Virtual Power Plant Consumer Insights Interim Report

February 2021

THE CUSTOMER EXPERIENCE EXPERTS

Important notice

PURPOSE

This document outlines key insights gained from the Virtual Power Plant (VPP) Consumer Insights study undertaken to date during the VPP Demonstration. It details the framework, final objectives, research program design, methodology and progress achieved of the Consumer Insights study.

This publication has been prepared by CSBA, a market research agency, on behalf of AEMO using information available in December 2020. Information made available after this date may have been included in this publication where practical.

Executive summary

The Australian Energy Market Operator (AEMO), with support from the Australian Renewable Energy Agency (ARENA), are conducting VPP Demonstrations with a range of specific objectives. These include:

- Demonstrating VPPs' capability to deliver multiple value streams (for example, frequency control ancillary services [FCAS], energy and potential network services).
- Developing AEMO's operational visibility of VPPs.
- Assessing regulatory arrangements for VPPs.
- Providing insights on how to better understand consumers' experiences of VPPs, and improve this experience in future.
- Assess the cyber security capabilities of VPPs and determine if augmentation is required.

In July 2019, AEMO commissioned Customer Service Benchmarking Australia (CSBA) to investigate and provide specific insights on how to improve consumers' VPP experience.

This report details the approach taken by CSBA, which included a baseline survey with consumers of VPP Demonstration participants (October 2019-December 2020), a longitudinal qualitative study (July 2020-January 2021), a post-Demonstrations survey (February 2021-April 2021), and consumer usage analysis (April-May 2021).

It also summarises some preliminary insights deriving from the first survey and the qualitative research to date.

The primary insights to date include:

- Overall consumer satisfaction with VPPs to date is high, and consumers indicated that they would be willing to, and indeed do, promote participation in a VPP to others.
- Engagement with the VPP is very high in the early stages (discovery phase) while consumers are learning about VPPs, and through to installation. Consumers are keen to understand the exact benefits of the program to themselves and the wider community.
- Consumers' ongoing satisfaction with and advocacy of VPPs will be further enhanced with improvements in communications after on-boarding (the entering and trialling phase). In particular, consumers want to understand:
  - The financial benefits to their household (how much energy they provided to the grid and what they were paid for this).
  - The environmental benefits (for example, how much CO2 was saved and how this can be translated into tangible terms, such as how many trees it is equivalent to planting).
  - The community benefits (for example, how many minutes of power shortfalls in their state were saved by their household's power contribution).

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1 Background and objectives

Recent innovations in technology, energy storage and communications have led to the development of virtual power plants (VPPs). For the purpose of this study, a VPP is defined as a group of households with solar panels and batteries that are coordinated to deliver services for power system operation and electricity markets. These VPPs are at an early stage of development in the energy market, but deployment from VPP providers and uptake from residents is currently taking place at a steady pace across Australia.

AEMO is conducting VPP Demonstrations, supported by the Australian Renewable Energy Agency (ARENA), to:

1. Demonstrate VPPs' capability to deliver multiple value streams (frequency control ancillary services [FCAS], energy and potential network services).
2. Develop AEMO's operational visibility of VPPs.
3. Assess regulatory arrangements for VPPs and inform appropriate changes.
4. **Provide insights on how to improve consumers' experiences of the VPPs in future.**
5. Assess the cyber security capabilities of VPPs and determine if augmentation is required.

To meet this consumer insights objective, in July 2019 AEMO commissioned Customer Service Benchmarking Australia (CSBA) to investigate and provide specific insights on how to improve the consumers' experience. The VPP consumer insight study aimed to answer three critical questions:

1. What are consumers' experiences of participating in Australia's early stage VPPs?
2. Is VPP participation attractive enough for consumers to give up control of their assets?
3. How can consumers' experience of VPP participation be improved to make it more attractive for consumers to sign up in future?

1.1 Why the VPP Demonstrations are important

Since the announcement of the VPP Demonstrations[1], VPPs have generated interest from state governments:

- New South Wales announced a target of 300,000 battery installations in the next 10 years.
- South Australia is currently rolling out a battery subsidy offer for 40,000 households, while an ongoing demonstration with the South Australian Housing Trust VPP will install up to 50,000 systems.
- Victoria is rolling out battery subsidies for eligible homes with existing solar panels.

