0.859	291	3.65	0.900	252	3.48	0.887	803	3.60	0.885
BA	Not having the technology	283	3.61	0.840	299	3.45	0.806	225	3.30	0.858	807	3.46	0.841
CPV	Not currently involved in CPV	309	3.73	0.829	296	3.48	0.882	192	3.53	0.831	797	3.59	0.856

Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'.
Standard Deviation (SD). ***Statistically significant at p<0.001

5.2 Property type and acceptance of distributed solar energy

The summary statistics of composite acceptance scores, according to the home property type and ownership, is presented in Table 6 and Table 7. Not surprisingly, respondents living in houses are more supportive of SHW (*t*-value=-4.075 p<0.001), SPV (*t*-value=-3.017 p<0.001), SPVB (*t*-value=-4.0231 p<0.001) when compared to households that are not living in houses. There were no statistically significant differences in support for OGPV, BA and CPV options in regard to housing type. However, home owners are more likely to support SPVB (*t*-value=-3.85 p<0.001), when compared to households that do not own their homes. Except for SPVB, there is no statistically significant difference in support in regard to home ownership[1].

[1] The sample size of the sub-groups having SHW and SPV by home ownership/type of house is too small to draw any meaningful comparisons.

Table 6 Support for distributed energy market technologies by home ownership

TECHNOLOGY OPTION		PROPERTY OWNER			NOT OWNER		
		N	Mean	SD	N	Mean	SD
SHW	Current users	91	4.08	0.917	19	3.88	0.705
	Not having the technology	476	3.91	0.803	228	3.86	0.801
SPV	Current users	151	4.01	0.882	11	4.39	0.512
	Not having the technology	424	3.93	0.864	237	3.84	0.867
SPVB	Not having the technology***	545	3.99	0.836	265	3.75	0.835
OGPV	Not having the technology	562	3.60	0.899	241	3.60	0.856
BA	Not having the technology	570	3.47	0.854	237	3.46	0.811
CPV	Currently not involved in CPV	542	3.56	0.843	255	3.65	0.881

Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'.
Standard Deviation (SD). ***Statistically significant at p<0.001

Table 7 Support for distributed energy market technologies by type of property

TECHNOLOGY OPTION		LIVING IN HOUSES			NOT LIVING IN HOUSES		
		N	Mean	SD	N	Mean	SD
SHW	Current users	105	4.06	0.894	5	3.73	0.641
	Not having the technology***	577	3.95	0.792	127	3.63	0.799
SPV	Current users	154	4.05	0.855	8	3.71	1.076
	Not having the technology***	519	3.95	0.846	142	3.70	0.909
SPVB	Not having the technology***	664	3.97	0.838	146	3.66	0.82
OGPV	Not having the technology	653	3.62	0.882	150	3.50	0.896
BA	Not having the technology	650	3.48	0.848	157	3.42	0.81
CPV	Currently not involved in CPV	637	3.59	0.827	160	3.61	0.967

Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'.
Standard Deviation (SD). Statistically significant at ***p<0.001

5.3 Knowledge and acceptance of distributed solar energy

As previously indicated, self assessed knowledge was tested through four statements about how easy it would be to explain concepts about distributed energy systems to peers (assessed on a 5-point Likert scale with 1 representing 'strongly disagree' and 5 representing 'strongly agree'). Objective knowledge was tested as a quiz with five statements about energy and the environment with only three response options allowed ('false', 'true', and 'don't know'). Respondents' overall scores showed that they felt confident in explaining solar energy concepts to peers (not so much about battery storage), but most respondents showed low levels of objective knowledge about energy issues in Australia (see Appendix A , Section A.2, , Table A.3 and Table A.4).

Table 8 compares the mean score for both self-assessed and objective knowledge across relevant demographic and socio-economic groups. Knowledge scores were subjected to a two-way analysis of variance across three age groups (18-39 years old, 40-59 years old and 60 years or older) and gender (males and females). The analysis was used to establish whether differences in knowledge scores across these groups are statistically significant.

In subjective knowledge scores, all effects are statistically significant at the 0.1% significance level. The effect of age is significant F (5, 2) = 22.65, $p < .001$[1], indicating that the subjective knowledge mean score is significantly higher for older groups than for younger groups. The effect of gender is also significant F (5, 1) = 190.55, $p < .001$, indicating that the subjective knowledge mean score is significantly higher for males than for females. However, the interaction effect of age groups and gender is found to be non-significant, F (5, 1) = 0.13.

In objective knowledge scores, all effects are statistically significant at the .001 significance level. Similar to the subjective knowledge scores, the effect of age is significant F (5, 2) = 17.15, $p < .001$, indicating that the objective knowledge mean score is significantly higher for older groups than for younger groups. The effect of gender is also significant F (5, 1) = 45.16, $p < .001$, indicating that the objective knowledge mean score is significantly higher for males than for females. The interaction effect of age groups and gender is non-significant, F (5, 1) = 2.39.

A test across three income groups (below $60,000; between $60,000 and $100,000; above $100,000), showed there was no evidence that there is a statistically significant difference of knowledge scores among groups. The analysis of variance shows that the effect of income for both subjective and objective knowledge scores is not significant, F (2,2082) = 1.21, and F (2,2082) = 2.79, respectively.

Table 8 Knowledge measures across demographic groups

		YOUNGER AGE GROUP			MIDDLE AGE GROUP			OLDER AGE GROUP			FULL SAMPLE		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Subjective knowledge	Female	497	3.13	0.913	482	3.22	0.930	342	3.43	0.955	1321	3.24	0.937
	Male	383	3.62	0.931	441	3.76	0.973	318	3.96	0.875	1142	3.77	0.941
Objective knowledge	Female	497	1.48	1.104	482	1.75	1.192	342	1.85	1.082	1321	1.68	1.141
	Male	383	1.89	1.198	441	1.93	1.262	318	2.22	1.125	1142	2.00	1.211

Subjective knowledge is measured in the Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'.
Objective knowledge is measured as the sum of correct answers obtained, ranging from 0 to 5. Standard Deviation (SD).

[1] The p-value is the minimum confidence level at which the hypothesis, that the mean value across groups is the same, can be rejected. A p-value of less than 0.001 means that there is a 99.9% chance that the mean values across the groups are different.

The Pearson's correlation statistics was used to investigate whether there is a linear relationship between knowledge and support towards distributed energy systems. The Pearson's correlation statistics are presented in Table 9 and show there is no significant relationship between objective knowledge and acceptance of distributed energy systems. However, people with higher levels of self-assessed knowledge in solar energy are more likely to express more support towards distributed energy systems, particularly, in the cases of solar hot water, solar PV panels, as well as community PV systems.

Table 9 Correlation between knowledge scores and support for distributed energy systems, by technology option

	SHW	SPV	SPVB	OGPV	BA	CPV
Objective knowledge	0.02	0.04	0.03	0.00	0.09*	0.07*
Subjective knowledge	0.17***	0.25***	0.31***	0.13***	0.06	0.26***
Sample size	**704**	**661**	**810**	**803**	**807**	**797**

Statistically significant at *p<0.05 ***p<0.001

5.4 Electricity bills and acceptance of distributed solar energy

The Pearson's correlation coefficients between perceived electricity bill costs and acceptance of distributed energy systems is presented Table 10 below. Results show that in households already using SPV systems, support for these systems are directly correlated with a self-assessment of relatively lower than average electricity bills (this correlation is statistically significant at the 0.1% confidence level). A positive but weak correlation is found for BA systems, implying that households with a perception of higher than average bills could be more supportive of these distributed systems.

Table 10 Correlation between perceived bill costs and support for distributed energy systems

	SHW		SPV		SPVB	OGPV	BA	CPV
	Current users	Not having the technology	Current users	Not having the technology	Not having the technology			
Pearson's correlation	-0.14	0.03	-0.21**	0.06	-0.03	0.05	0.10**	-0.02
Sample size	**110**	**704**	**162**	**661**	**810**	**803**	**807**	**797**

Statistically significant at **p<0.01

5.5 Attribute preferences for distributed solar energy systems

Groups of predefined combinations of four attributes were presented to respondents repeatedly (over nine sets). A normalised score between 1 and -1 was calculated as the weighted sum of the number of times that each attribute was most preferred minus the number of times it was least preferred.

In the full sample, cost savings are the most important feature perceived by respondents. The next most valued attributes included reliability and durability, meeting electricity needs and providing uninterrupted power, followed by benefits to the environment and reducing reliance of energy retailers. Whereas visual appeal, increased safety levels and ease to install and maintain were the attributes least valued by respondents.

The normalised scores are presented in Table 11 below. The scores did not show any statistically significant difference in the preference ranking across respondents of the different technologies. This suggests that the appraisal of technology attributes is mostly influenced by broader individual valuation preferences for distributed energy systems, as a whole.

Table 11 Normalised valuation of technology attributes

TECHNOLOGY ATTRIBUTES	MEAN	SD	PROPORTION OF CHOICES AS IMPORTANT	PROPORTION OF CHOICES AS LEAST IMPORTANT
Reduces electricity costs	0.69	0.37	32.3%	1.4%
Technology is reliable and durable	0.30	0.36	16.4%	2.9%
Meets my current electricity needs	0.17	0.33	14.7%	5.3%
Provides uninterrupted power	0.17	0.54	11.0%	5.5%
Benefits the environment	-0.07	0.56	9.6%	12.8%
Reduces reliance on energy retailers	-0.07	0.48	9.1%	12.3%
Easy to install and maintain	-0.21	0.39	4.0%	13.2%
Increased safety levels	-0.15	0.33	2.4%	8.9%
It has visual appeal	-0.84	0.29	0.5%	37.8%

Note: each feature was presented four times to participants except for 'Meets my current electricity needs' (five times) and 'Provides uninterrupted power' (three times).

The correlation between the normalised valuation score for each technology attribute and the composite support score for each technology option is presented in Table 12. This table shows that respondents valuing the benefits to the environment the most tend to be slightly more supportive of distributed energy systems (although this is a weak correlation, it holds across technology options – particularly for SHW, SPV and CPV). In addition, respondents with higher levels of support towards distributed energy systems do not generally value reliability (in terms of providing uninterrupted power) or visual appeal as key priorities (the correlation coefficients indicate these are weak negative effects, but are nevertheless consistent across technology options).

Table 12 Correlation between technologies' attributes and support for distributed energy systems

	SHW	SPV	SPVB	OGPV	BA	CPV
Benefits the environment	0.16***	0.16***	0.12***	0.11***	0.08*	0.22***
It has visual appeal	-0.16***	-0.24***	-0.08*	-0.19***	-0.09*	-0.15***
Meets my current electricity needs	-0.05	0.025	-0.04	0.00	0.04	-0.08*
Provides uninterrupted power	-0.10**	-0.15***	-0.16***	-0.09**	-0.06	-0.15***
Reduces reliance on energy retailers	0.03	0.11**	0.05	0.05	0.05	0.02
Increased safety levels	0.02	-0.02	-0.07*	0.05	0.00	0.06
Reduces electricity costs	0.04	0.02	0.01	0.03	0.02	-0.07
Easy to install and maintain	-0.06	-0.11**	0.00	-0.03	-0.03	-0.05
Technology is reliable and durable	-0.05	-0.01	0.03	-0.06	-0.07	-0.03
Sample size	**704**	**661**	**810**	**803**	**807**	**797**

Statistically significant at *p<0.05,**p<0.01***p<0.001

5.6 Payment preferences

Respondents expressed a preference to buy a solar PV system upfront and were indifferent to buying the distributed energy systems with finance or leasing them. Although, respondents appear to be neutral to ESCOs' packages (in terms of their perceptions of being a good idea, having support from friends and family and potential interest to signing to it), this option is ranked by most as the least preferred among the four payment options (refer to Appendix A, Section A.4, Table A.15). In addition, although 58.6% of respondents in the sample would be willing to sign a contract with ESCOs to obtain savings in electricity bills, there are 25.9% of them that, despite other potential benefits explained, would not consider doing it at all (refer to Appendix A, Section A.4, Table A.14).

About half of respondents would be willing to let ESCOs turn on/off pool pumps and dishwashers, followed by electric heater and air-conditioners (with 39.1% and 37.4% respectively). The summary of results of the ranking exercise is presented in Figure 12 below.

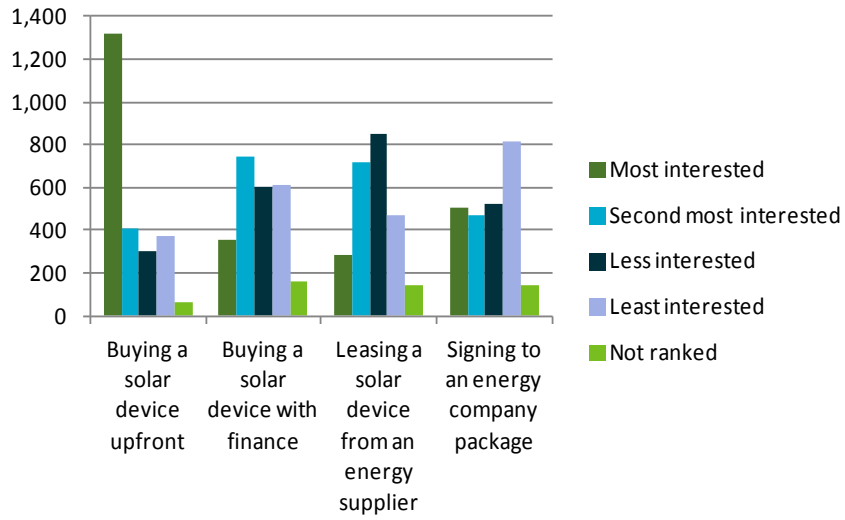


Figure 13 Ranking of finance options to install or replace a solar device at home

The payment options were further subjected to a two-way analysis of variance across age groups (18-39 years old, 40-59 years old, and 60 years or older) and gender to establish whether preferences for payment options differ significantly across these groups (see Table 13). The effect of age was statistically significant in the importance score for buying upfront, with F (2, 2457) = 7.97, $p < .001$, indicating that buying upfront is most preferred for respondents in older age groups than it is for younger respondents. This was expected, given that younger households may have more limited access to capital or prioritise other household expenses. The effect of gender F (1, 2457) = 0.01 was not significant, and the interaction effect of age groups and gender F (1, 2457) = 1.42 was also non-significant.

In the importance score for buying solar PV technologies with finance, only the interaction between age and gender was statistically significant F (2, 2457) = 3.22, $p < .05$. The effects of gender F (1, 2457) = 1.89 and age F (1, 2457) = 0.16 were not significant. This indicates that while the overall preference score for buying with finance is similar across gender and across the different age groups, there is statistical significant difference within each gender across age groups, i.e. older males are less likely to prefer buying with finance when compared to younger and middle age males.

