

# **‘We want it to work’: understanding household experiences with new energy technologies in Australia**

Final report of the VOICES project (Victorian Energy and Water Ombudsman’s Investigation of Consumer Experiences)

Mr Hugo Temby  
Dr Hedda Ransan-Cooper

2021



# 'We want it to work': understanding household experiences with new energy technologies in Australia

Final report of the VOICES project (Victorian Energy and Water Ombudsman's Investigation of Consumer Experiences)

Mr Hugo Temby  
Dr Hedda Ransan-Cooper

March 2021

**Suggested citation:** Temby H, Ransan-Cooper H. *'We want it to work': understanding household experiences with new energy technology in Australia*. Battery Storage and Grid Integration Program (Australian National University), Canberra, Australia.

Battery Storage and Grid Integration Program  
The Australian National University  
Canberra ACT 2600 Australia  
[www.bsgip.com](http://www.bsgip.com)

This project received funding from the Energy and Water Ombudsman Victoria (EWOV) and the Department of Environment, Land, Water and Planning. The views expressed herein are not necessarily the views of EWOV or the Victorian Government.

## Table of contents

Acknowledgements	ii
Executive summary	iii
Guide to this report	viii
1. Background and context	1
State of knowledge on household energy transitions	2
Conceptual framing for VOICES	3
2. Methods	7
3. Motivations, attitudes and expectations	13
Pro-environmental attitudes	13
Transition awareness	16
Financial expectations	19
Independence and resilience	21
Community mindedness and collectivist values	24
Comfort	26
Personal transitions as triggers for technology purchases	28
Effort and implications for equity	29
4. Information sources and preferences	30
Seeing (and touching, hearing and remembering) is believing	30
Powering people’s passion: energy community groups in Victoria	32
State your case: the roles of government	34
‘Anything that’s obviously spin, I just glaze over’: industry information and marketing	37
The medium is the message – but some are missing out	39
Case study: My Efficient Electric Home	42
5. Experiences with installation and use	51
Technology providers as critical transition intermediaries	51
Technology use: practical, sensory and emotional aspects	60
Other factors, other actors: tariffs, bills, and retailers	69
6. Views on emerging business models and reforms for grid integration	73
Concerns about third party control of batteries, solar and electric vehicles	74
Conditions for third party control	81
Solutions should be collective and fair	82
7. Implications	84
References	89
Appendices	91

## Acknowledgements

We acknowledge and celebrate the First Australians on whose traditional lands we conducted our research, and pay our respect to their Elders past and present. The Ngunnawal and Ngambri people are the Traditional Owners of the land where the Australian National University's Acton campus is located. And our fieldwork, though largely virtual, took place in the traditional lands of First Nations peoples around Australia.

We gratefully acknowledge funding from the Energy and Water Ombudsman Victoria and the Victorian Department of Environment, Land, Water, Planning, which has made this research possible. We benefited from their collegiate and collaborative approach to the project, and their patience as we addressed the implications of the COVID-19 pandemic in 2020.

We thank the many other organisations and individuals who provided assistance, including with recruitment, by making their data available, and by sharing critical insights. In particular, we thank Prof Kate Auty, the Australian Electric Vehicle Association, the Consumer Action Law Centre, Curtin University, the Energy and Water Ombudsman South Australia, My Efficient Electric Home, Renew, Dr Mike Roberts and Totally Renewable Yackandandah. Thanks also go to Zoe Pruksapun-Duffin for research assistance.

Finally, but crucially, we acknowledge the VOICES participants, who so generously gave their time and shared their stories when so much else was happening in their lives.

## Executive summary

Australians are adopting new energy products and services in great numbers and at a great pace. In 2020, households and businesses installed a record 334,000 rooftop solar systems – despite, or perhaps due to, the impacts of the COVID-19 pandemic. Over the next two decades, the contribution of these systems, together with home batteries, is expected to more than double from around 9 per cent in 2021 to 20 per cent by 2040. Along with projected growth in electric vehicles (EVs) and other new energy products and services, the unfolding household energy transition will have profound implications for grid management. This has prompted a concerted effort by governments, industry and researchers to respond to technical challenges.