In April 2019, AEMO published a report on the Technical Integration of Distributed Energy Resources (DER)[2] that shared preliminary findings on the behaviour of DER during disturbances. It highlighted potential risks to system security and proposed the development of improved DER performance standards. The uplift of DER performance standards will contribute to the technical integration of DER, while the VPP Demonstrations program is focused on market integration of DER, noting that these two elements are heavily inter-related.

Based on these findings, it is crucial for AEMO to understand the potential uptake of VPPs from the general population to explore and adapt the capabilities of aggregated DER to deliver contingency FCAS3 but also to develop a deep understanding of how VPPs respond to energy market price signals.

Ultimately, VPPs hold a lot of potential to help develop a more efficient power system for all electricity consumers, as well as providing direct value to consumers owning VPP assets. Understanding consumers' experiences and exploring ways to optimise these experiences will likely improve the success of VPPs overall.

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[1] *With the publication of AEMO's November 2018 Consultation Paper, at https://aemo.com.au/-/media/files/electricity/nem/der/2018/nem-vpp-demonstrations-program.pdf?la=en&hash=ECB02780C7E3B8AF22A62DFD24C79523.*

[2] *At https://aemo.com.au/-/media/files/electricity/nem/der/2019/technical-integration/technical-integration-of-der-report.pdf?la=en.*

[3] *FCAS maintain frequency within normal operating requirements to avoid negative impact to electricity supply. Contingency FCAS are triggered occasionally by frequency deviations after major contingency events, and can be supplied by local plant; regulation FCAS are controlled centrally by AEMO and continually correct minor changes in frequency.*

2 Detailed methodology, approach and rationale

Figure 1 shows the typical lifecycle of a product or service. These are briefly outlined as:

- Development phase – creating a product or service, refining it and readying it for market
- Introduction phase – building a market and awareness for the product. VPPs in Australia would currently be considered to be in this phase.
- Growth phase - the product has been accepted by consumers and companies are striving to increase their market share.
- Maturity phase - sales begin to level off, competition increases and product features are enhanced to maintain market share.
- Decline phase - decreasing revenue due to market saturation, high competition, and changing consumer needs.

Figure 1 The phases of the lifecycle progression

CSBA developed a multi-staged market research approach, using specific methodologies to tackle the **introduction** phase of VPPs in the market and capture consumers' evolving behaviours and attitudes.

The approach was carefully developed to provide relevant and meaningful insights to consumers' experience of VPPs in line with emerging drivers and barriers, as VPPs gain traction in the energy market and steadily move from the **introduction** phase to the **growth** phase.

A longitudinal study approach[4] was adopted to provide solid insights on the VPP Demonstrations and unveil the potential uptake by the mass market across an extended period of time (six months minimum).

2.1 VPP Demonstrations consumer insight study streams in detail

Stream 1: Baseline survey

The baseline survey was conducted from October 2019 to December 2020, and incorporated a quantitative online survey programmed by CSBA, sent to at least 75% of consumers who are part of the VPP Demonstrations. The survey captured the current market landscape, perceptions of the VPP, drivers, barriers, attraction, current attitudes and overall satisfaction with the VPP.

[4] *A longitudinal study in this context is a study conducted among a cohort of consumers at different stages of their journey experiencing the VPP Demonstrations.*

Stream 2: Longitudinal study

The longitudinal study was conducted from July 2020 to January 2021, and involved:

- A series of qualitative activities exploring a range of topics in depth with the same constituent group of 50 consumers. This stream ran for more than six months, and activities included:
  - 60 minute, one-on-one, depth interviews.
  - Online bulletin board activities.
  - Journaling.
- Deriving/identifying segments and underlying motivational VPP uptake.

Stream 3: Post-demonstration survey

A post-demonstration survey will run from March 2021 to April 2021, covering:

- A final survey to quantify and validate findings from the qualitative interview.
- Capturing the current market landscape, to compare results with Stream 1 and understand the evolution of the VPP industry across consumers.
- Segmentation of the market and quantifying drivers to forecast market uptake.