In the importance score for leasing, the effect of age is statistically significant F (2, 2457) = 43.40, $p < .001$, indicating that the leasing option is mostly preferred by respondents in younger groups than in older groups. By contrast, for the ESCOs option, the effect of age is statistically significant F (2, 2457) = 21.93, $p < .001$, indicating that signing to an ESCOs' package is mostly preferred by respondents in older age groups than in younger age groups. The effect of gender and the interaction effect of age groups and gender are not significant in either the leasing or ESCOs options.

Table 13 Preferred payment options by age groups and gender

FINANCE OPTION		YOUNGER AGE GROUP			MIDDLE AGE GROUP			OLDER AGE GROUP			FULL SAMPLE		
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Buying upfront	Female	497	2.00	1.192	482	1.80	1.137	342	1.68	1.123	1321	1.85	1.161
	Male	383	1.90	1.158	441	1.87	1.163	318	1.73	1.146	1142	1.84	1.157
Buying with finance	Female	497	2.47	1.079	482	2.48	1.143	342	2.35	1.441	1321	2.44	1.205
	Male	383	2.43	1.087	441	2.47	1.120	318	2.60	1.339	1142	2.49	1.176
Leasing system	Female	497	2.71	1.056	482	2.49	1.085	342	2.11	1.240	1321	2.47	1.141
	Male	383	2.74	0.963	441	2.51	1.068	318	2.29	1.109	1142	2.52	1.060
Contracts with ESCOs	Female	497	2.60	1.181	482	2.67	1.290	342	2.20	1.437	1321	2.52	1.304
	Male	383	2.70	1.221	441	2.66	1.291	318	2.35	1.322	1142	2.59	1.285

Ranking score with 1 representing 'most interested' and 4 representing 'least interested'. Standard Deviation (SD).

Table 14 presents preferences for the payment options across income groups. A one-way analysis of variance across three income groups (below $60,000, between $60,000 and $100,000, and above $100,000) shows that the effect of income for both buying upfront F (2,2082) = 0.04 and buying with finance (F (2,2082) = 0.43) was not statistically significant. This means that preferences for those options are similar across the various income groups. However, the effect of income is significant for both leasing F (2,2082) = 12.42, p <0.001 and ESCOs options F (2,2082) = 13.59, p <0.001 demonstrating that the preference for those options does vary with respondents' income. That is those with incomes below $60,000 give greater preference to leasing and entering into contracts with energy services through ESCOs when compared with higher income groups.

Table 14 Preferred payment options by income groups

	LOW INCOME GROUP			MIDDLE INCOME GROUP			HIGH INCOME GROUP			FULL SAMPLE		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Buying upfront	886	1.87	1.203	578	1.85	1.154	621	1.87	1.125	2085	1.87	1.166
Buying with finance	886	2.44	1.249	578	2.43	1.161	621	2.49	1.092	2085	2.45	1.179
Leasing system	886	2.37	1.148	578	2.58	1.092	621	2.63	1.003	2085	2.51	1.097
Contracts with ESCOs	886	2.40	1.349	578	2.63	1.238	621	2.74	1.229	2085	2.56	1.292

Ranking score with 1 representing 'most interested' and 4 representing 'least interested'. Standard Deviation (SD).

5.6.1 PREFERRED FEATURES OF PAYMENT OPTIONS

Preferred features of payment options based on the mean values (see Appendix A, Section A.4, Table A.16) include cost savings (first, immediate and, then, in the long-term), and being able to afford the technology. The least important feature is allowing the energy company to manage households' electricity usage. All other features are valued at similar levels, i.e. not requiring a fixed-term contract, allowing to own solar/battery systems, not requiring an upfront t payment, having a positive impact on property value or resale, allowing to pay solar/battery systems through monthly instalments and having the energy company be responsible for the solar/battery systems maintenance and repair works – among these features, the least important to householders is being able to pay for solar/battery systems through monthly instalments.

5.7 Beliefs, values and attitudes

As previously mentioned in the methodology section, a single composite score can be calculated to reflect the strength of respondents' values, beliefs and attitudes. The survey conducted in this study included three measures from the VBN Theory, namely awareness of consequences (AC), ascription of responsibility (AR), and personal norms (PN). These three psychological measures have been successful in explaining judgements about energy policies and the household energy use. Table 15 reports the correlation between respondents' AC, AR and PN values and their support across distributed energy technology options. The results show that values, beliefs and norms in relation to awareness and perceived responsibility for problems resulting from energy use are moderately correlated with support for distributed energy, suggesting that such measures can contribute to predicting support for distributed energy technologies. For instance, respondents, who feel responsible for energy problems, have stronger personal norms and are generally more supportive towards distributed energy technologies.

Table 15 Correlation between values, beliefs, norms and technology acceptance

	SHW	SPV	SPVB	OGPV	BA	CPV
VBN_AC	0.34***	0.35***	0.35***	0.19***	0.22***	0.38***
VBN_AR	0.26***	0.28***	0.23***	0.15***	0.23***	0.28***
VBN_PN	0.29***	0.31***	0.26***	0.17***	0.22***	0.35***
Sample size	**704**	**661**	**810**	**803**	**807**	**797**

Statistically significant at ***p<0.001

5.8 Trusted sources and preferred means of information

Across the full sample, respondents trust CSIRO, consumer organisations, scientists or engineers and experts in solar technology the most to provide honest information about energy efficiency and the use of solar energy in the household. The sources least trusted include the media and electricity and gas companies (this is consistent across technology options and householders – refer to Figure 13 and Table 16 below.

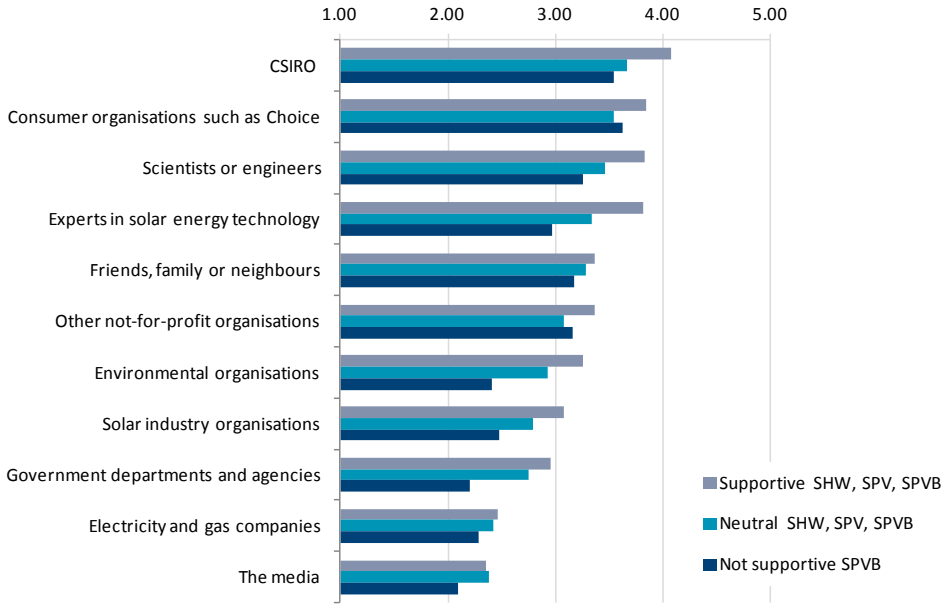


Figure 14 Trust for sources of information (sorted by most to least trusted)
Note: Likert scale with 1 representing 'strongly disagree' and 5 'strongly agree'

Table 16 Correlation between trust for sources of information and support for distributed energy systems

	SHW	SPV	SPVB	OGPV	BA	CPV
Environmental organisations	0.26 ***	0.29 ***	0.22 ***	0.15 ***	0.19 ***	0.26 ***
Consumer organisations	0.17 ***	0.15 ***	0.16 ***	-0.01	0.11**	0.13***
Other NGOs	0.22***	0.19***	0.15***	0.10**	0.21***	0.20***
Scientists or engineers	0.22***	0.27***	0.25***	0.09*	0.23***	0.30***
CSIRO	0.19***	0.33***	0.26***	0.13***	0.21***	0.30***
Experts in solar technology	0.266***	0.319***	0.297***	0.195***	0.250***	0.329***
Government departments or agencies	0.09*	0.16***	0.21***	0.06	0.10**	0.18***
Solar industry organisations	0.23***	0.23***	0.18***	0.16***	0.16***	0.29***
Electricity and gas companies	0.01	0.04	0.03	0.03	0.02	0.05
The media	0.02	0.01	0.06	0.03	0.03	0.02
Friends, family or neighbours	0.08*	0.11**	0.06	0.09**	0.11**	0.07
Sample size	**704**	**661**	**810**	**803**	**807**	**797**

Statistically significant at *p<0.05, **p<0.01***p<0.001

In terms of preferred means of information, respondents expressed that they would like to have case studies showing advantages and disadvantages of investing in solar energy, online information through a solar industry website, a home energy expert visiting or the respondents would visit a house with solar energy in the city to find out more about solar PV technologies. Case studies obtained the highest score (3.7) in a 5-point Likert scale with 1 representing 'not at all' and 5 'very much' among all options (see Appendix A, Section A.5). The least preferred options to receive information are through phone calls from the energy supplier, the newspaper or magazine/TV advertising.

6 Key findings and discussion

6.1 Support of householders for solar distributed technologies

The results from the national survey present evidence about the current state of play in relation to Australian householders and their willingness to consider investing in a solar PV distributed energy market. Solar PV panels and solar hot water systems have been installed by approximately 20% and 10% of the households in the sample, respectively. In addition, a large proportion of energy and water efficient appliances currently used by households have also been installed over the last five years. Among households with solar hot water and solar PV systems installed (including solar PV connected to the grid, with and without batteries, and off-grid systems), there is a high level of satisfaction and current users express a willingness to further invest in these distributed technologies. The main motivation for householders' decision to install distributed energy technologies in their home is cost savings, followed by reducing their householders' greenhouse gas footprint.

Among householders that have not installed any sort of distributed energy systems to date, there is a positive perception and support towards most technology options. The acceptance levels, in terms of willingness to install or invest in these options, tend to range always from neutral to supportive (it is neutral for battery alone and community PV systems). The mean scores for acceptance of all solar distributed technologies for the respondents (SHW, SPV, SPVB and OGPV) indicate households are on average supportive of these systems.

Support for distributed energy technologies does not appear to differ significantly across age, gender or income groups. However, survey results indicate that those respondents living in houses exhibit higher levels of support for SHW, SPV and SPVB. This is perhaps not surprising as living in a house makes it somewhat easier to install solar PV distributed systems. In addition, respondents who are property owners are more supportive towards SPVB. Respondents' perception of their electricity bills is not correlated with support towards solar distributed energy, but appears to be significant in battery alone systems. The survey data show there is significant evidence of a positive correlation between respondents' support for solar distributed energy technologies and respondents' values, beliefs and norms, which encompass awareness of the impact of energy use and perceived responsibility for associated problems.

Households' decisions to install or invest in solar distributed energy systems are determined to a great extent by implicit tradeoffs across a set of technology and service attributes, which are valued differently by individuals. The survey data show that, in deciding to invest in a distributed solar PV technology, householders' value attributes in relation to cost savings, reliability and durability of the technology and meeting electricity needs as the most important attributes. On the other hand, increased safety, ease to install and visual appeal are valued the least important attributes. This ranking of attributes holds across all technology options under consideration. The data analysis presents further evidence that householders' that are more supportive of distributed energy technologies, value environmental benefits more highly than power supply reliability.

The preferred payment option for installing solar distributed technologies at home is purchasing the technologies upfront. Respondents are on average indifferent between purchasing with finance and leasing the technologies, while accessing packages through ESCOs is on average the least preferred option, partly explained by the fact that householders are less familiar with this option in the current market. Although householders in the sample are on average neutral to ESCOs services, i.e. neither agreeing nor disagreeing with these services, there appears to be a strong resistance by 26% of respondents, who would not sign up to a contract at all. However, some potential uptake is possible by 59% of the respondents, who would be willing to sign a contract with ESCOs on the basis of obtaining savings in their electricity bills. In terms of relevant effects of demographic and socio-economic groups, the data show that people in older age groups may prefer purchasing upfront or signing to a ESCOs' contract, while people in younger groups expressed

higher preference for leasing technologies. Low-income groups are more likely to support leasing or ESCOs' contract options.

The current contribution of households in the solar distributed energy market is increasing. Overall, the survey results indicate that there is generally support for householders for participating in the distributed energy market, particularly through installing SHW, SPV and SPVB, and most would consider installing these systems through the upfront purchase of the technology. Cost savings in electricity bills is the main motivation for householders to consider installing these distributed energy systems (along with signing to ESCOs' packages). However, householders that are more supportive of distributed energy technologies value environmental benefits more highly than power reliability.

In terms of informing potential future adopters of distributed energy systems, practical information is more likely to be engaging through case studies on investing in solar energy, solar industry websites, visits to houses with solar energy or home energy experts visiting their home. Trusted information sources on this topic include CSIRO and consumer organisations, along with engineers, scientists and relevant experts.

6.2 Limitations of the analysis

Survey responses are based on respondents' own understanding of distributed energy technology and service options described in the questionnaire. Preferences towards *emerging* technologies and services are best appraised when end-users can actually experience how new systems work, e.g. seeing peers who already installed PV solar systems at their homes or who have signed to energy services provided by ESCOs. Over time, it is expected that the general population will become more familiar with distributed energy technologies and services as they are adopted in the community, which in time may change their relative preferences.

Although our sample contains about 71% of decision-makers in energy matters in the household, the elicitation of preferences for installing solar PV technologies through the survey does not necessarily translate into investment decisions to be taken at the household level. Nevertheless, it is reasonable to expect that the proportion of households reporting higher levels of acceptance of solar PV technologies would have higher propensity to undertake investment decisions or engage in additional energy services associated with the solar distributed energy market.

The demographic compositions across the subsamples for technology options are slightly different. Our analyses therefore included cross checks of mean comparison tests and correlations by technology options, as well as age, gender and income groups. While the survey was designed to have a representative sample of the Australian population and to ensure potential bias are limited (in setting realistic and relevant questions around specific technology options), the present analysis cannot capture the impact of survey timing and other potential unanticipated events, e.g. political announcements, that may have possibly affected the responses of some survey participants.

6.3 Areas for further research

Areas for further analysis include analysing the extent to which hardship issues have been faced across householders and how these are correlated with preferences for distributed energy, exploring the impact of the role of the VBN Theory in explaining householders' support for distributed energy technologies, modelling the decision to install or invest in solar distributed energy technologies as a function of key determinants. It would be also relevant to understand whether adopting energy conservation measures and installing solar PV distributed energy systems are perceived by households as a complementary or as a substitution measure for potential cost savings.

7 Glossary

ANOVA (analysis of variance) simultaneously compares the means of several groups.

Cronbach's alpha is a coefficient of reliability (or consistency) that measures how closely related a set of items are as a group. A value of alpha above 0.70 is often used as evidence that the items measure an underlying construct.