The household energy transition also stands to have significant social impacts. But beyond fairly instrumentalist research into the attitudes of energy ‘consumers’, surprisingly little is known about householders’ motivations for purchasing new energy technologies. And still less is known about their experiences using it – and the issues that they encounter. This is a major knowledge gap: new technologies are coming to market faster than regulatory frameworks can adapt, exposing users (and non-users) to new forms of risks and costs. It is critical to consider the implications associated with ‘responsibilising’ householders for new types of involvement in the energy system.

In this context, the Victorian Department of Environment, Land, Water and Planning and the Energy and Water Ombudsman partnered with the Australian National University’s Battery Storage and Grid Integration Program to undertake this research project, VOICES (Victorian Ombudsman’s Investigation of Consumer Experiences). From June 2020 until February 2021, we undertook (largely) virtual fieldwork reaching 92 householders, businesses, and industry experts. Methods included semi-structured interviews and technology tours, focus groups, a content analysis of an online user forum and a secondary analysis of existing data. This report presents our findings spanning the full breadth of householders’ journeys with their new energy products and services, and also focuses on the broader market and regulatory settings within which householders make their decisions.

### Motivations, attitudes and expectations

We find that almost all householders were motivated to some degree by pro-environmental attitudes, particularly the need for climate action. A sense of what we term ‘transition awareness’ – knowledge of, and motivation to support, the energy transition, was another significant factor. A range of other motivations, attitudes and expectations were at play, including financial expectations; the desire for greater self-sufficiency and resilience; community mindedness; enthusiasm for technology; and comfort. Major life events, like partnering, separation, retirement and illness also played a role in technology choices. These motivations, attitudes and expectations were held to varying degrees, in varying combinations, and interacted in complex and sometimes conflicting ways. Householders told us they were investing significant

time, effort and funds into researching, choosing and configuring their technology – resources that not all Australians have to spare.

#### Information sources and preferences

Many households and experts spoke of the importance of experiential information in purchasing a new energy technology and in learning to use it. Information from, and participation in, community groups was also highly valued by many households, and helped with their purchase and use of technology. Governments and industry also have a number of informational roles, but one in particular – leadership – is currently underdone, and some technology providers are failing to provide adequate information to users. Information quality and availability can be an issue, particularly for regional users. And vulnerable users are particularly exposed – sometimes deliberately, by unethical providers – to information asymmetries.

#### Experiences with installation and use

Technology providers (retailers, installers, and dealers) have a central role in determining whether householders' experiences with new energy products and services are positive. Good providers made the time to understand householders' contexts and objectives; to help navigate complex technological choices; to provide transparent generation estimates; and to simplify processes of installation, rebate application, and grid connection. Post-installation roles were also critical, in particular handover and after-sales support. Householders were employing a diverse range of monitoring strategies, and some – who were in a position to – were working to change their energy use practices to make better use of their new technology. EV charging was mostly done at home, but was complex and poorly understood, even by EV owners. Emotional and sensory experiences are shaping, and shaped by, experiences with technology, as are tariffs, bills and electricity retailers.

#### Householder views on emerging business models and reforms

Householders have a range of concerns associated with emerging proposals for the grid integration of new energy technologies. The root of these is that many householders feel the energy sector's motivations and concerns are not in line with their own. Issues raised include data privacy, and scepticism that third-party control would be in their best interest. Many householders did not trust networks or retailers, because they were perceived to hold narrow profit motives. Householders also felt a desire to control aspects of their energy use and technologies in line with their own routines and contexts, which they saw as conflicting with third party automation and control. Many householders were wary about solar curtailment and solar export charges, and felt that grid operators should do more to enable rooftop solar. Data privacy and misuse were also common concerns.

#### Implications and possible responses

Whether 'pale green' or 'true believer', we heard people want an energy system that

- is affordable – both financially and environmentally
- allows households to achieve their particular priorities: which could, depending on contexts, be any combination of comfort, convenience, self-sufficiency, entertainment, or community care
- is fair, and does not penalise people who are unable or unwilling to engage, or on the basis of gender, income level, housing tenure or location.

But the energy sector is not providing people with a system that reflects these values. Information on new energy products and services, and the energy sector more broadly, is complex and confusing. Managing new energy technology for a positive outcome is hard work, and many Australians – including vulnerable groups – will not be in a position to put in this effort, exposing them to new risks. We find there are five risk ‘areas’: quality, complexity, accessibility, timeframes and culture. Without action, these can be expected to get worse, and affect more people, as new energy products and services grow in popularity across Australia.