Stream 4: Consumer usage analysis

A review of consumer usage from April 2021 to May 2021 will include:

- Conducting a comparison analysis between market research results and AEMO internal data.
- Understanding the impact of the VPP on household consumption.
- Unveiling the economic potential of VPPs and impact on overall household consumption.

Consumers who participated in this study were told their feedback would be used to better understand consumers' experience of VPPs and to drive future improvements in the industry.

CSBA would like to thank the research participants who took part in this research study, to uncover the necessary insights to drive the success of the VPP Demonstrations.

2.2 Framework and approach for analysis

For each of the streams in Section 2.1, CSBA used the following framework and approach for analysis.

Stream 1: Baseline survey

CSBA analysed the quantitative online survey, which captured perceptions and attitudes, to identify any correlations based on:

- Demographics.
- Time since joining the VPP program (3, 6, 12, or over 12 months).
- Satisfaction scores and drivers to join a VPP.
- Comparison between participants based on business models.

Streams 2 and 3: Longitudinal study and post-demonstration survey

CSBA conducted a brainstorming workshop with researchers to analyse the qualitative interviews, online bulletin boards, and journaling completed as part of the longitudinal study, and will do the same following the quantitative online survey. This process quantifies and validates qualitative findings, identifies emerging themes, and analyses and compares long-term data, to highlight trends related to:

- Current perceptions and mindset towards VPPs.
- Underlying emotional and rational drivers towards participation in a VPP.
- Mapping the VPP Demonstrations consumer journey with key steps.

- Specific typologies framing adoption of VPPs
- Attitudes and behavioural changes in the household and towards energy consumption in general due to the VPP.
- Barriers and opportunities to leverage the VPP offerings in the Australian market.

Stream 4: Consumer usage analysis

This will involve analysis of comparisons between market research results and AEMO's internal data. Overall, the cross-analysis is designed to capture correlations based on:

- Consumer usage data on energy import and export from the grid, based on segments such as pre-solar, pre-VPP Demonstrations, with solar, joined a VPP, exited a VPP.
- Consumer satisfaction scores and drivers or barriers to join a VPP.
- Economic analysis based on the overall impact to energy bills.

2.3 Current approach to data collection

Figure 2 and Figure 3 illustrate CSBA's detailed approach to quantitative, qualitative and consumer usage data.

Figure 4 summarises the consumer usage analysis process.