Degrees of freedom (df) are the values that are free to vary when calculating a statistic.

F value is the score obtained when you perform the F-statistic. In this report we applied the ANOVA F-statistic which uses information about the variances of each population (within) and grouping of populations (between) to determine if variability between and within each populations are significantly different.

Mean is the sum of all observed scores, divided by the total number of observations.

ns means that the statistic is not significant ($p>0.05$).

Paired sample *t*-tests compares two sets of related scores and tests if there is a statistically significant difference between the means of these two observations.

Pearson's Correlation is the standardised covariance between two variables. It measures the strength of the linear relationship between these two variables independently of the scales used to measure them.

P- value is the probability of the test statistic.

Standard deviation (SD) is the positive square root of the variance. Variance is an average of the squared deviations; that is, it approximates the average of the squared distances from the mean.

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Appendix A Summary statistics

A.1 DEMOGRAPHICS

Apx Table A.1 Sample composition by place of residence and gender

PLACE OF RESIDENCE	FULL SAMPLE			SOLAR HOT WATER			SOLAR PV			SOLAR PV & BATTERY			BATTERY ALONE			OFFGRID PV			COMMUNITY PV		
	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total
NSW	56%	44%	767	58%	42%	231	62%	38%	265	50%	50%	242	55%	45%	270	52%	48%	260	58%	42%	266
Sydney	54%	46%	559	56%	44%	165	61%	39%	201	49%	51%	173	52%	48%	203	51%	49%	184	55%	45%	192
Rest NSW	60%	40%	208	62%	38%	66	64%	36%	64	54%	46%	69	64%	36%	67	54%	46%	76	64%	36%	74
VIC	55%	45%	653	53%	47%	224	53%	47%	230	62%	38%	206	56%	44%	207	50%	50%	220	53%	47%	219
Melbourne	55%	45%	514	55%	45%	177	57%	43%	180	62%	38%	165	55%	45%	158	49%	51%	169	53%	47%	179
Rest VIC	53%	47%	139	47%	53%	47	42%	58%	50	59%	41%	41	59%	41%	49	55%	45%	51	55%	45%	40
QLD	49%	51%	486	44%	56%	171	44%	56%	148	60%	40%	152	55%	45%	164	43%	57%	166	51%	49%	171
Brisbane	49%	51%	277	44%	56%	94	44%	56%	85	64%	36%	86	55%	45%	93	40%	60%	96	48%	52%	100
Rest QLD	50%	50%	209	44%	56%	77	44%	56%	63	55%	45%	66	55%	45%	71	49%	51%	70	55%	45%	71
SA	47%	53%	186	58%	42%	53	50%	50%	70	44%	56%	57	42%	58%	74	38%	62%	58	53%	47%	60
Adelaide	39%	61%	150	46%	54%	39	40%	60%	55	40%	60%	48	36%	64%	61	30%	70%	50	43%	57%	47
Rest SA	83%	17%	36	93%	7%	14	87%	13%	15	67%	33%	9	69%	31%	13	88%	13%	8	92%	8%	13
WA	56%	44%	276	54%	46%	112	55%	45%	78	54%	46%	139	53%	47%	72	54%	46%	80	68%	32%	71
Perth	53%	47%	216	52%	48%	92	51%	49%	61	54%	46%	112	52%	48%	58	46%	54%	59	62%	38%	50
Rest WA	67%	33%	60	65%	35%	20	71%	29%	17	52%	48%	27	57%	43%	14	76%	24%	21	81%	19%	21
ACT	40%	60%	30	44%	56%	9	63%	38%	8	22%	78%	9	67%	33%	9	22%	78%	9	31%	69%	16
NT	58%	42%	12	33%	67%	6	83%	17%	6	50%	50%	4	100%	0%	1	67%	33%	3	50%	50%	4
TAS	68%	32%	53	70%	30%	10	72%	28%	18	69%	31%	13	68%	32%	22	61%	39%	23	70%	30%	20
TOTAL	54%	46%	2463	53%	47%	816	55%	45%	823	55%	45%	822	54%	46%	819	49%	51%	819	55%	45%	827

Apx Table A.2 Age profile of respondents for the national sample and across technology options

	FULL SAMPLE			SOLAR HOT WATER			SOLAR PV			SOLAR PV & BATTERY			BATTERY ALONE			OFFGRID PV			COMMUNITY PV		
AGE PROFILE	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total	%Female	%Male	Total
18-24	63%	37%	206	66%	34%	65	60%	40%	89	68%	32%	72	52%	48%	48	59%	41%	64	68%	32%	74
25-29	56%	44%	210	49%	51%	76	59%	41%	69	62%	38%	65	66%	34%	58	48%	52%	73	54%	46%	79
30-34	54%	46%	227	64%	36%	67	49%	51%	77	57%	43%	70	56%	44%	82	43%	57%	74	56%	44%	84
35-39	54%	46%	237	62%	38%	60	56%	44%	70	53%	47%	92	56%	44%	80	45%	55%	82	54%	46%	90
40-44	52%	48%	248	48%	52%	89	54%	46%	84	46%	54%	82	57%	43%	79	53%	47%	83	54%	46%	79
45-49	55%	45%	233	61%	39%	85	58%	42%	67	53%	47%	85	53%	47%	79	57%	43%	77	49%	51%	73
50-54	51%	49%	235	46%	54%	69	55%	45%	87	51%	49%	82	42%	58%	74	51%	49%	75	59%	41%	83
55-59	50%	50%	207	49%	51%	67	48%	52%	67	52%	48%	77	52%	48%	66	43%	57%	65	57%	43%	72
60-64	51%	49%	200	44%	56%	66	56%	44%	66	60%	40%	72	52%	48%	73	37%	63%	65	57%	43%	58
65-69	55%	45%	277	50%	50%	108	55%	45%	96	55%	45%	65	60%	40%	113	53%	47%	96	53%	47%	76
70-74	50%	50%	136	49%	51%	47	47%	53%	38	58%	42%	43	53%	47%	47	43%	57%	53	50%	50%	44
75+	45%	55%	47	41%	59%	17	69%	31%	13	35%	65%	17	45%	55%	20	50%	50%	12	33%	67%	15
TOTAL	**54%**	**46%**	**2463**	**53%**	**47%**	**816**	**55%**	**45%**	**823**	**55%**	**45%**	**822**	**54%**	**46%**	**819**	**49%**	**51%**	**819**	**55%**	**45%**	**827**

A.2 KNOWLEDGE MEASURES

Apx Table A.3 Self-assessed knowledge

Q1 Please tell us to what extent you agree or disagree that: I could easily explain to a friend...	Mean	SD
...what solar energy is about	3.88	1.00
...what a solar water heater is	3.76	1.08
...what solar power or photovoltaic (PV) panels are	3.33	1.24
...what a battery storage system is	2.97	1.30

Where SD=standard deviation

Apx Table A.4 Objective knowledge

Q2. Please tell us whether the following questions are true, false or you don't know	Frequency	Percentage
Households in Australia are mostly responsible for electricity peak demand		
TRUE (CORRECT)	**1208**	**49.05%**
FALSE	619	25.13%
Don't know	636	25.82%
Most renewable energy in Australia comes from solar energy		
TRUE	1087	44.13%
FALSE (CORRECT)	**558**	**22.66%**
Don't know	818	33.21%
Most solar energy in Australia is used for residential water heating		
TRUE (CORRECT)	**986**	**40.03%**
FALSE	641	26.03%
Don't know	836	33.94%
Transport is the largest contributor to greenhouse gas emissions generated by households in Australia		
TRUE	970	39.38%
FALSE (CORRECT)	**642**	**26.07%**
Don't know	851	34.55%
The largest cost of providing electricity to households comes from building and maintaining the electricity poles and wires		
TRUE (CORRECT)	**1103**	**44.78%**
FALSE	487	19.77%
Don't know	873	35.44%

A.3 WILLINGNESS TO USE TECHNOLOGY OPTIONS

Apx Table A.5 Experience with the technology options and willingness to install/invest in them

Q3-Q49	SOLAR HOT WATER			SOLAR PV			SOLAR PV & BATTERY			OFFGRID PV			BATTERY ALONE			COMMUNITY PV		
If previously installed/invested in this technology	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
I am happy with the solar hot water/solar PV/battery storage	110	4.01	1.19	162	4.06	1.16	12	3.75	1.29	4	4.00	0.82	12	3.08	1.00	1	4	0
I would consider further investing in solar hot water/solar	110	4.05	1.02	162	3.91	1.11	12	4.00	1.04	4	4.25	0.96	12	3.08	1.16	1	5	0
My friends and family support it	110	4.09	0.99	162	4.14	0.97	12	4.00	0.85	4	4.25	0.96	12	2.83	1.11	1	5	0
Willing to invest in PV owned by a commercial business																1	5	0
Willing to invest in PV owned by a not-for-profit business																1	5	0
Main reason installed	N	%		N	%		N	%		N	%		N	%				
To save money on my power bill/To make money	61	55.45%		114	70.37%		6	50.00%		0	0.0%		6	50%		0	0	
To reduce my household carbon emissions	10	9.09%		19	11.73%		1	8.33%		0	0.0%		0	0%		0	0	
To be less reliant on energy retailers	11	10.00%		6	3.70%		0	0.00%		0	0.0%		1	8.33%				
To benefit from the government rebates				17	10.49%		2	16.67%										
To avoid loss of energy during power outages							1	8.33%		0	0.0%		1	8.33%				
Lack of access from mains power										4	100.0%		0	0%				
To contribute to Australia's energy security																0	0	
Other	28	25.45%		6	3.70%		2	16.67%		0	0.0%		4	33.33%		1	100.0	
Total	**110**	**100.0**		**162.0**	**99.99**		**12**	**100.0**		**4**	**100.0**		**12**	**100.0**		**1**	**100.0**	
Have not previously installed/invested in this technology	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
The technology sounds like a good idea	704	4.32	0.81	661	4.30	0.94	810	4.31	0.91	803	4.03	1.01	807	3.82	1.03	797	4.21	0.93
My friends and family are likely to support it	704	3.82	0.92	661	3.86	0.98	810	3.82	0.97	803	3.48	1.01	807	3.35	0.96	797	3.38	1.03
I would consider installing it in my home/ investing in solar PV	704	3.67	1.19	661	3.76	1.20	810	3.81	1.21	803	3.43	1.25	807	3.28	1.19	797	3.18	1.17
This sort of technology is not suitable for my home	704	2.23	1.26	661	2.33	1.28	810	2.27	1.26	803	2.55	1.28	807	2.60	1.13			
Willing to invest in PV owned by a commercial business																797	2.91	1.23
Willing to invest in PV owned by a not-for-profit business																797	3.43	1.25

Where N= number of respondents; SD=standard deviation

Apx Table A.6 Features of technology options already installed by households

Q3-Q49	SOLAR HOT WATER		SOLAR PV		SOLAR PV & BATTERY		OFFGRID PV		BATTERY ALONE	
Size of solar PV system	N	%	N	%	N	%	N	%		
1.5 kWp or less			36	22.2%	1	8.33%	1	25.0%		
Between 1.51 and 2.99 kWp			29	17.9%	1	8.33%	0	0.0%		
Between 3 and 4.99 kWp			29	17.9%	0	0.00%	0	0.0%		
Above 5 kWp			4	2.5%	0	0.00%	0	0.0%		
Invalid response			7	4.3%	2	16.67%	1	25.0%		
Don't know			57	35.2%	8	66.67%	2	50.0%		
Total			**162**	**100.0%**	**12**	**100.0%**	**4**	**100.0%**		
Year Installed (solar hot	N	%	N	%	N	%	N	%		
2009-2013	53	48.18%	139	85.80%	10	83.33%	3	75		
2004-2008	20	18.18%	14	8.64%	0	0.00%	1	25		
2003 or earlier	28	25.45%	4	2.47%	1	8.33%	0	0		
Don't know	9	8.18%	5	3.09%	1	8.33%	0	0		
Total	**110**	**100.0%**	**162**	**100.00%**	**12**	**99.99**	**4**	**100**		
Size of battery system					N	%	N	%	N	%
10 kWh					1	8.33%	0	0.0%	0	0.0%
20 kWh					2	16.67%	1	25.0%	0	0.0%
Don't know					9	75.00%	3	75.0%	12	100.0%
Total					**12**	**100.0%**	**4**	**100.0%**	**12**	**100.0%**
Year Installed (battery system)					N	%	N	%	N	%
2009-2013					10	83.3%	3	75.0%	3	25.0%
2004-2008					1	8.3%	1	25.0%	0	0.0%
2003 or earlier					0	0.0%	0	0.0%	2	16.7%
Don't know					1	8.3%	0	0.0%	7	58.3%
Total					**12**	**100.0%**	**4**	**100.0**	**12**	**100.0%**
Type of booster	N	%								
Electric booster	79	71.82%								
Gas booster	16	14.55%								
Don’t know	12	10.91%								
Don't have a booster	3	2.73%								
Total	**110**	**100.0%**								

Q26. If installing a PV system, on what basis would you be willing to pay to have a battery storage included with it?	**N**	**%**
If there were financial incentives in place	267	33.0
To store power for me to trade it or use it at times when power is more expensive	229	28.3
To make me less reliant on the grid after daylight hours	161	19.9
To provide energy to my home during power outages	87	10.7
Not interested at all	66	8.2
Total	**810**	**100.0**

Apx Table A.7 Support for distributed energy market technologies across gender and age

TECHNOLOGY OPTION			YOUNGER AGE GROUP			MIDDLE AGE GROUP			OLDER AGE GROUP			FULL SAMPLE	
			N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
SHW	Current users	Female	24	3.93	0.729	17	4.06	1.113	18	4.26	0.882	59	4.07	0.894
		Male	16	3.85	0.894	16	4.21	0.934	19	4.02	0.842	51	4.03	0.882
	Not having the technology	Female	136	3.95	0.715	142	3.93	0.817	95	3.83	0.808	373	3.91	0.778
		Male	92	3.95	0.783	133	3.86	0.856	106	3.82	0.837	331	3.87	0.829
SPV	Current users	Female	17	4.06	1.197	32	4.14	0.708	30	3.79	0.996	79	3.99	0.942
		Male	21	3.89	0.812	32	4.08	0.790	30	4.21	0.776	83	4.08	0.791
	Not having the technology	Female	154	3.86	0.838	132	3.91	0.829	87	3.70	0.930	373	3.84	0.858
		Male	113	4.00	0.856	109	3.96	0.828	66	3.93	0.968	288	3.97	0.870
SPVB	Not having the technology	Female	175	3.89	0.788	163	3.84	0.880	108	3.89	0.768	446	3.87	0.817
		Male	117	4.06	0.837	160	3.98	0.836	87	3.84	0.968	364	3.97	0.871
OGPV	Not having the technology	Female	152	3.61	0.851	148	3.58	0.869	139	3.47	0.888	439	3.55	0.869
		Male	108	3.71	0.871	143	3.72	0.929	113	3.49	0.890	364	3.65	0.904
BA	Not having the technology	Female	136	3.50	0.836	154	3.45	0.807	103	3.32	0.837	393	3.43	0.826
		Male	147	3.71	0.834	145	3.45	0.808	122	3.28	0.878	414	3.49	0.854
CPV	Not currently involved in CPV	Female	179	3.63	0.864	164	3.38	0.821	100	3.56	0.790	443	3.52	0.838
		Male	130	3.87	0.760	132	3.61	0.940	92	3.51	0.876	354	3.68	0.872