Building on suggestions from participants, we provide a number of possible responses (Table 1.1) that would, if taken together:

- increase protections for existing technology users
- expand access to cheap, clean electricity, including for vulnerable groups, without increasing their risk
- build trust and confidence in the energy sector.

The quotation we have chosen as the title of this report, ‘We want it to work’, comes from one householder, Jane, who was on one level reflecting on the difficulties she encountered with her virtual power plant. But Jane was also expressing a wider frustration (shared by many other householders) with a perceived energy leadership deficit in Australia – that is, that her personal commitment to climate action was not sufficiently reflected by (current) government policy settings and industry offerings. More and better government leadership – on climate change, on energy, on planning, on buildings – is critical. But there also needs to be concerted and ongoing attention to the roles of communities, civil society and industry across scales from local to national.

Addressing the energy leadership deficit in Australia goes well beyond the remit of the Energy and Water Ombudsman and, too, that of the Department of Environment, Land, Water and Planning. But we see a clear role for strengthened, coordinated approaches to energy and climate governance, even at the state level, that:

- reflects the scale and urgency of the climate crisis
- help make the energy system more equitable and just – including for women, renters, regional, diverse and low-income households
- better apportion risk and avoid unwelcome ‘responsibilisation’ of householders.

Table 1: possible responses

<p>Motivations, attitudes &amp; expectations</p>	<ol style="list-style-type: none"> <li>1. Consider ways to better support clean, cheap energy for all Australians, including low-income groups, that better manage the trade-offs between risk, responsabilisation, equity and economic efficiency (e.g. social enterprises, community energy, mid-scale generation, neighbourhood batteries).</li> <li>2. Consider other, non-technology alternatives for increasing energy equity, for example energy efficiency.</li> </ol>
<p>Information sources &amp; preferences</p>	<ol style="list-style-type: none"> <li>3. Better promotion of existing Victorian Government information resources (potentially via My Efficient Electric Home, SolarQuotes.com, Renew, technology providers).</li> <li>4. Better enforcement of existing Clean Energy Council requirements on staff training and information provision covering, inter alia, expected benefit, operation and maintenance.</li> <li>5. Work with vehicle manufacturers to develop an EV buyer’s guide, setting out key considerations for people considering an EV purchase.</li> <li>6. Consider providing more support for user-led deliberation, including My Efficient Electric Home and other online forums, community groups, and local governments (also consider physical and virtual alternatives to Facebook).</li> <li>7. Consider other options for improving energy engagement in the community.</li> </ol>
<p>Experiences with installation &amp; use</p>	<ol style="list-style-type: none"> <li>8. Better enforcement of existing new energy technology consumer protections (especially for responsible sales and marketing, after-sales support and coordinate of the grid-connection process).</li> <li>9. Better enforcement of adjacent regulations/codes, including around electricity safety and occupational health and safety.</li> <li>10. Consider expanding the Energy and Water Ombudsman Victoria’s jurisdiction to include all new energy technology products and services.</li> <li>11. Consider alternative options for timely issue resolution that are more responsive and accessible (e.g. digital) to reflect changing markets.</li> <li>12. Consider tightening Solar Victoria guidelines to exclude buy now, pay later finance and unsolicited sales – not just high-pressure sales.</li> <li>13. Consider options for decentralising the national energy regulatory framework to better oversight outcomes for users of decentralised energy technology.</li> <li>14. Consider options for a compensation scheme of last resort for new energy technology users who are left out of pocket through the fault of their provider and unable to be recompensed through other means (models include the Victorian Legal Services Board’s Fidelity Fund, the ACT Government’s Default Insurance Fund, and the Commonwealth’s proposed Compensation Scheme of Last Resort).</li> </ol>

Views on new business models & reforms	15. Support for new multi-stakeholder partnerships working on value-sensitive design, responsible research and innovation, and social and institutional innovations for decentralised energy ownership and operation.
Overarching	<p>16. Ensure all policy making in energy, transport and planning is climate compatible – and coordinated across all areas and levels of government.</p> <p>17. Invest in research capacity for socio-technical transitions, to identify governance responses that support rapid and equitable transitions.</p>

## Guide to this report

This report presents our findings spanning the full breadth of householders' journeys with their new energy products and services. These journeys also provide a frame for this report.