Figure 2 Quantitative date collection overview

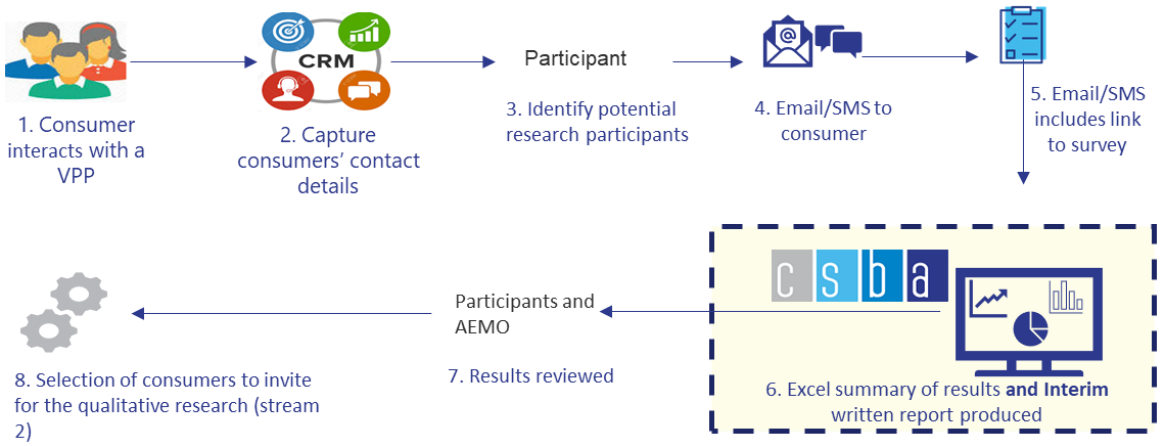


Figure 3 Qualitative date collection overview

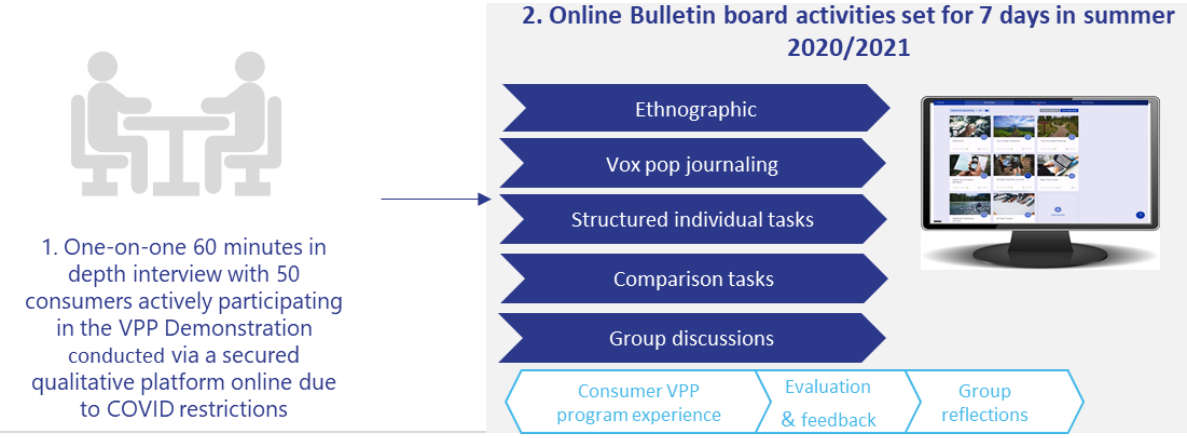
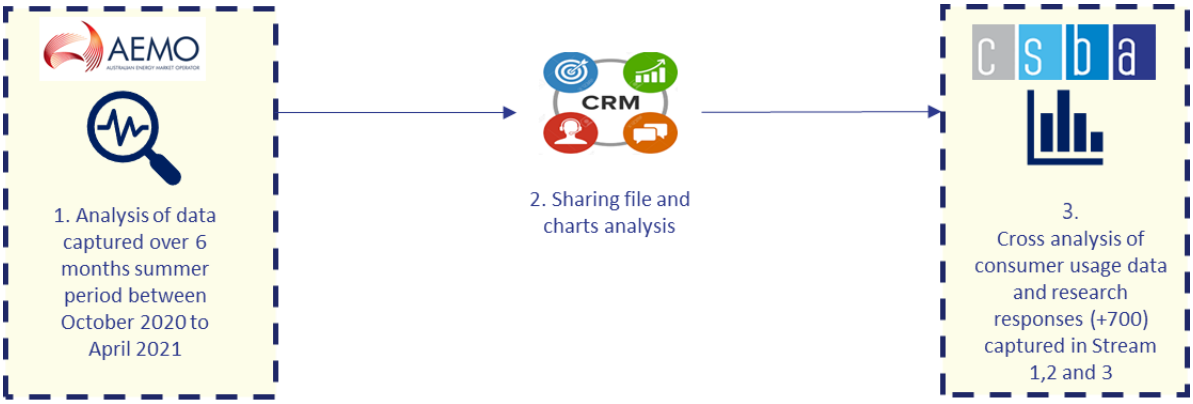


Figure 4 Consumer usage analysis



2.4 Overview of challenges face and adopted solutions

When the VPP Demonstrations consumer insight study began in July 2019, many potential VPP providers had expressed interest but some factors – including limited numbers of enrolled consumers and the impacts of COVID-19 – initially reduced the level of enrolment.

AEMO worked with CSBA to implement solutions so the insights study could proceed from the outset:

1. Extending the study completion to July 2021 giving time for providers to enter the demonstration.
2. Accelerating participation by establishing deadlines for registration.
3. Changing qualitative interviews to an online methodology that ensured safe social distancing.
4. CSBA managing closely stakeholders' request to add/remove specific questions from the Stream 1 baseline survey, encouraging them to consider the critical need for consistency across all providers and submitting review to AEMO for final approval.