Where N= number of respondents and SD= standard deviation
Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'

Apx Table A.8 Support for distributed energy market technologies by income groups

TECHNOLOGY OPTION		LOW INCOME GROUP			MIDDLE INCOME GROUP			HIGH INCOME GROUP			FULL SAMPLE	
		N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
SHW	Current users	30	4.30	0.513	20	4.28	0.565	29	4.48	0.459	79	4.36	0.510
	Not having the technology	247	3.86	0.816	192	3.95	0.769	167	3.95	0.778	606	3.91	0.791
SPV	Current users	65	4.16	0.784	38	3.98	0.873	35	3.97	0.834	138	4.06	0.821
	Not having the technology	240	3.78	0.893	134	4.04	0.824	183	3.99	0.865	557	3.91	0.873
SPVE	Not having the technology	282	3.81	0.840	197	3.94	0.891	202	4.00	0.844	681	3.91	0.860
OGP'	Not having the technology	306	3.61	0.875	187	3.53	0.919	198	3.65	0.894	691	3.60	0.893
BA	Not having the technology	287	3.39	0.858	183	3.52	0.821	207	3.56	0.852	677	3.48	0.848
CPV	Currently not involved in CPV	281	3.56	0.847	186	3.62	0.876	205	3.57	0.898	672	3.58	0.870

Where N= number of respondents and SD= standard deviation
Likert scale with 1 representing 'strongly disagree', 3 'neutral' and 5 'strongly agree'

A.4 PAYMENT OPTIONS

Apx Table A.9 Decision maker on energy matters

Q50. Who would probably be the one to decide whether or not your household would participate in solar energy initiatives such as the options just described? (Please tick one only)	Frequency	Percentage
Yourself	**817**	**33.17%**
Your spouse/partner	241	9.78%
Your parent(s)	127	5.16%
Your housemate/flatmate	8	0.32%
Your landlord	302	12.26%
Yourself in consensus with others (such as partner, flatmate or parent)	**929**	**37.72%**
Other	39	1.58%
TOTAL Decision-makers in the sample (yourself + yourself in consensus with others)	**1746**	**70.89%**

Apx Table A.10 Normalised valuation of technology attributes

Q51. This question is designed to help us understand what is most important to you if you were to install a solar and/or battery system in your home.	Mean	SD
Reduces electricity costs	0.69	0.37
Meets my current electricity needs	0.17	0.33
Provides uninterrupted power	0.17	0.54
Technology is reliable and durable	0.30	0.36
Reduces reliance on energy retailers	-0.07	0.48
Benefits the environment	-0.07	0.56
Increased safety levels	-0.15	0.33
Easy to install and maintain	-0.21	0.39
It has visual appeal	-0.84	0.29

Where SD= standard deviation

Apx Table A.11 Preferences for Energy Service Providers (ESCOs)

Q52. How much do you agree with each of the following statements about signing to an energy service company package?	Mean	SD
The package sounds like a good idea	3.27	1.18
My friends and family are likely to support it	3.00	1.03
I would consider signing to an energy service company package	2.92	1.21
This sort of package is not suitable for my home	2.93	1.20

Where SD= standard deviation

Apx Table A.12 Motivations to sign a contract with ESCOs

Q53. On what basis would you be prepared to sign a contract with an Energy Service Company to give them permission to manage how electricity is used in your home? (Please tick main reason only)	Frequency	Percentage
To save money on my power bill	1443	58.59%
So I don't need to worry about how I use electricity at home	116	4.71%
To reduce the use of energy at peak demand	89	3.61%
To reduce my household carbon emissions	152	6.17%
Yes. Other reason.	25	1.02%
Not at all	638	25.90%

Apx Table A.13 Preferences for demand controlling across household appliances

Q54. Assuming you have the following appliances in your home, which ones would you be prepared to let an Energy Service Company turn on and off? (please tick all that apply)	Frequency	Percentage
Air-conditioner	683	37.42%
Refrigerator	163	8.93%
Electric water heating system	597	32.71%
Electric heater	714	39.12%
Clothes dryer	1126	61.7%
Pool pump	998	54.68%
Dishwasher	927	50.79%
Washing machine	715	39.18%
Deep freezer	243	13.32%
Other	84	4.6%

Apx Table A.14 Reasons for NOT signing a contract with ESCOs (most frequent themes)

Word	Count	Percentage	Example
use	185	29.0%	*would like to remain unrestricted on how i use electricity*
like	136	21.3%	*If I'm paying the bill, I want to use it when and how I like.*
want	135	21.2%	*I don't want people telling me how much electricity I can use.*
control	111	17.4%	*Loss of control & long term contract*
power	107	16.8%	*Giving permission to an energy service company to manage how elctricity is used in my house takes the power out of my hands to manage the usage myself.*
manage	75	11.8%	*I think I am able to manage my power levels well.*
company	71	11.1%	*We don't live in a Russian style socialist society ? There is no way I would hand over the control to some company , especially not on a ten year contract I would sooner go off grid all together than let that happen*
contract	71	11.1%	*I feel they have a lot of control on energy already. I would prefer to distance myself from them as much as possible. That is what i see as success, not being stuck in a 10 year contract with them.*
home	71	11.1%	*I like to be in control of my assets and use of all things in my home.*
usage	61	9.6%	*I want to control the energy usage of my house by my own.*
trust	60	9.4%	*I do not trust power companies now, let alone give them access to directly manage electricity usage at my house.*

Apx Table A.15 Preferences for financial arrangements

Q56. Consider you were about to install or replace a solar device in your home. There are four options for payment to invest in a solar PV system.	Mean	SD
Buying a solar device upfront	1.84	1.16
Buying a solar device with finance	2.46	1.19
Leasing a solar device from an energy supplier	2.49	1.10
Signing to an energy service company package	2.55	1.30

Where SD= standard deviation

Apx Table A.16 Preferences for detailed features of payment options

Q57. Please rank the following 10 statements about different payment options, from ranking from top to bottom, where your most preferred option is on top...	Mean	SD
Provides you with immediate costs savings	3.39	2.38
It is cheaper in the long-term	4.05	2.49
Allows you to afford the technology	4.53	2.56
Does not require a fixed term contract	4.98	2.68
Allows you to own the solar or battery system	5.11	3.08
Does not require an upfront payment	5.41	2.95
The energy company is responsible for all the solar and/or battery system maintenance and repairs	5.55	2.99
Have a positive impact on your property value and resale	5.59	2.83
Allows you to pay the solar and/or battery system through monthly instalments	5.85	2.78
Allows the energy company to manage your electricity usage	7.93	2.87

Where SD= standard deviation

A.5 BELIEFS, VALUES AND ATTITUDES

Apx Table A.17 Attitudes towards adoption of the technology

Q58. In this question we would like to know whether you agree or disagree with the statements below. We would like to know your opinion even if you do not plan to invest in solar energy at the moment.	Mean	SD
Installing a solar PV system will improve the value of my house	3.69	0.96
I may want to invest in a solar PV system even if I may move houses in the future	3.44	1.07
The payback period of investing in a solar PV system is currently too long	3.41	0.95
I would install a solar PV system because it reduces greenhouse gas emissions from my electricity consumption	3.52	1.09
I would invest in a solar PV system because solar energy is produced locally	3.43	1.03
I am concerned that the production of solar PV systems is not environmentally friendly	2.60	1.05
I believe investing in solar PV systems is the right thing to do	3.84	0.98
I am not happy with my current sources of energy and think I need to change	3.08	1.11
I am unable to control how energy efficient specific appliances are in the house I live in	2.69	1.14
I would invest in a solar PV system to be more self-sufficient/produce my own electricity	3.90	0.96
Investing in a solar PV system is not currently a high priority for me or my household	3.31	1.16
It is difficult to understand what the best solar options are for my household	3.26	1.10
I don't use enough hot water or electricity to warrant investing in a solar hot water or PV system	2.45	1.12
I would only install a solar system at home if there are sufficient incentives available (i.e. rebates or feed-in tariffs	3.79	1.05
I would only consider investing in solar options if the hot water system broke down or if renovating my home	2.86	1.18
Solar technology will improve over time and I should wait a few more years before investing	3.25	1.01

Where SD= standard deviation

Apx Table A.18 Concerns around future energy availability or affordability

Q59. How concerned, if at all, are you that in the next 10-20 years…	Mean	SD
…electricity and gas will become unaffordable for you?	3.81	1.13
...petrol will become unaffordable for you?	3.76	1.16
...there will be more frequent power outages?	3.52	1.15
...there will be a national petrol shortage?	3.51	1.17

Where SD= standard deviation

Apx Table A.19 Trusted information sources

Q60. To what extent do you trust each of the groups and organisations listed below to provide honest information about energy efficiency and the use of solar energy in the household?	Mean	SD
Environmental organisations	3.11	1.10
Consumer organisations such as Choice	3.76	0.94
Other not-for-profit organisations	3.26	0.93
Scientists or engineers	3.69	0.93
CSIRO	3.94	0.94
Experts in solar energy technology	3.63	0.95
Government departments and agencies	2.87	1.08
Solar industry organisations	2.97	0.96
Electricity and gas companies	2.42	1.03
The media	2.37	0.98
Friends, family or neighbours	3.31	0.97

Where SD= standard deviation

Apx Table A.20 Preferred means of information about solar PV

Q61. If you were considering investing in a solar and/or battery system in your home please indicate on a scale of 1 (not at all) to 5 (very much) how you would like to find out more about it.	Mean	SD
Through a home exhibition show	3.06	1.12
By having a home energy expert visiting my house	3.17	1.23
Through newspaper or magazine advertising	2.62	1.08
Through case studies that show the advantages and disadvantages of investing in solar energy	3.66	1.02
Through my energy supplier mail newsletter	2.74	1.12
Through my energy supplier website	3.01	1.11
Through the solar industry website	3.37	1.04
By receiving a phone call from energy supplier	2.02	1.06
By visiting a house that has solar energy in my city	3.26	1.15
By watching TV advertising	2.58	1.11

Where SD= standard deviation

Apx Table A.21 Values

Q62. Please indicate the extent to which you agree or disagree with each of the statements below.	Mean	SD
The depletion of energy resources is a problem for society	3.98	1.01
I feel partly responsible for the depletion of energy resources	3.03	1.16
In principle, individuals on their own cannot contribute to the reduction of energy problems	2.61	1.22
I feel personally obliged to save as much energy as possible	3.70	1.05
I feel morally obliged to save energy, regardless of what others do	3.62	1.12
Not only the government and industry are responsible for high energy consumption levels, I am too	3.62	1.07
I feel morally obliged to use green instead of regular electricity	3.13	1.18
I feel obliged to bear the environment and nature in mind in my daily behaviour	3.53	1.11
Environmental quality will improve if we use less energy	3.65	1.07
Energy savings help reduce climate change	3.58	1.15
Climate change is a problem for society	3.76	1.22
I feel partly responsible for climate change	2.93	1.25

Where SD= standard deviation

Apx Table A.22 Attitudes towards environment versus economic priorities

Q63. Which of the following statements best describes your view?	Frequency	Percentage
In Australia, the highest priority should be given to protecting the environment, even if it increases the costs of living for my household.	271	11.01%
In Australia, both the environment and maintaining the costs of living to my household are important, but the environment should come first.	524	21.27%
Both, the environment and maintaining the costs of living, are equally important in Australia.	988	40.11%
In Australia, both maintaining the costs of living to my household and protecting the environment are important, but the costs of living to my household should come first.	680	27.61%
In Australia, the highest priority should be given to decreasing the costs of living to my household, even if it hurts the environment.	271	11.01%

A.6 HOUSEHOLD INFORMATION

Apx Table A.23 Household energy use

Q64. Which energy sources do you use in your household? (Tick as many as apply)	Frequency	Percentage
Electricity	2412	97.93%
Gas (mains)	1334	54.16%
Gas (bottled)	438	17.78%
Solar	585	23.75%
Others	41	1.66%
No access to mains power or gas	12	0.49%

Apx Table A.24 Household appliances

Q65. Which devices you have in your home and whether you have installed it in the last 5 years				
	Have this technology at home		Installed in the last 5 years	
	Frequency	Percentage	Frequency	Percentage
Water-saving showerhead(s)	1547	62.81%	1035	42.02%
Solar PV panels	451	18.31%	403	16.36%
Solar hot water system	294	11.94%	169	6.86%
Solar heater in the pool	93	3.78%	31	1.26%
Rainwater tank	661	26.84%	341	13.84%
Outdoor solar lighting	416	16.89%	276	11.21%
Low-energy light bulbs	2083	84.57%	1640	66.59%
Insulation	1632	66.26%	484	19.65%
Gas water heating system	1064	43.2%	285	11.57%
Energy efficient appliances	1472	59.76%	897	36.42%
Electric hot water system	991	40.24%	206	8.36%
Draught proofed windows/doors	521	21.15%	0	0%
Double glazing windows	157	6.37%	59	2.4%
Central heating	454	18.43%	112	4.55%
Ceiling fans	1076	43.69%	337	13.68%
Air-conditioner	1713	69.55%	672	27.28%

Note: Data presented in this table has minor discrepancies when compared to Apx Table A.28 due to inconsistencies in the responses from a small percentage of survey respondents. However, such discrepancies are minor and do not influence the overall analysis of the survey results.

Apx Table A.25 Ownership of air conditioners

Q65a. Please specify how many rooms in your home have air-conditioning											
	1	2	3	4	5	6	7	8	9	10	Total
Frequency	564	308	183	141	157	127	85	66	34	46	1711
Percentage	32.96	18.00	10.70	8.24	9.18	7.42	4.97	3.86	1.99	2.69	100.00

Apx Table A.26 Bill frequency

Q66. How often do you pay your electricity bill?	Frequency	Percentage
Fortnightly	135	5.48%
Monthly	327	13.28%
Quarterly	1845	74.91%
Half-yearly	4	0.16%
Annually	2	0.08%
Other (breakdown below)	148	6.01%
Weekly	9	0.37%
Bimonthly	87	3.53%
Solar credit	10	0.41%
Don't know	25	1.02%
Don't pay	12	0.49%
Off grid solar PV	1	0.04%
Other/missing	4	0.16%

Apx Table A.27 Electricity bill amount

Q67. How much was your last electricity bill ? (values were converted into monthly spend using Q66)	Frequency	Percentage
<$49	143	7.4%
$50 - 99	482	25.1%
$100 - 149	400	20.8%
$150 - 199	172	9.0%
$200 - 249	92	4.8%
$250 - 299	39	2.0%
$300 - 349	33	1.7%
$350 - 399	11	0.6%
$400 - 449	9	0.5%
$450 - 499	6	0.3%
$500 - 749	25	1.3%
$750 - 999	18	0.9%
$1000 - 1249	8	0.4%
$1250 - 1499	9	0.5%
>$1500	23	1.2%

Apx Table A.28 Credits in electricity bill due to solar PV

Q68. If you have a solar PV system installed in your home, did you receive any credits or payments from it in your last bill	Frequency	Percentage
Yes	385	15.63%
No	261	10.60%
I don't have a solar PV system in my home	1817	73.77%

Note: Data presented in this table has minor discrepancies when compared to Apx Table A.24 due to inconsistencies in the responses from a small percentage of survey respondents. However, such discrepancies are minor and do not influence the overall analysis of the survey results.