Following the background and methods chapters (1 and 2):

- Chapter 3 explores householders' motivations and expectations for their new energy technology purchase
- Chapter 4 examines the information sources that householders access in considering their technology purchase and in its operation, and why – we then explore the roles of an online user forum, My Efficient Electric Home, in market formation and consumer protection
- Chapter 5 relates householders' experiences with the installation and use of their technology – and the issues that they encounter
- Chapter 6 explores the views of householders and experts on new business models and policy reforms for network integration of new energy technology
- Chapter 7 considers the implications of our findings, and sets out some possible responses.

We then provide three appendices that provide additional, summary information on

- the positive emotions and negative emotions experienced by householders using their technology
- attitudes among householders to emerging business models and reforms for grid integration
- common issues and risks with new energy products and services as communicated to us by householders and experts.

## 1. Background and context

*'It's important we get this right, because it's coming, and it's coming faster than we probably expect.'*

—James, energy retail expert

Australians are adopting new energy products and services in great numbers and at a great pace. Across the country, households and businesses installed a record 334,000 rooftop solar systems in 2020 – despite, or perhaps due to, the impacts of the COVID-19 pandemic.<sup>1,2</sup> This brings the total number of installed systems in Australia to around 2.66 million, and one in four households.<sup>3,4</sup> Over the next two decades, the contribution of these systems, together with home batteries, is expected to double from around 9 per cent in 2021 to 20 per cent by 2040.<sup>5</sup> Along with projected growth in electric vehicles (EVs) and other new energy products and services, the unfolding household energy transition will have profound implications for energy equity and grid management.

### The brief

The rapid uptake of new energy products and services has prompted a concerted effort by governments, industry and researchers to respond to associated technical challenges. But the household energy transition also stands to have significant social impacts, and beyond fairly narrow and instrumentalist research into the attitudes of energy ‘consumers’, surprisingly little is understood about householders’ motivations for purchasing new energy technologies. And still less is known about their experiences using it – and the issues that they encounter. This is a major knowledge gap: new technologies are coming to market faster than regulatory frameworks can adapt, exposing users (and non-users) to new forms of risks and costs. It is critical to consider the implications associated with ‘responsibilising’ householders for managing the energy system in new ways.

In this context, the Victorian Department of Environment, Land, Water and Planning and the Energy and Water Ombudsman Victoria have partnered with the Australian National University’s Battery Storage and Grid Integration Program to undertake this research. Our project, VOICES (Victorian Energy and Water Ombudsman’s Investigation of Consumer Experiences) has explored experiences with and views on seven new energy products and services: 1) rooftop solar; 2) home batteries; 3) EVs; 4) home energy management systems; 5) virtual power plants (VPPs); 6) microgrids; and 7) peer-to-peer trading. The focus of the research is primarily on understanding: 1) the range of problem areas encountered by users of new energy products and services; and 2) barriers to market formation of less common technologies such as EVs and VPPs.

## State of knowledge on household energy transitions

### Research on household technology adoption in Australia

In Australia, energy social scientists have undertaken several in-depth studies into the motivations for, experiences of, and impacts from, household consumption of new energy technologies. Key reports include:

- the CONSORT Bruny Island Battery Trial's final report, *Social science* (2019), by Watson et al.<sup>6</sup>
- the Engaging Households towards the Future Grid project's interim report, *Engaging households towards the Future Grid: experiences, expectations and emerging trends* (2019) by Nicholls et al.<sup>7</sup> and final report, *Engaging households towards the Future Grid: an engagement strategy for the energy sector* (2019) by Strengers et al.<sup>8</sup>
- the Smart Home Control project's final report, *Smart home control: exploring the potential for enabling technologies in vulnerable, disengaged and regular households* (2017) by Nicholls et al.<sup>9</sup>
- the Consumer-led Distributed Energy Study project's final report, *VPP user research* (2020) by Roberts et al.<sup>10</sup>

Key themes that emerge from these studies include:

- Householders have a range of motivations as well as financial savings for household energy technology purchase, including a desire to contribute to the energy transition, and become more self-sufficient.
- New energy products and services can be confusing and their installation frustrating and stressful, with key gaps between user expectations and what has been provided. 'Intermediaries' such as installers can be either barriers or enablers for positive experiences of technology use and wider diffusion.
- 'Smart' energy technologies do not always neatly slot into people's everyday lives, and so the potential positive impacts are highly uneven (and may even cause new types of intra-household conflict). They are also sometimes not smart in the way householders want them to be.
- Australians are highly dissatisfied with the energy system as it stands. There are low levels of trust attributed to high energy bills, a lack of long-term planning, and privatisation of an essential service.
- While many households are largely disengaged from the market and associated actors (large retailers and some networks), they are highly engaged on energy issues such as comfort, reliability, affordability and environmental sustainability.
- The distrust that Australians express in relation to the existing energy market is likely to affect perceptions of emerging policy reforms and business models such as solar curtailment, VPPs and vehicle-to-grid technology.

A common theme underpinning these studies is that consumption is not only a matter of consumer motivation alone. Householders make consumption decisions and experience technology in specific social, political and environmental contexts. Understanding these contexts – the organisations householders come into contact with, the conversations they have with others, their everyday routines and expectations of technology, previous experience and future hopes/desires are all important in understanding technology adoption. The energy industry has tended to frame the household energy transition as about individuals

making decisions according to their perceived interest and motivation. The research above reveals the limitations of this approach.

While the above studies have been able to shed light on the many risks and opportunities in household energy technology adoption, they are limited in number. For instance, the CONSORT trial still stands as the only study of experiences of new energy products and services providing network support (the *VPP user research* report relates to existing owners' perceptions, rather than experiences). As well, the focus of several of these studies, understandably given the interest in social acceptance of new technologies, have been on *perceptions* of emerging technologies. There is generally a gap in detailed analysis of existing technology owners' *experiences* of new energy technologies, partly because some of these technologies have only so recently come to market.

## Conceptual framing for VOICES

How are technologies adopted?

Energy policy discussions in Australia have typically been dominated by neoclassical economics, and more recently, behavioural economics. In terms of explaining energy transitions by researchers, economics has a number of strengths including providing the basis for supporting new technologies at different stages of the 'innovation chain'. One drawback is that it only provides limited insights into either the process of innovation or the most effective means of policy support. Insights from behavioural economics and social psychology provide deeper insights into the influences on relevant choices and routines and suggest ways to 'nudge' people and organisations towards desirable choices and routines. However, this generally only focuses on individual consumers and assumes the designers of the program have a complete understanding of the best public interest outcome. It thus under-appreciates the importance of interactions with other actors, organisational decision-making, economic and social contexts and the degree of complexity involved in asserting the programmatic goal. More fundamentally, both economics and social psychology have an individualist orientation that underestimates the significance of the collective and structural factors that shape behaviour, guide innovation and enable and constrain individual choice.<sup>11</sup>

Domestication theory and user innovation

To guide our research into the motivations, experiences, and 'coproduction' of technologies in the home, we draw on domestication theory. Domestication theory grew out of anthropology and consumption studies in the 1990s. The approach was originally used to better understand social acceptance (and rejection, or non-use) of new information communication technologies such as personal computers and, later, mobile phones. Domestication theory identifies four processes through which new technologies become domesticated: *appropriation*, or the 'negotiations and considerations' of technology acquisition; *objectification*, or the location of the technology in the (physical) home; *incorporation*, or the scheduling and use of the technology; and conversion—the 'mobilisation' of technologies as part of people's identity. The theory emphasises the creative agency of users, who do not just buy new technologies but also embed them in their daily lives, and sometimes creatively modify their functions in this process.<sup>12</sup> Embedding new technologies in domestic spheres requires cognitive work (learning about the artefact and developing new competencies), symbolic and affective work (articulation of new interpretive categories, symbols, and beliefs that guide 'sense-making' of new technologies) and practical work (adjustment of user routines to

match the new technology).<sup>13</sup> Similarly, the literature on user innovation suggests that users play active roles in the development of new uses of technologies that were not foreseen by producers, a phenomenon we observe in this study with energy technologies.<sup>12</sup> The theory provides a conceptual framework to understand the process of how the technology ‘comes in’ to the home and stabilises (or not) into routines with particular outcomes and impacts.