2.5 Learnings gained for future research in the industry

Since the launch of the VPP Demonstrations, CSBA, AEMO, and the different organisations involved have learned valuable lessons, relating to:

- The need to work collaboratively to identify challenges and readjust the overall approach.
- The need to be flexible in the approach to the analysis. As the VPP industry lifecycle is still in a very early stage, many stakeholders needed more time to frame their business model around their VPP offerings to ensure business viability.
- The need for confidentiality of information among stakeholders; commercial sensitivity is paramount in the industry and is being carefully monitored by participants.
- The need for a huge amount of engagement and collaboration so everyone's priorities were met. This required compromise (adjusting the questionnaire in some areas to accommodate providers' priorities, and providers accepting that some questions couldn't be changed to preserve consistency across the consumer groups). This was navigated successfully, with all parties emerging with their priorities intact and a closer relationship with these stakeholders.

3 Consumer insights so far

The preliminary research findings result from 470 digital surveys and 23 qualitative depth interviews conducted with VPP Demonstration participants consumers. All consumers were living in South Australia and were enrolled with one of two VPP providers. Table 1 summarises the cohort's demographics.

Table 1 Consumer profile based on demographics

	88%	Free standing home
	87%	Metropolitan
50+	74%	Age 50+
	55%	Participating in VPP Demonstrations less than 12 months
	53%	Empty Nesters

The research sought to answer the following research objectives:

- What are consumers' experiences of participating in Australia's early stage VPPs participating in the demonstrations?
- Is participation in the VPP Demonstrations attractive enough for consumers to give up control of their assets?
- How can the consumer experience of participation be improved to make it more attractive for consumers to sign up in future?

It is important to note that data and insights presented at this early stage may not represent the future VPP consumer cohort, because consumers to date have benefitted from government-funded programs, with some of the Energy Locals (Tesla) consumers not owning the systems installed where they reside. Full research results will be provided in mid-2021 upon the completion of the research program, with the remaining VPPs and their consumers.

Response rates were at an average of 24% – a high response rate, attesting to consumers' level of engagement.

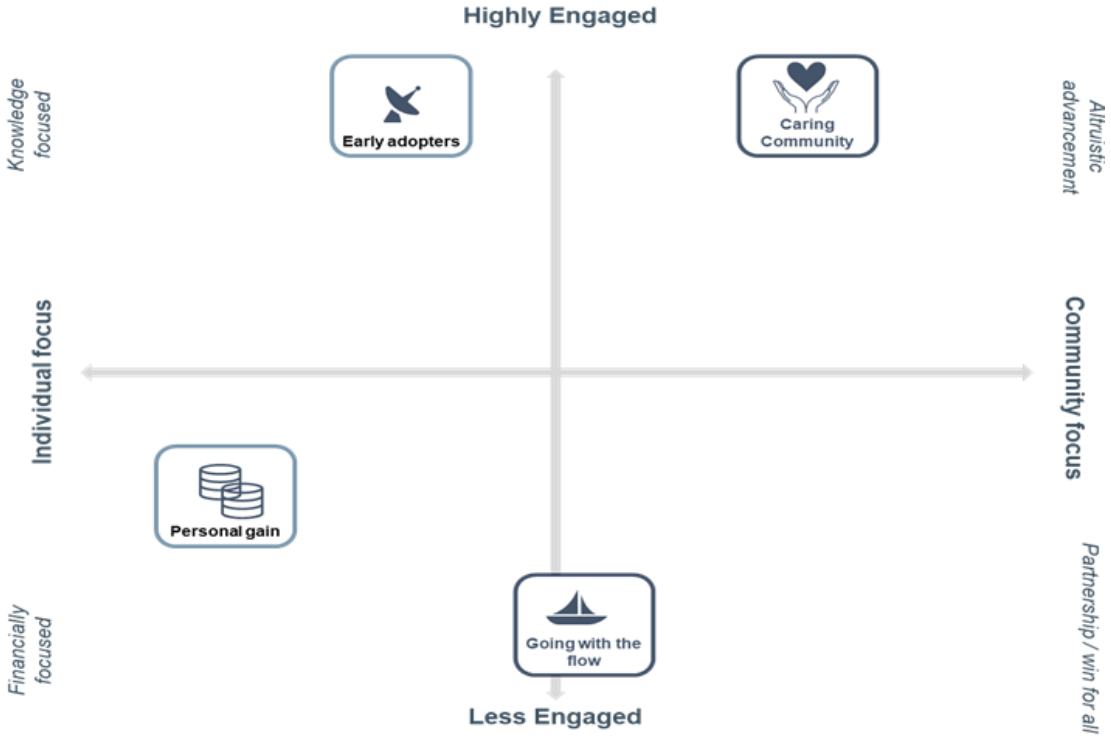
Analysis of the quantitative results demonstrated that VPP Demonstrations consumers are overrepresented in some demographic groups; they are more likely to be living in a metropolitan area, more likely to be male, more likely to be aged 50 years and over, less likely to have dependent children and more likely to live in a freestanding home. Qualitative analysis showed that in the case of couples, there may be two decision-makers in the household, both choosing a VPP, but sometimes for different reasons.