Apx Table A.29 Green power

Q69. Do you purchase accredited Green Power?	Frequency	Percentage
No	2162	87.78%
Yes	301	12.22%
Q69a. What percentage? (if yes)	**Frequency**	**Percentage**
Less than 20%	35	11.63%
20-40%	24	7.97%
40-60%	4	1.33%
60-80%	2	0.66%
80-100%	12	3.99%
Don't know	224	74.42%
Q69b. For approximately how long have you done this? (if yes)	**Frequency**	**Percentage**
Less than 1 year	67	22.18%
1 year	49	16.23%
2 years	55	18.21%
3 years	32	10.60%
4 years	22	7.28%
5 years	24	7.95%
More than 5 years	53	17.55%

Apx Table A.30 Self assessment of household bill

Q70. Please select the number that best reflects how you would rate your household energy bill	Frequency	Percentage
Very low	90	3.65%
Low	417	16.93%
Average	1066	43.28%
High	661	26.84%
Very high	229	9.30%

Apx Table A.31 Experiences with unexpected events

Q71. Have you experienced any of the following in the past 2 years	Frequency	Percentage
Natural disaster in your home town	253	10.27%
Power outage/disruption	1381	56.07%
Increases in electricity prices	2050	83.23%
Change in electricity provider	605	24.56%
None of these	205	8.32%

Apx Table A.32 Type of property

Q72. Which of the following best describes where you live	Frequency	Percentage	2011 Census (population aged 18 and over) Percentage
Separate house	175	72.88%	74.3%
Flat, unit, or apartment	436	17.70%	11.4%
Row or terrace house/townhouse	123	4.99%	8.4%
Semi-detached house	89	3.61%	
Other	20	0.81%	1.2%
Not stated/not applicable			4.7%

Apx Table A.33 Home ownership

Q73. Which of the following best describes the home in which you live	Frequency	Percentage	2011 Census (population aged 18 and over) Percentage
A rented apartment/house	623	25.29%	25.7%
An apartment/house with mortgage	850	34.51%	34.4%
An apartment/house owned outright	844	34.27%	29.4%
Public housing	61	2.48%	
Share households	48	1.95%	
Other	37	1.50%	0.7%
Not stated/Not applicable			9.8%

Apx Table A.34 Daytime spent at home

Q74. In a typical week, how many days would you or others in your household spend at home DURING DAYTIME for large periods of time (such as work from home/ pre-school children/elderly)	Frequency	Percentage
7 days per week	1089	44.21%
6 days per week	185	7.51%
5 days per week	265	10.76%
4 days per week	182	7.39%
3 days per week	248	10.07%
2 days per week	416	16.89%
1 day per week	78	3.17%

Apx Table A.35 Household type

Q75. Please tick one term from the list below that best describes your household			2011 Census (population aged 18 and over)
	Frequency	Percentage	Percentage
Single person household	335	13.6%	12.0%
Shared person household	288	11.69%	4.4%
Couple with no child/children	731	29.68%	25.1%
Couple with child/children	828	33.62%	36.1%
One parent with child/children	142	5.77%	8.8%
Other family (e.g. extended family household)	139	5.64%	4.5%
Other			4.6%
Not stated/not applicable			4.5%

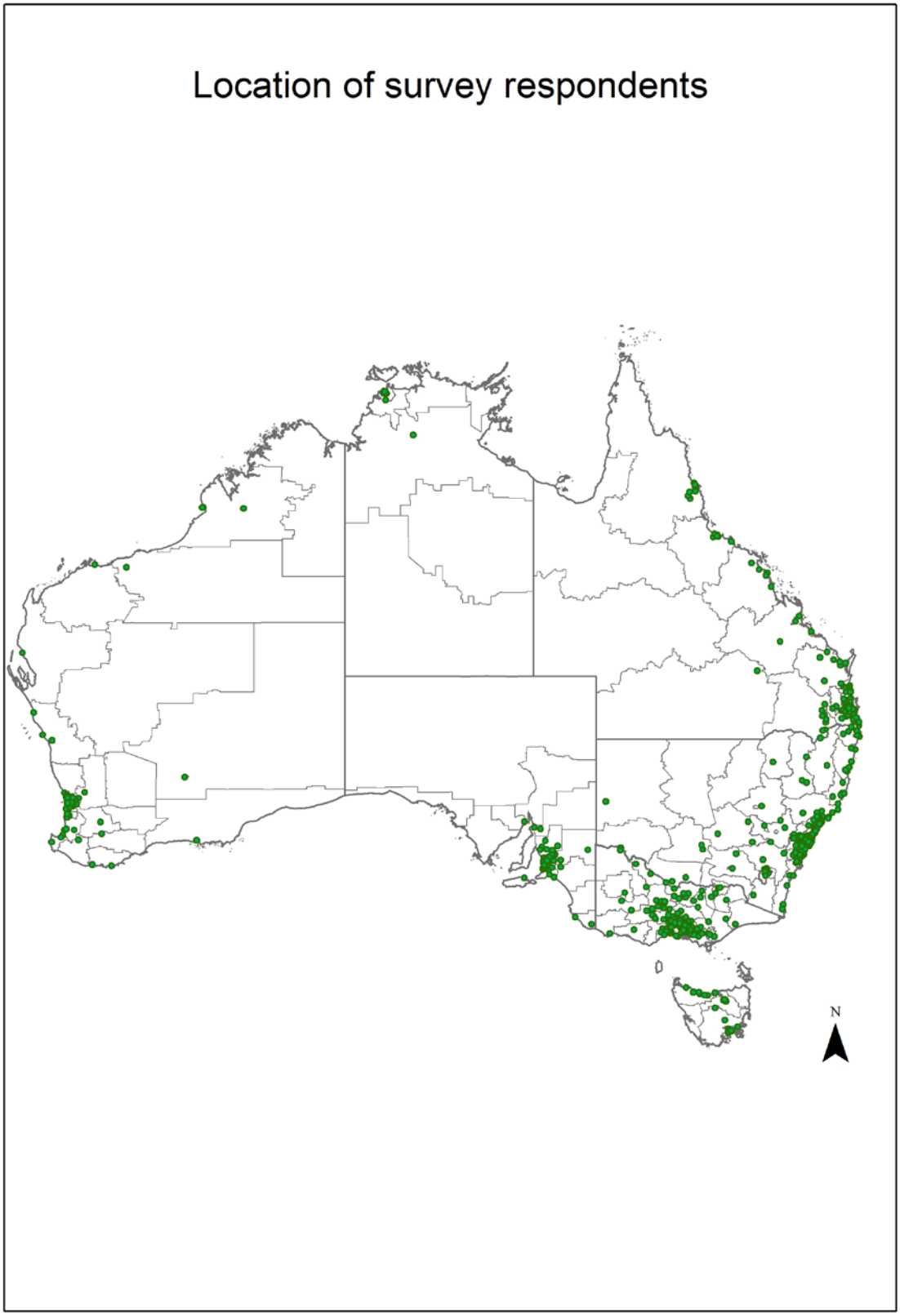
Apx Table A.36 Number of persons living at home

Q76. How many people (including yourself) live in your household										
	1	2	3	4	5	6	7	8	9	10 or more
Frequency	330	940	464	428	196	65	17	7	4	5
Percenatge	13.44%	38.27%	18.89%	17.43%	7.98%	2.65%	0.69%	0.29%	0.16%	0.20%

N=2546 (7 missing values)

A.7 DEMOGRAPHIC AND SOCIOECONOMIC INFORMATION

Apx Figure A.1 Respondents place of residence



Apx Table A.37 Respondents' age group

Q78. What is your age			2011 Census (population aged 18 and over)
	Frequency	Percentage	Percentage
18-24	206	8.36%	12.2%
25-29	210	8.53%	9.2%
30-34	227	9.22%	8.8%
35-39	237	9.62%	9.2%
40-44	248	10.07%	9.3%
45-49	233	9.46%	9.1%
50-54	235	9.54%	8.8%
55-59	207	8.4%	7.9%
60-64	200	8.12%	7.3%
65-69	277	11.25%	5.6%
70-74	136	5.52%	4.3%
75+	47	1.91%	8.4%

Apx Table A.38 Respondents' gender

Q79. What is your gender			2011 Census (population aged 18 and over)
	Frequency	Percentage	Percentage
Female	1321	53.63%	51.2%
Male	1142	46.37%	48.8%

Apx Table A.39 Respondents' level of education

Q80. Please tick the highest level of education you have completed		
	Frequency	Percentage
Some primary schooling	9	0.37%
Some secondary schooling	305	12.40%
Year 12 or equivalent	434	17.65%
Trade certificate/apprenticeship	342	13.91%
Diploma/advanced diploma	487	19.80%
Bachelor/honours degree	607	24.68%
Postgraduate degree	271	11.02%
Other	4	0.16%

N =2459 (4 missing values)

Apx Table A.40 Respondents' employment status

Q81. Please tick one term from the list below that best describes your employment status			2011 Census (population aged 18 and over)	
	Frequency	Percentage		Percentage
Employed full-time	788	32.03%	Employed full-time	38.3%
Employed part-time	330	13.41%	Employed part-time	17.4%
Self employed	197	8.01%		
Casual employment	114	4.63%		
Retired	474	19.27%	Not in the labour force	31.6%
Conducting unpaid work (carer/home/volunteer	141	5.73%		
Student	137	5.57%		
Not employed	156	6.34%		
Unable to work	109	4.43%		
Other	14	0.57%	Other	7.0%
			Not stated/not applicable	5.7%

N=2460 (3 missing values)

Apx Table A.41 Respondents' annual household income

Q82. What is your annual household's income, before tax			2011 Census (household income)	
	Frequency	Percentage		Percentage
Less than $20 000	171	6.94%	Less than $20 799	10.25%
$20 000 - $39 999	355	14.41%	$20 800 - $41 599	15.33%
$40 000 - $59 999	360	14.62%	$41 600 - $64 999	13.48%
$60 000 - $79 999	304	12.34%	$65 000 - $77 999	6.20%
$80 000 - $99 999	274	11.12%	$ 78 000 – 103 999	9.65%
$100 000 - $124 999	250	10.15%	$ 104 000 or more	22.16%
$125 000 - $149 999	175	7.11%		
$150 000 or more	196	7.96%		
Prefer not to say	378	15.35%	Not stated/Not applicable	22.93%

Apx Table A.42 Personal relationship with people in the solar PV industry

Q83. Do you or a close family/friend have work experience within the solar industry		
	Frequency	Percentage
Yes	157	6.37%
No	2306	93.63%

Appendix B Survey questionnaire

PROJECT TITLE: STAKEHOLDER INTEREST IN ACTIVE PARTICIPATION IN THE DISTRIBUTED ENERGY MARKET

(ONLINE SURVEY PAGE 1)

PARTICIPANT INFORMATION– ONLINE SURVEY

The purpose of this study is to gather your opinion about the use of a diverse range of solar and other energy systems. This research is being conducted by the CSIRO (Commonwealth Scientific Industrial and Research Organisation) under contract to the Australian Photovoltaic Association (APVA) and is funded by the Australian Solar Institute. CSIRO conducts social research on public understanding of energy technologies and APVA is interested on issues that are relevant to the uptake of solar power and, more specifically, to the development of the solar photovoltaic (PV) market in Australia.

Why this research is being conducted?

Attempts to reduce greenhouse gas emissions from electricity generation, as well as increased electricity prices over the last five years, has motivated households to invest in solar PV systems or solar hot water systems. This has led to a significant growth of this industry in the Australian market. Solar PV and related energy systems can be configured and delivered in a diverse range of formats. The information generated by this research will assist in establishing Australians' preferred options in regard to the configuration and delivery of solar PV and related energy systems.

What is involved?

You are invited to respond to an online survey about energy efficiency and a range of alternative models for generating electricity from solar and related energy systems. Responding to this questionnaire may take up to 25 minutes of your time.

Do I have to be part of this program?

Completion of the online survey is completely voluntary and you are free to withdraw at any time without prejudice or penalty. If you wish to withdraw from the study you may ask for your information to be removed from the study without penalty or explanation. We would like to encourage you to participate in the study as your participation will ensure that we understand your opinion about household energy efficiency as well as your preferred options in regard to the configuration and delivery of solar and related energy systems.

How will my responses be recorded, used and kept?

The completed online survey will only be seen by members of the research team. All your personal information will be de-identified meaning that your responses will be assigned an identity code and your personal information will be detached from your survey responses. All data collected will be kept in locked storage for up to five years. Information will be used to prepare research reports and academic publications. CSIRO has been conducting other projects like this around Australia to learn more about perceptions of low-emission technologies. Therefore, the information you provide, such as your knowledge and opinions, will also be compared to information collected in previous projects about other energy technologies. The researchers will report on these comparisons in publicly available reports, academic

journals and conference papers. Your personal information will not appear in any publications. The findings gathered from the study will also be provided to APVA for their use and information.

How can I find out more about the study?

If you would like more information about this study please contact the project leader Peta Ashworth by phone (07 33274145) or e-mail (Peta.Ashworth@csiro.au).

Has this project received ethical clearance?

This study has been cleared in accordance with the ethical review processes of CSIRO within the guidelines of the National Statement on Ethical Conduct in Human Research. If you have any questions concerning your participation in the study, feel free to contact the researchers by e-mail at Peta.Ashworth@csiro.au or phone (07) 33274145. Alternatively, any concerns or complaints about the study can be raised with CSIRO's Social Science Human Research Ethics Committee by email at csshrec@csiro.au or by contacting the Manager of Social Responsibility and Ethics on (07) 3833 5693.

Please tick the appropriate box:

- ☐ Yes, I have reviewed the information above and I agree to participate in this online survey
- ☐ Sorry, I do not wish to participate in this online survey **(DISQUALIFY FOR SURVEY AND RECEIVE THANK YOU PAGE)**

(FOR PARTICIPANTS THAT AGREED TO PARTICIPATE)

Please provide your e-mail address if you would like to receive a copy of the summary findings by email

Email address: _____

Thank you for your agreement to participate in this research.

Peta Ashworth

Research Group Leader

CSIRO Science Into Society Group

T: 07 33274145 **|** E: peta.ashworth@csiro.au

(START SURVEY)

SURVEY QUESTIONNAIRE

HOUSEHOLDER INTEREST IN ACTIVE PARTICIPATION IN THE SOLAR DISTRIBUTED ENERGY MARKET

This questionnaire is designed to assist CSIRO to gain an understanding about your opinion towards solar energy and other energy systems that may be available to households in Australia to provide hot water or electricity. Responding to this questionnaire may take up to 25 minutes of your time.

SECTION 1: SOLAR ENERGY AND OPTIONS

Q1. Please tell us to what extent you agree or disagree that:

I could easily explain to a friend...	**Strongly Disagree**		**Neither Disagree nor Agree**		**Strongly Agree**
...what **solar energy** is about	1	2	3	4	5
...what a **solar water heater** is	1	2	3	4	5
...what **solar power or photovoltaic (PV) panels** are	1	2	3	4	5
...what a **battery storage system** is	1	2	3	4	5

Q2. Please tell us whether the following questions are true, false or you don't know:

Households in Australia are mostly responsible for electricity peak demand	True	False	Don't know
Currently, most renewable energy in Australia comes from solar energy	True	False	Don't know
Most solar energy in Australia is used for residential water heating	True	False	Don't know
Transport is the largest contributor to greenhouse gas emissions generated by households in Australia	True	False	Don't know
The largest cost of providing electricity to households comes from building and maintaining the electricity poles and wires	True	False	Don't know

[DESIGN SURVEY SO PARTICIPANTS CANNOT GO BACK TO QUESTION 1/2 SO DESCRIPTION BELOW DOES NOT INFLUENCE QUESTION 1/2 RESPONSES]

[THIS SECTION FORWARD: PRESENT TWO DESCRIPTIONS PER SURVEY. RANDOMISE THE OPTIONS]

The survey will ask you questions about **two different options of solar PV systems** that may be available to households in Australia to provide hot water or electricity. Most of these options are already available for purchase, while others are likely to be available in the future. We ask you to consider that these options would be available to you.

OPTION 1: SOLAR HOT WATERSYSTEM [RANDOMISE 2 TECHNOLOGY OPTIONS OUT OF 6]

One way of participating in distributed energy generation is installing a solar hot water system in your home. Please take your time to read the description of this system before answering the questions below.

A **solar hot water panel** sits on your roof and **uses the sun to heat water** flowing through the panel. The water then flows to a hot water tank.

- The hot water tank may be built in as part of the solar hot water panel on your roof or it may be separate.
- Solar hot water panels can be installed in most roofs.
- The hot water tank will also have a gas or electricity booster to be used for days when there is not much sun.
- Depending on the hot water system you currently have, the solar hot water system may reduce the amount of electricity or gas you have to buy from your energy company.

Photo source: www.ata.org.au

Q3. Do you have a solar hot water system installed in your home?

- ☐ No **[MOVE TO Q8]**
- ☐ Yes **[CONTINUE TO Q4]**

Q4. What type of booster does the solar hot water system have?

- ☐ Electric booster
- ☐ Gas booster
- ☐ Don't have a booster
- ☐ Don't know

Q5. What year was the solar hot water system installed?

- ☐ _____ [drop down: 1990 or earlier; 1991; (...); 2013]
- ☐ Don't know

Q6. What was the main reason for your decision to install it? *Please tick one only*

☐ To save money on my power bill
☐ To be less reliant on energy retailers
☐ To reduce my household carbon emissions
☐ Other. Please specify_____

Q7. How much do you agree with each of the following statements about the solar hot water system installed in your home? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
I am happy with the solar hot water system I have in my home	1	2	3	4	5
I would consider further investing in solar hot water systems in the future	1	2	3	4	5
My friends and family support it	1	2	3	4	5

Q8. How much do you agree with each of the following statements about solar hot water systems? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The technology sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider installing this in my home	1	2	3	4	5
This sort of technology is not suitable for my home	1	2	3	4	5

[RANDOMISE 2 TECHNOLOGY OPTIONS OUT OF 6]

OPTION 2: SOLAR PV SYSTEM THAT SUPPLIES ENERGY BACK TO THE ELECTRICITY GRID

One way of participating in distributed energy generation is installing a solar Photovoltaic (PV) system in your home. Please take your time to read the description of this system before answering the questions below.

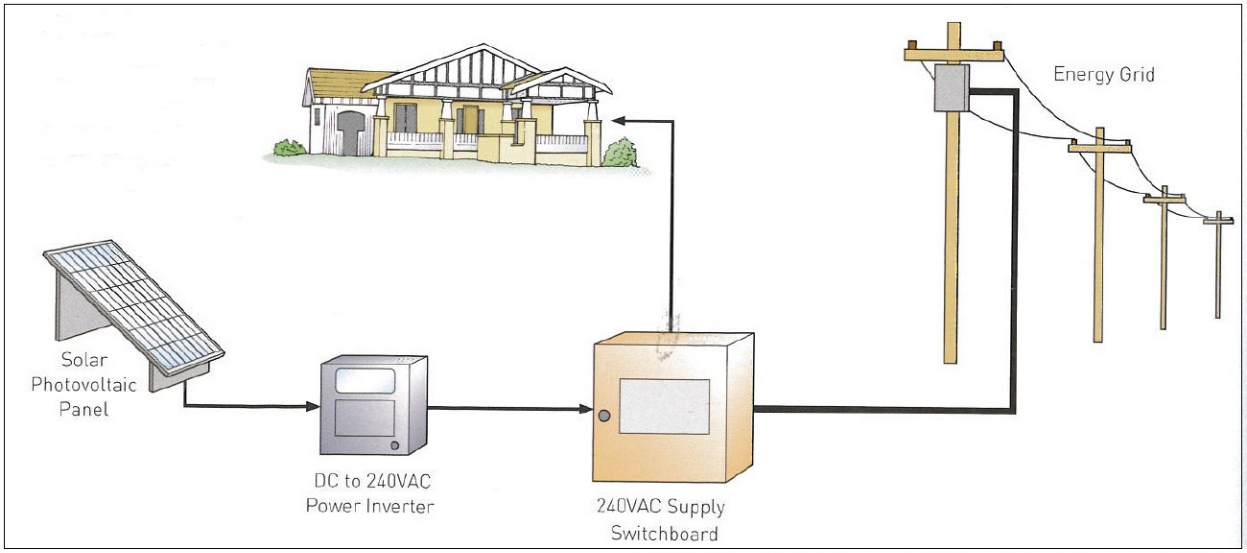
PV panels or solar power systems consist of a set of panels that convert sunlight into electricity. The amount of energy generated from a solar PV panel will depend on the following conditions:

- intensity of sunlight
- material used to make PV panels
- number of solar panels
- presence of shadows
- direction in which the panels point
- ambient temperature.

The solar PV system sits on your roof and the electricity it generates is used by your house, with any excess energy generated by the solar PV system going into the electricity grid.

- The electricity grid continues to supply your house along with any additional electricity you might need.
- The electricity from your PV system will reduce the amount of electricity you have to buy from your energy company.

- If the solar panels supply more electricity than your house is using, the excess energy generated by the solar PV system is sent to the electricity grid and the power company pays you for the energy you supply to the grid (the amount you are paid will depend on the contract you have with the power company).



Source: The CSIRO Home EnergySaving Book. John Wright, Peter osman and Peta Ashworth. CSIRO 2009.

Q9. Do you have a solar PV system installed in your home?

☐ No **[MOVE TO Q15]**

☐ Yes **[CONTINUE TO Q10]**

Q10. Is your solar PV system connected to the electricity grid?

☐ No **[MOVE TO Q15]**

☐ Yes **[CONTINUE TO Q11]**

Q11. What is the approximate size of the solar PV system?

☐ _____ kWp

☐ Don't know

Q12. What year was it installed?

☐ _____ [drop down: 1990 or earlier; 1991; (...); 2013]

☐ Don't know

Q13. What was the main reason for your decision to install a solar PV system? *Please tick one only*

☐ To save money on my power bill

☐ To reduce my household carbon emissions

☐ To be less reliant on energy retailers

☐ To benefit from the government rebates (ie. feed-in tariffs)

☐ Other. Please specify_____

Q14. How much do you agree with each of the following statements about having solar PV panels on the roof of your home connected to the grid? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
I am happy with the solar hot water system I have in my home	1	2	3	4	5
I would consider further investing in solar hot water systems in the future	1	2	3	4	5
My friends and family support it	1	2	3	4	5

Q15. How much do you agree with each of the following statements about having solar PV panels on the roof of your home, and connected to the grid? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The technology sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider installing this in my home	1	2	3	4	5
This sort of technology is not suitable for my home	1	2	3	4	5

[RANDOMISE 2 TECHNOLOGY OPTIONS OUT OF 6]

OPTION 3: SOLAR PV SYSTEM WITH BATTERY STORAGE

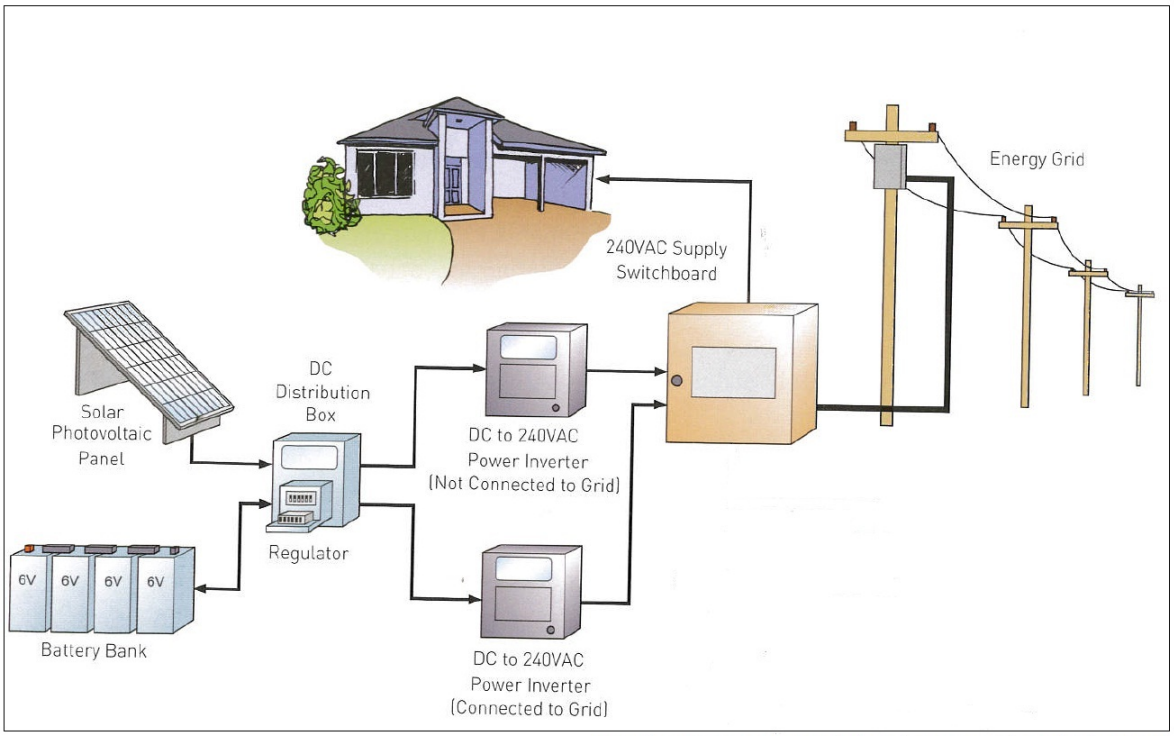
One way of participating in distributed energy generation is installing a solar PV system in your home. Please take your time to read the description of this system before answering the questions below.

Solar PV panels or solar power systems consist of a set of panels that convert sunlight into electricity. The amount of energy generated from a solar PV panel will depend on the following conditions:

- intensity of sunlight
- material used to make PV panels
- number of solar panels
- presence of shadows
- direction in which the panels point
- ambient temperature.

A solar PV system sits on your roof and the electricity it generates is first used in your house with the excess used to charge up storage batteries. When the battery system is fully charged, any solar electricity is sent to the electricity grid.

- The solar PV system with battery backup will reduce the amount of electricity you have to buy from your energy company. For instance, you could use the electricity stored in the batteries to provide electricity at peak demand, which would reduce your electricity bill more if your electricity rates during that time are higher.
- The batteries will also provide backup electricity for a period of time if the power grid is cut-off.



Source: The CSIRO Home EnergySaving Book. John Wright, Peter osman and Peta Ashworth. CSIRO 2009.

Q16. Do you have a solar PV system installed in your home?

☐ No **[MOVE TO Q25]**

☐ Yes **[CONTINE TO Q17]**

Q17. Is your solar PV system connected to the electricity grid?

☐ No **[MOVE TO Q15]**

☐ Yes **[CONTINUE TO Q11]**

Q18. What is the approximate size of the solar PV system?

☐ _____ kWp

☐ Don't know

Q19. What year was the solar PV system installed?

☐ _____ **[drop down: 1990 or earlier; 1991; (...); 2013]**

☐ Don't know

Q20. Does your solar PV system include a battery storage system installed in your home?

☐ No **[MOVE TO Q25]**

☐ Yes **[CONTINE TO Q21]**

Q21. What is the capacity of the battery storage system?

☐ _____ kWh

☐ Don't know

Q22. What year was the battery storage system installed?

☐ _____ **[drop down: 2000 or earlier; 2001; (...); 2013]**

☐ Don't know

Q23. What was the main reason for your decision to install the solar PV and battery storage system?
Please tick one only

- ☐ To save money on my power bill
- ☐ To benefit from the government rebates (ie. feed-in tariffs)
- ☐ To reduce my household carbon emissions
- ☐ To avoid loss of energy during power outages
- ☐ To be less reliant on energy retailers
- ☐ Other. Please specify_____

Q24. How much do you agree with each of the following statements about having solar PV panels on the roof of your home connected to a battery storage system? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
I am happy with the solar hot water system I have in my home	1	2	3	4	5
I would consider further investing in solar hot water systems in the future	1	2	3	4	5
My friends and family support it	1	2	3	4	5

Q25. How much do you agree with each of the following statements about having solar PV panels on the roof of your home connected to a battery storage system?

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The technology sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider installing this in my home	1	2	3	4	5
This sort of technology is not suitable for my home	1	2	3	4	5

Q26. If installing solar PV, on what basis would you be willing to pay to have a battery storage system included with it? *(Please tick main reason only)* **[MOVE TO NEXT OPTION]**

- ☐ To make me less reliant on the grid after daylight hours
- ☐ To store power for me to trade it or use it at times when power is more expensive
- ☐ To provide energy to my home during power outages
- ☐ If there were financial incentives in place
- ☐ Not interested at all

[RANDOMISE 2 TECHNOLOGY OPTIONS OUT OF 6]

OPTION 4: INSTALLING A SOLAR PV SYSTEM THAT IS NOT CONNECTED TO THE ELECTRICITY GRID

One way of participating in distributed energy generation is installing a solar Photovoltaic (PV) system in your home. Please take your time to read the description of this system before answering the questions below.