3.1 Consumers overall perception of VPPs

Understanding the drivers of participation can help stakeholders to meet consumer needs and expectations more effectively.

Figure 5 outlines the primary drivers of consumers participating in the consumer insights study, being level of engagement with the VPP (high to low) and the focus of the benefits (individual vs community).

Figure 5 Consumer drivers of participation



Three strong consumer segments emerged, based on their focus and drivers for participation, and each segment would value different approaches to engagement:

- **Early Adopters** are highly engaged with the new technology. These consumers wanted information and tools to engage with their system as effectively as possible (providing depth of information about their energy usage, battery storage, solar charging, environmental benefits and money saved).
- **Caring Community** are consumers focused on the benefits of renewable energy and stabilising electricity supply for the community, and want to learn more about the specific benefits of the VPP to the environment and wider community.
- **Personal Gain** are consumers who are primarily seeking a positive financial outcome, and want to be shown the savings they are accruing.

The fourth segment, **Going With the Flow**, are more likely to be consumers who appreciate the benefits of VPPs but are less engaged.

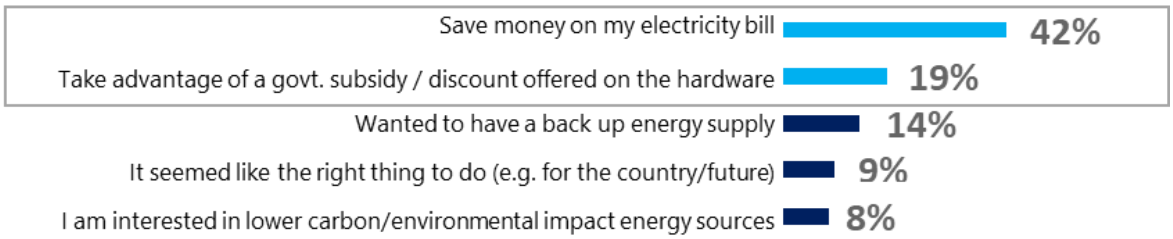
Quantitative research helps to understand the importance of these different drivers.

A very strong driver for participation in a VPP (as shown in Figure 6), among many consumers in different segments, is an expectation of a positive financial outcome through lower energy bills:

- 42% indicated being interested in joining a VPP to save money on their electricity bill through lower charges for usage.
- 19% wanted to take advantage of a discount offered on hardware.

This demonstrates that when attracting new consumers to a VPP, highlighting the financial savings is an important message.