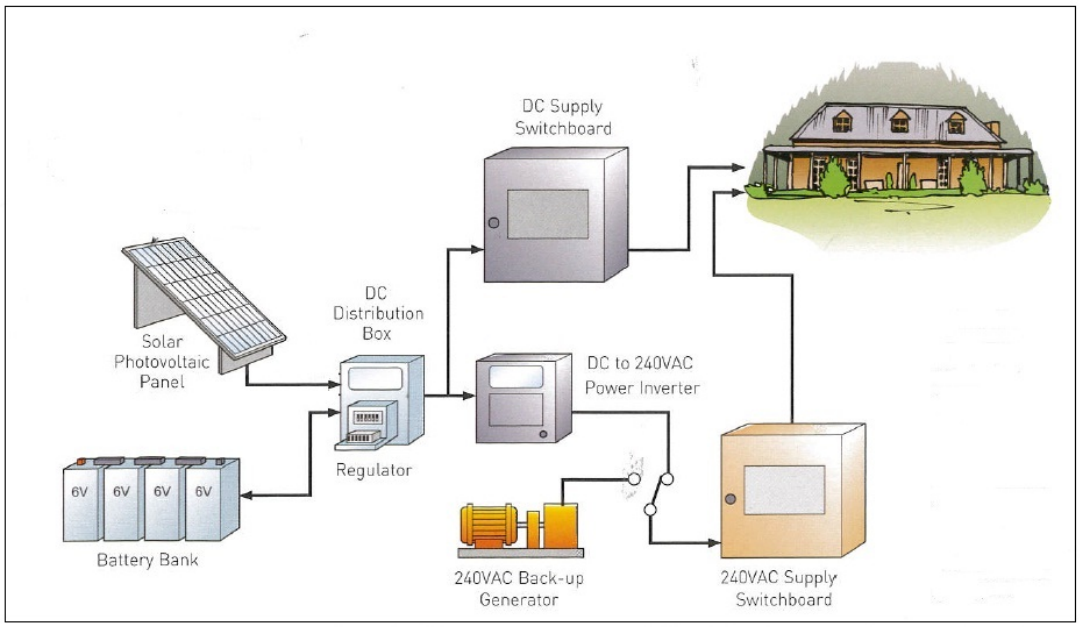
Solar PV panels or solar power systems consist of a set of panels that convert sunlight into electricity. The amount of energy generated from a solar PV panel will depend on the following conditions:

- intensity of sunlight
- material used to make PV panels
- number of solar panels

- presence of shadows
- direction in which the panels point
- ambient temperature.

A Solar PV system sits on your roof and the electricity it generates is first used in your house, with the excess used to charge up storage batteries. The solar PV system is not connected to the electricity grid.

- The electricity stored in the batteries is used, when the solar PV system is not producing electricity (such as at night time).
- A diesel or petrol generator can be used to provide additional backup electricity if the amount of electricity generated by both the solar panels and battery system is insufficient to meet household needs.
- The system is independent from the electricity grid and from electricity retailers.



Source: The CSIRO Home EnergySaving Book. John Wright, Peter osman and Peta Ashworth. CSIRO 2009.

Q27. Do you have a solar PV system installed in your home?

☐ No **[MOVE TO QUESTION Q36]**
☐ Yes **[MOVE TO QUESTIONQ28]**

Q28. Is your solar PV system connected to the electricity grid?

☐ No **[CONTINUE TO Q29]**
☐ Yes **[MOVE TO Q36]**

Q29. What is the approximate size of the solar PV system installed in your home?

☐ _____kWp
☐ Don't know

Q30. What year was the solar PV system installed?

☐ _____ **[drop down: 1990 or earlier; 1991; (...); 2013]**
☐ Don't know

Q31. Does your solar PV system include a battery storage system installed in your home?

☐ No **[MOVE TO Q34]**

☐ Yes **[CONTINE TO Q32]**

Q32. What is the size of the battery storage system installed in your home?

☐ _____ kWh

☐ Don't know

Q33. What year was the battery storage system installed?

☐ _____ **[drop down: 2000 or earlier; 2001; (...); 2013]**

☐ Don't know

Q34. What was the main reason for your decision to install a solar PV system that is not connected to the grid? *Please tick one only*

☐ Lack of access to mains power
☐ To reduce my household carbon emissions
☐ To be less reliant on energy retailers
☐ To save money on my power bill
☐ To avoid loss of energy during power outages
☐ Other. Please specify_____

Q35. How much do you agree with each of the following statements about the solar PV panels on the roof of your home that are NOT connected to the grid? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
I am happy with the solar hot water system I have in my home	1	2	3	4	5
I would consider further investing in solar hot water systems in the future	1	2	3	4	5
My friends and family support it	1	2	3	4	5

Q36. How much do you agree with each of the following statements about having solar PV panels on the roof of your home that are NOT connected to the grid? [MOVE TO NEXT OPTION]

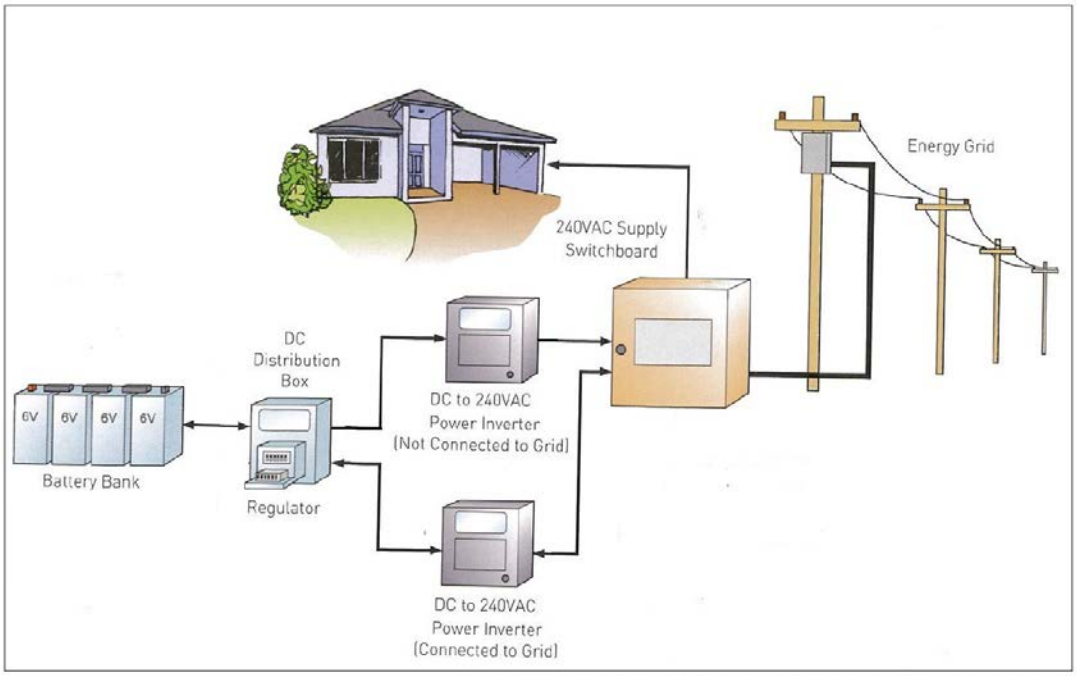
	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The technology sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider installing this in my home	1	2	3	4	5
This sort of technology is not suitable for my home	1	2	3	4	5

OPTION 5: BATTERY STORAGE SYSTEM [RANDOMISE 2 TECHNOLOGY OPTIONS OUT OF 6]

A way of participating in distributed energy generation is by storing electricity supplied by the electricity grid through a stack of batteries in your home. Please take your time to read the description of this system before answering the questions below.

- A battery storage system can be used by households to store electricity purchased from the electricity grid.

- The battery would store electricity at the time of the day when the price of electricity is low. The household could then use the stored electricity to meet its needs during peak periods, when the price of electricity is higher (for example, in the case that price tariffs for peak and off-peak times are different).
- This system refers to when a **battery storage system only** is installed in your home. This means that the **battery system is not connected to solar PV panels or other energy systems such as wind turbines**.



Source: Modified from The CSIRO Home EnergySaving Book. John Wright, Peter osman and Peta Ashworth. CSIRO 2009.

Q37. Do you have any BATTERY STORAGE system installed in your home?

☐ No **[MOVE TOQ43]**

☐ Yes **[CONTINUE TO Q38]**

Q38. Is your battery storage system connected to any of the following energy systems?

☐ Electricity supplied by the grid only **[CONTINUE TO Q39]**

☐ Solar PV panels installed on your roof **[MOVE TO Q43]**

☐ Other alternative energy system such as wind. Please specify:_____ **[MOVE TOQ43]**

Q39. What is the size of the battery storage system installed in your home?

☐ _____ kWh

☐ Don't know

Q40. In what year was the battery storage system installed?

☐ _____ **[drop down: 2000 or earlier; 2001; (...); 2013]**

☐ Don't know

Q41. What was the main reason why you installed a battery storage system? *Please tick one only*

☐ To save money on my power bill
☐ To reduce my household carbon emission
☐ To be less reliant on energy retailers
☐ To decrease my energy use at peak demand
☐ To avoid loss of energy during power outages
☐ Other. Please specify_____

Q42. How much do you agree with each of the following statements about the battery storage system in your home? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
I am happy with the solar hot water system I have in my home	1	2	3	4	5
I would consider further investing in solar hot water systems in the future	1	2	3	4	5
My friends and family support it	1	2	3	4	5

Q43. How much do you agree with each of the following statements about having a battery storage system in your home? [MOVE TO NEXT OPTION]

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The technology sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider installing this in my home	1	2	3	4	5
This sort of technology is not suitable for my home	1	2	3	4	5

[RANDOMISE 2 TECHNOLOGY OPTIONS OUT OF 6]

OPTION 6: INVESTING IN SOLAR PV SYSTEMS THAT ARE INSTALLED IN A PUBLIC OR COMMERCIAL BUILDING

A way of participating in distributed energy generation is investing in solar Photovoltaic (PV) systems that are installed outside of your home. Please take your time to read the description of this system before answering the questions below.

Solar PV panels or solar power systems consist of a set of panels that convert sunlight into electricity. The amount of energy generated from a solar PV panel will depend on the following conditions:

- intensity of sunlight
- material used to make PV panels
- number of solar panels
- presence of shadows
- direction in which the panels point
- ambient temperature.

A not-for-profit organisation, local council or private company invests in a solar PV system. The solar PV system is installed in a public or commercial building (e.g. a public school).

- The electricity generated is then sold to provide electricity to the building and/or to the grid.
- The organisation or private company runs the system and determines how to use or distribute the profits from the project.

- As with other financial investments, the investors receive a share of the profit generated by the business.

Solar panels on the roof of the Multi Story Carparks, The University of Queensland

Photo Source: The University of Queensland

Q44. Have you made any direct investment in a solar PV system installed in a public or commercial building by a council, not-for-profit organisation or private company?

☐ No **[MOVE TOQ48]**

☐ Yes **[CONTINUE TO Q45]**

Q45. Please tell us more about it. For example, do you know where the solar PV system is installed and who is responsible for the system? [space for text description]

Q46. What was the main reason why you decided to invest in it? *Please tick one only*

☐ To make money
☐ To reduce carbon emissions
☐ To contribute to Australia's energy security
☐ Other. Please specify_____

Q47. How much do you agree with each of the following statements about your investments in solar PV systems that are installed in a public or commercial building? [MOVE TO Q49]

	Strongly disagree		**Neither Disagree nor Agree**		**Strongly agree**
I am happy with the solar hot water system I have in my home	1	2	3	4	5
I would consider further investing in solar hot water systems in the future	1	2	3	4	5
My friends and family support it	1	2	3	4	5

Q48. How much do you agree with each of the following statements about investing in solar PV systems that are installed in a public or commercial building?

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The technology sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider investing in solar PV systems that are installed in a public or commercial building	1	2	3	4	5

Q49. Assuming there are no cost differences, how willing would you be to invest in solar PV systems that are installed in a public or commercial building? We are asking your opinion on this for situations where the systems are owned by a commercial business and if they are owned by a not-for profit business?

	Not at all				Very much so
Owned by a commercial business	1	2	3	4	5
Owned by a not-for-profit business	1	2	3	4	5

[ALL THE QUESTIONS FROM THIS POINT FORWARD ARE TO BE INCLUDED IN ALL SURVEYS]

Q50. Who would probably be the one to decide whether or not your household would participate in solar energy initiatives such as the options just described? *(Please tick one only)*

- ☐ Yourself
- ☐ Your spouse/partner
- ☐ Your parent(s)
- ☐ Your housemate/flatmate
- ☐ Your landlord
- ☐ Yourself in consensus with others (such as partner, flatmate or parent)
- ☐ Other. Please specify: _____

Q51. This question is designed to help us understand what is most important to you if you were to install a solar and/or battery system in your home. We would like to know your opinion even if you do not plan to invest in solar energy at the moment. The section shows several sets of four features. Please tick which feature (among each set of four) is the MOST important and which is the LEAST important to you. We need to ask you to answer several sets to gather your opinion on all the features **[PLEASE RANDOMISE FEATURES AND SETS – each feature is repeated 4 times]**

Set	Which is **MOST** important? (tick one from each group of 4)	**What is important to you if you were to install a solar and/or battery system in your home?**	Which is **LEAST** important? (tick one from each group of 4)
A	☐	Reduces reliance on energy retailers	☐
	☐	Increased safety levels	☐
	☐	Reduces electricity costs	☐
	☐	Easy to install and maintain	☐
B	☐	Technology is reliable and durable	☐
	☐	Benefits the environment	☐
	☐	Easy to install and maintain	☐
	☐	It has visual appeal	☐
C	☐	Increased safety levels	☐
	☐	Reduces electricity costs	☐
	☐	It has visual appeal	☐
	☐	Meets my current electricity needs	☐
D	☐	Benefits the environment	☐
	☐	Easy to install and maintain	☐
	☐	Provides uninterrupted power	☐
	☐	Meets my current electricity needs	☐
E	☐	Reduces my electricity costs	☐
	☐	It has visual appeal	☐
	☐	Meets my current electricity needs	☐
	☐	Reduces reliance on energy retailers	☐
F	☐	Easy to install and maintain	☐
	☐	Provides uninterrupted power	☐
	☐	Reduces reliance on energy retailers	☐
	☐	The technology is reliable and durable	☐
G	☐	It has visual appeal	☐
	☐	Meets my current electricity needs	☐
	☐	The technology is reliable and durable	☐
	☐	Increased safety levels	☐
H	☐	Provides uninterrupted power	☐
	☐	Reduces reliance on energy retailers	☐
	☐	Increased safety levels	☐
	☐	Benefits the environment	☐
I	☐	Meets my current electricity needs	☐
	☐	Technology is reliable and durable	☐
	☐	Benefits the environment	☐
	☐	Reduces electricity costs	☐

SECTION 2: OPTIONS FOR PAYMENT

Another type of distributed energy system involves energy companies providing a service package for operating and maintaining the household energy system. **Please take your time to read the description of this system before answering the questions below.**

ENERGY SERVICE COMPANY SERVICE PACKAGE

In this option an energy company undertakes a home audit of the household electricity needs and designs an energy package suitable for your household, aiming at optimising your household energy consumption.

- This could include the investment in and installation of devices such as a solar PV system, solar hot water system and energy efficient appliances in your home.
- The energy company would also invest in and install an electronic energy manager to work out the best time for your household to use appliances.
- The electronic energy manager might switch on and off some of your major home appliances (such as air conditioner, pool pump and hot water system) to reduce electricity use at times of high demand and high cost.
- You can still control the energy manager to override it any time.
- The energy company establishes a contract with you to remotely manage the use of your appliances. You sign a contract (usually a 10 year contract) and instead of paying a power bill you pay a fixed monthly bill to the energy company.

Q52. How much do you agree with each of the following statements about signing to an energy service company package?

	Strongly disagree		Neither Disagree nor Agree		Strongly agree
The package sounds like a good idea	1	2	3	4	5
My friends and family are likely to support it	1	2	3	4	5
I would consider signing to an ESCO package	1	2	3	4	5
This sort of package is not suitable for my home	1	2	3	4	5

Q53. On what basis would you be prepared to sign a contract with an Energy Service Company to give them permission to manage how electricity is used in your home? *(Please tick main reason only)*

- ☐ To save money on my power bill
- ☐ To reduce the use of energy at peak demand
- ☐ To reduce my household carbon emissions
- ☐ So I don't need to worry about how I use electricity at home
- ☐ Yes, Other reason. Please specify _____
- ☐ Not at all **[MOVE TO Q55]**

Q54. Assuming you have the following appliances in your home, which ones would you be prepared to let an Energy Service Company turn on and off? *(please tick all that apply)* [MOVE TO Q56]

- ☐ Air-conditioner
- ☐ Refrigerator
- ☐ Electric hot water system
- ☐ Electric heater
- ☐ Clothes dryer
- ☐ Pool pump
- ☐ Dishwasher
- ☐ Washing machine
- ☐ Deep freezer
- ☐ Other. Please specify_____

Q55. Please tell us why you would not be interested in signing a contract with an Energy Service Company to give them permission to manage how electricity is used in your home.

[OPEN QUESTION – insert text space]

Q56. Consider you were about to install or replace a solar device in your home. There are four options for payment to invest in a solar PV system. Please read each option and then indicate how likely you would be to consider those options if installing a solar device in your home. Please rank your preference for the payment options to invest in a solar PV system from 1 (MOST interested) down to 3 (LEAST interested). [Provide drop-down options (1, 2, 3 or 4) to ease participants' response]

	BUYING A SOLAR DEVICE UPFRONT	BUYING A SOLAR DEVICE WITH FINANCE	LEASING A SOLAR DEVICE FROM AN ENERGY SUPPLIER	SIGNING TO AN ENERGY SERVICE COMPANY PACKAGE
Do I own the solar PV system?	Yes	Yes. But only after you have paid the final instalment	No. The business that installed the system owns it.	No. The energy service company owns it.
Who can manage the use of appliances?	Your household.	Your household.	Your household.	Your household and the energy service company
How do I pay for the system?	Up front when you get the system.	Through monthly payments	Through monthly payments.	Through monthly payments
How many bills do I get?	One bill from your electricity retailer.	One bill from your electricity retailer.	Two bills, one from the solar leasing company and one from the electricity retailer.	One bill from your energy service company.
Who operates and maintain the solar PV system?	You are responsible for all maintenance and repairs outside the warranty period.	You are responsible for all maintenance and repairs outside the warranty period.	The solar leasing company is responsible for all maintenance and repairs from when the system is installed.	The energy service company is responsible for all maintenance and repairs from when the system is installed.
How that affects my power bill?	The electricity your solar PV system generates can be used to reduce your current power bill.	The electricity your solar PV system generates can be used to offset the monthly payments and/or your current power bills	You will be offered electricity rates lower than your current tariff for the duration of the contract, around 10 - 20 years.	The cost of your monthly payments should be lower than your current power bill.
Enter your rank order in each box	☐	☐	☐	☐

Q57. Please rank the following 10 statements about different payment options, from 1 to 10, where a ranking of 1 represents the option that would be of MOST interest to you, through to 10 which is the option of LEAST interest to you.

	Ranking from: **1 -MOST INTEREST to you to 10- LEAST INTEREST to you**
Provides you with immediate costs savings	
Allows you to own the solar or battery system	
Does not require an upfront payment	
Does not require a fixed term contract	
It is cheaper in the long-term	
Allows the energy company to manage your electricity usage	
Allows you to afford the technology	
Have a positive impact on your property value and resale	
Allows you to pay the solar and/or battery system through monthly instalments	
The energy company is responsible for all the solar and/or battery system maintenance and repairs	

SECTION 3: SOLAR ENERGY AND YOUR HOUSEHOLD

Q58. In this question we would like to know whether you agree or disagree with the statements below. We would like to know your opinion even if you do not plan to invest in solar energy at the moment.

	Strongly disagree		Neither disagree nor agree		Strongly agree
Installing a solar PV system will improve the value of my house	1	2	3	4	5
I may want to invest in a solar PV system even if I may move houses in the future	1	2	3	4	5
The payback period of investing in a solar PV system is currently too long	1	2	3	4	5
I would install a solar PV system because it reduces greenhouse gas emissions from my electricity consumption	1	2	3	4	5
I would invest in a solar PV system because solar energy is produced locally	1	2	3	4	5
I am concerned that the production of solar PV systems is not environmentally friendly	1	2	3	4	5
I believe investing in solar PV systems is the right thing to do	1	2	3	4	5
I am not happy with my current sources of energy and think I need to change	1	2	3	4	5
I am unable to control how energy efficient specific appliances are in the house I live in	1	2	3	4	5
I would invest in a solar PV system to be more self-sufficient/produce my own electricity	1	2	3	4	5
Investing in a solar PV system is not currently a high priority for me or my household	1	2	3	4	5
It is difficult to understand what the best solar options are for my household	1	2	3	4	5
I don't use enough hot water or electricity to warrant investing in a solar hot water or PV system	1	2	3	4	5
I would only install a solar system at home if there are sufficient incentives available (i.e. government rebates or feed-in tariffs)	1	2	3	4	5
I would only consider investing in solar options if the hot water system broke down or if I were renovating my home	1	2	3	4	5
Solar technology will improve over time and I should wait a few more years before investing	1	2	3	4	5

Q59. How concerned, if at all, are you that in the next 10-20 years…

	Not at all				Very much
…electricity and gas will become unaffordable for you?	1	2	3	4	5
...petrol will become unaffordable for you?	1	2	3	4	5
...there will be more frequent power outages?	1	2	3	4	5
…there will be a national petrol shortage?	1	2	3	4	5

SECTION 4: INFORMATION SOURCES

Q60. To what extent do you trust each of the groups and organisations listed below to provide honest information about energy efficiency and the use of solar energy in the household?

	Not at all				Very much
Environmental organisations	1	2	3	4	5
Consumer organisations such as Choice	1	2	3	4	5
Other not-for-profit organisations	1	2	3	4	5
Scientists or engineers	1	2	3	4	5
CSIRO	1	2	3	4	5
Experts in solar energy technology	1	2	3	4	5
Government departments and agencies	1	2	3	4	5
Solar industry organisations	1	2	3	4	5
Electricity and gas companies	1	2	3	4	5
The media	1	2	3	4	5
Friends, family or neighbours	1	2	3	4	5

Q61. If you were considering investing in a solar and/or battery system in your home please indicate on a scale of 1 (not at all) to 5 (very much) how you would like to find out more about it.

	Not at all				Very much
Through a home exhibition show	1	2	3	4	5
By having a home energy expert visiting my house	1	2	3	4	5
Through newspaper or magazine advertising	1	2	3	4	5
Through case studies that show the advantages and disadvantages of investing in solar energy	1	2	3	4	5
Through my energy supplier mail newsletter	1	2	3	4	5
Through my energy supplier website	1	2	3	4	5
Through the solar industry website	1	2	3	4	5
By receiving a phone call from energy supplier	1	2	3	4	5
By visiting a house that has solar energy in my city	1	2	3	4	5
By watching TV advertising	1	2	3	4	5

SECTION 5: ENERGY AND THE ENVIRONMENT

Q62. Please indicate the extent to which you agree or disagree with each of the statements below.

	Strongly Disagree		Neither disagree nor agree		Strongly Agree
The depletion of energy resources is a problem for society	1	2	3	4	5
I feel partly responsible for the depletion of energy resources	1	2	3	4	5
In principle, individuals on their own cannot contribute to the reduction of energy problems	1	2	3	4	5
I feel personally obliged to save as much energy as possible	1	2	3	4	5
I feel morally obliged to save energy, regardless of what others do	1	2	3	4	5
Not only the government and industry are responsible for high energy consumption levels, I am too	1	2	3	4	5
I feel morally obliged to use green instead of regular electricity	1	2	3	4	5
I feel obliged to bear the environment and nature in mind in my daily behaviour	1	2	3	4	5
Environmental quality will improve if we use less energy	1	2	3	4	5
Energy savings help reduce climate change	1	2	3	4	5
Climate change is a problem for society	1	2	3	4	5
I feel partly responsible for climate change	1	2	3	4	5

Q63. Which of the following statements best describes your view?

1	2	3	4	5
In Australia, the highest priority should be given to protecting the environment, even if it increases the costs of living for my household.	In Australia, both the environment and maintaining the costs of living to my household are important, but the environment should come first.	Both, the environment and maintaining the costs of living, are equally important in Australia.	In Australia, both maintaining the costs of living to my household and protecting the environment are important, but the costs of living to my household should come first.	In Australia, the highest priority should be given to decreasing the costs of living to my household, even if it hurts the environment.

SECTION 6: ABOUT YOUR HOUSEHOLD

Q64. Which energy sources do you use in your household? *(Tick as many as apply)*

- ☐ Electricity
- ☐ Gas (mains)
- ☐ Gas (bottled)
- ☐ Solar
- ☐ Others. Please specify: _____
- ☐ I do not have access to mains power or gas

Q65. Please tick which devices you have in your home and whether you have installed them in the last 5 years.

	Have this technology at home		Have installed it in the last 5 years		
Water-saving showerhead(s)	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Solar PV panels	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Solar hot water system	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Solar heater in the pool	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Rainwater tank	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Outdoor solar lighting	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Low-energy light bulbs	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Insulation	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Gas hot water system	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Energy efficient appliances	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Electric hot water system	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Draught proofed windows/doors	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Double glazing windows	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Central heating	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Ceiling fans	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
Air-conditioner	☐ Yes	☐ No	☐ Yes	☐ No	☐ Don't know
[IF YES TO AIR CONDITIONER] Please specify how many rooms in your home have air-conditioning:_____					

Q66. How often do you pay your electricity bill? *(Please tick one only)*

☐ Fortnightly
☐ Monthly
☐ Quarterly
☐ Half-yearly
☐ Annually
☐ Other (please specify: _____)

Q67. Roughly, how much was your last electricity bill? $_____

Q68. If you have a solar PV system installed in your home, did you receive any credits or payments from it in your last bill?

☐ Yes
☐ No
☐ I don't have a solar PV system in my home

Q69. Do you purchase accredited Green Power?

☐ No
☐ Yes → **What percentage? _____% [Include option for 'I don't know']**

For approximately how long have you done this? _____ [drop down month and year options]

Q70. Please select the number that best reflects how you would rate your household energy bill.

Very low	Low	Average	High	Very high
1	2	3	4	5

Q71. Have you experienced any of the following in the past 2 years? *(Please tick all that apply)*

- ☐ Natural disaster in your home town
- ☐ Power outage/disruption
- ☐ Increases in electricity prices
- ☐ Change in electricity provider
- ☐ None of these

Q72. Which of the following best describes where you live? *(Please tick one only)*

- ☐ Separate house
- ☐ Flat, unit, or apartment
- ☐ Row or terrace house/townhouse
- ☐ Semi-detached house
- ☐ Other. Please specify_____

Q73. Which of the following best describes the home in which you live? *(Please tick one only)*

- ☐ A rented apartment/house
- ☐ An apartment/house with mortgage
- ☐ An apartment/house owned outright
- ☐ Public housing
- ☐ Share households
- ☐ Other. Please specify _____

Q74. In a typical week, how many days would you or others in your household spend at home DURING DAYTIME for large periods of time (such as work from home/ pre-school children/elderly)?

- ☐ 7 days/week
- ☐ 6 days/week
- ☐ 5 days/week
- ☐ 4 days/week
- ☐ 3 days/week
- ☐ 2 days/week
- ☐ 1 day/week

Q75. Please tick one term from the list below that best describes your household. *(Tick one only)*

- ☐ Single person household
- ☐ Shared person household
- ☐ Couple with no child/children
- ☐ Couple with child/children
- ☐ One parent with child/children
- ☐ Other family (e.g. extended family household)

Q76. How many people (including yourself) live in your household? _____

SECTION 7: ABOUT YOU

Q77. What is your postcode? _____

Q78. What is your age? _____

Q79. What is your gender?

- ☐ Female
- ☐ Male

Q80. Please tick the highest level of education you have completed. *(Please tick one only)*

- ☐ Some primary schooling
- ☐ Some secondary schooling
- ☐ Year 12 or equivalent
- ☐ Trade certificate/apprenticeship
- ☐ Diploma/advanced diploma
- ☐ Bachelor/honours degree
- ☐ Postgraduate degree
- ☐ Other. Please specify_____

Q81. Please tick <u>one term</u> from the list below that <u>best</u> describes your employment status. *(Please tick one only)*

- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Self employed
- ☐ Casual employment
- ☐ Retired
- ☐ Conducting unpaid work (carer/home/volunteer)
- ☐ Student
- ☐ Not employed
- ☐ Unable to work
- ☐ Other. Please specify_____

Q82. What is your annual household's income, before tax?

- ☐ Less than $20 000
- ☐ $20 000 - $39 999
- ☐ $40 000 - $59 999
- ☐ $60 000 - $79 999
- ☐ $80 000 - $99 999
- ☐ $100 000 - $124 999
- ☐ $125 000 - $149 999
- ☐ $150 000 or more
- ☐ Prefer not to say

Q83. Do you or a close family/friend have work experience within the solar industry?

- ☐ Yes
- ☐ No

THANK YOU FOR YOUR PARTICIPATION

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