Figure 6 Drivers for participation



Beyond lowering power bills, consumers can see a range of benefits, both for themselves as well as the wider community, in being a part of the VPP:

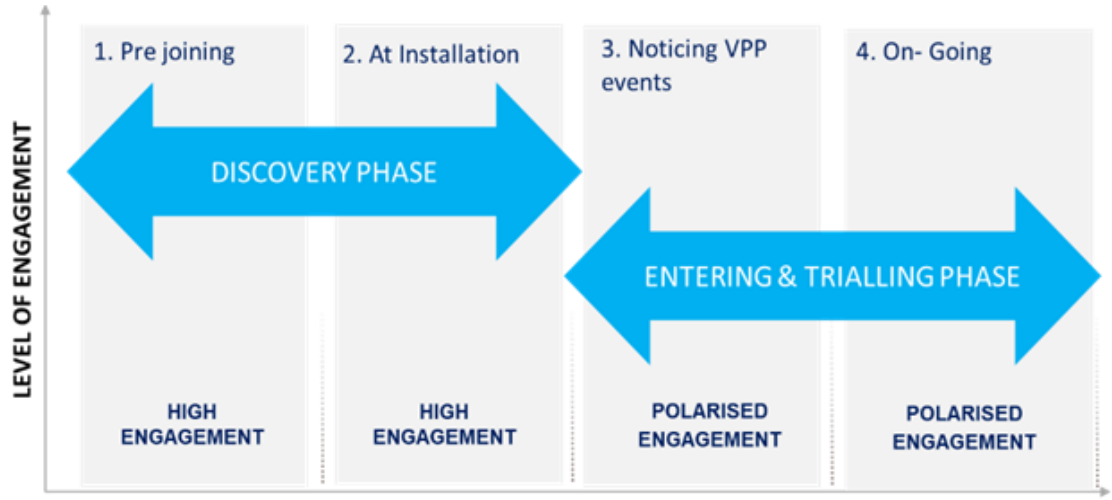
- Achieving faster payback on hardware.
- Willing to be part of the latest technology and pioneering in energy solution.
- Opportunity to utilise cleaner energy.
- Being able to support the state's power supply leading to fewer power outages in the community.

One key objective of the research was to understand how satisfied VPP consumers have been. Results showed a high level of satisfaction, and consumers indicating that they would be willing to recommend VPP participation to others. Qualitative research indicates that:

- **Early Adopters** are excited to be a part of the "leading edge" program.
- **Caring Community** and **Going with the Flow** are feeling good about using renewable energy.
- Some **Personal Gain** are experiencing the anticipated level of financial benefit while others are not, leading to variances in their levels of satisfaction with the program. Anecdotal evidence suggests that some **Personal Gain** did not receive comprehensive information about the financial costs and benefits of the VPP, leaving some feeling a bit disappointed. More comprehensive information at the beginning of joining a VPP would assist with later satisfaction levels for this segment.

Figure 7 outlines the consumer journey, from when they first learn about a VPP through to on-boarding and ongoing collaboration.

Figure 7 The VPP consumer journey



3.2 Improving VPP consumer experiences

The early stages of discovering a VPP and starting to experience and understand its benefits are critical touchpoints, shaping the overall consumer journey and perceptions of the VPP. Opportunities to strengthen and capitalise on the consumers' positive perceptions of the VPP concept are key to high levels of ongoing satisfaction and advocacy.

Communication improvements are encouraged during the entering and trialling phase to help consumers understand the benefit of participating in a VPP, by providing the information sought. In particular, consumers would like to understand:

- The financial benefits to their household (how much energy they provided to the grid and what they were paid for this).
- The environmental benefits (for example, how much CO2 was saved, and how can this be translated into tangible terms such as how many trees it is equivalent to planting).
- The community benefits (for example, how many minutes of power shortfalls in their state was saved by their household's power contribution).

CSBA will investigate further and validate findings throughout the remaining of the research.

In conclusion, to date in the research program,

- There are several compelling benefits for being a part of a VPP which are attractive to a range of consumers.
- Engagement, satisfaction and advocacy can be increased by ensuring consumers are kept informed throughout all stages of the journey and the benefits of a VPP are regularly reinforced with information about financial benefits, how their assets are improving grid stability for others, and the effects and impact of using renewable source of energy on the environment.

3.3 VPP consumer research next steps

The consumer program of work is continuing with the qualitative online community study at the beginning of 2021, a post-demonstration survey to be conducted in March 2021, and analysis of consumer data up to May 2021.

Any questions about this research study can be directed to Sabrina Cook, CX (Customer Experience) Consultant at sabrina.cook@csba.com.au.