### Socio-technical transitions

But new technologies also emerge from specific social, political and cultural processes, which also occur outside of the domestic sphere. As such, our study also draws on insights from socio-technical transitions literature. Energy services such as electricity, heating and mobility are provided through large-scale, capital-intensive and long-lived infrastructures that co-evolve with associated technologies, institutions, skills, knowledge and behaviours to create broader ‘socio-technical systems’.<sup>14</sup> These systems are called ‘sociotechnical’ because they involve multiple, interlinked social and technical elements, such as technologies, markets, industries, policies, physical infrastructures, user practices and societal discourses. The implications for our study is that understanding barriers to specific technologies – for example, EVs – requires recognition that EV adoption is not just about user motivations/a simple substitution of one type of car for another, but that it may require changes across a range of arenas of social activity. This is why we interviewed intermediaries and experts across the range of areas which intersect the technology, such as EV dealerships, other technology providers and user groups.<sup>15</sup>

Sociotechnical systems have considerable inertia, making it difficult for radically different (and more sustainable) technologies and behaviours to become established – such as EVs or public transport. Hence, bringing about a sustainable energy system involves more than improving individual technologies or changing individual behaviours, but instead requires interlinked and potentially far-reaching changes in the systems themselves – or ‘socio-technical transitions’. These transitions are typically complex, protracted and path dependent and the outcomes are challenging to predict. Generally, new technologies often become mainstreamed through the following processes: when the visions and expectations of a ‘niche’ technology become more precise and broadly accepted, and the various learning about what the technology can do/be are shared resulting in a ‘dominant design’. (A new technology will initially be quite fluid and open to ‘what could be’, but then solidifies and becomes embedded in standards and training and becomes more rigid<sup>16</sup>. The networks of organisations involved in the technology also increase in size, which we can observe, for instance, in the establishment of industry bodies such as the Clean Energy Council. An implication for our research is that scaling up new energy products and services is not just about industry meeting consumer demand. It will also require the involvement of many players and good coordination between different parts of the system. As such, as much as we need to understand user expectations and motivations, we also need to understand the capacities of regulators, dispute resolution schemes, policymakers, consumers, advocacy groups, businesses, and industry bodies.

### How do energy technologies have a positive impact?

Socio-technical transitions researchers have recently paid more attention to questions of responsible innovation and energy justice. But it is worth emphasising this theme as it has its own research tradition. Just as it is important to understand the processes behind how technology becomes accepted and used, it is also important to explore who the technology benefits, and who is exposed to associated risks, from cradle

to grave. Elements of these questions can only be answered with quantitative data, and with extensive detailed analysis (for each new energy product and service) and are thus not all in scope of this study, nevertheless they provide an important framing for our analysis:

1. Are the benefits of new energy products and services accessible to all its users, and user types, if not why?
2. Are the risks (financial, safety, cultural) raised by new energy products and services appropriately managed within the current regulatory and market context?
3. Do new energy products and services individually, and taken together, reflect the needs and values of Australians?

These questions inform our research approach. For instance, we made a concerted effort to recruit participants from groups that are less well represented in energy technology such as women, renters, and regional Australians. We also included specific questions around experiences and views on emerging business models and reforms (such as solar curtailment). Figure 1.1 shows how these energy justice questions, together with questions arising from domestication theory and socio-technical transitions, make up the wider conceptual framing for our research.

#### State of knowledge on how to ensure rapid and equitable energy transitions

How transitions are governed can be equally important as the specific technologies or the policy incentives, in terms of technology uptake. One approach for considering rapid and just energy transitions is ‘polycentric governance’. Polycentric governance involves multiple governing authorities at different scales rather than only the ‘government’ (though governments do play a pivotal role). This governance approach involves building coalitions. It can harness the power of diverse perspectives, and promotes cooperation rather than competition. Polycentrism captures the benefits of local action without compromising many of the benefits of national level action (e.g. equity, and consistency). Having multiple organisations (from civil society and industry) means that different actors can review a problem, provide improved solutions and better experimentation. Energy research suggests this could facilitate future rapid energy transitions.

Features of an effective polycentric energy governance framework could include several features: 1) equity and co-benefits; 2) inclusivity and local involvement; 3) information, demonstration and innovation; 4) ownership and accountability; 5) organisational multiplicity; and 6) experimentation and flexibility. An in-depth discussion about how these features are present or where they are missing in the seven technology and service types is outside of the scope of this report, but would warrant further research. They also indirectly inform our suggestion for potential future responses outlined in Chapter 7.

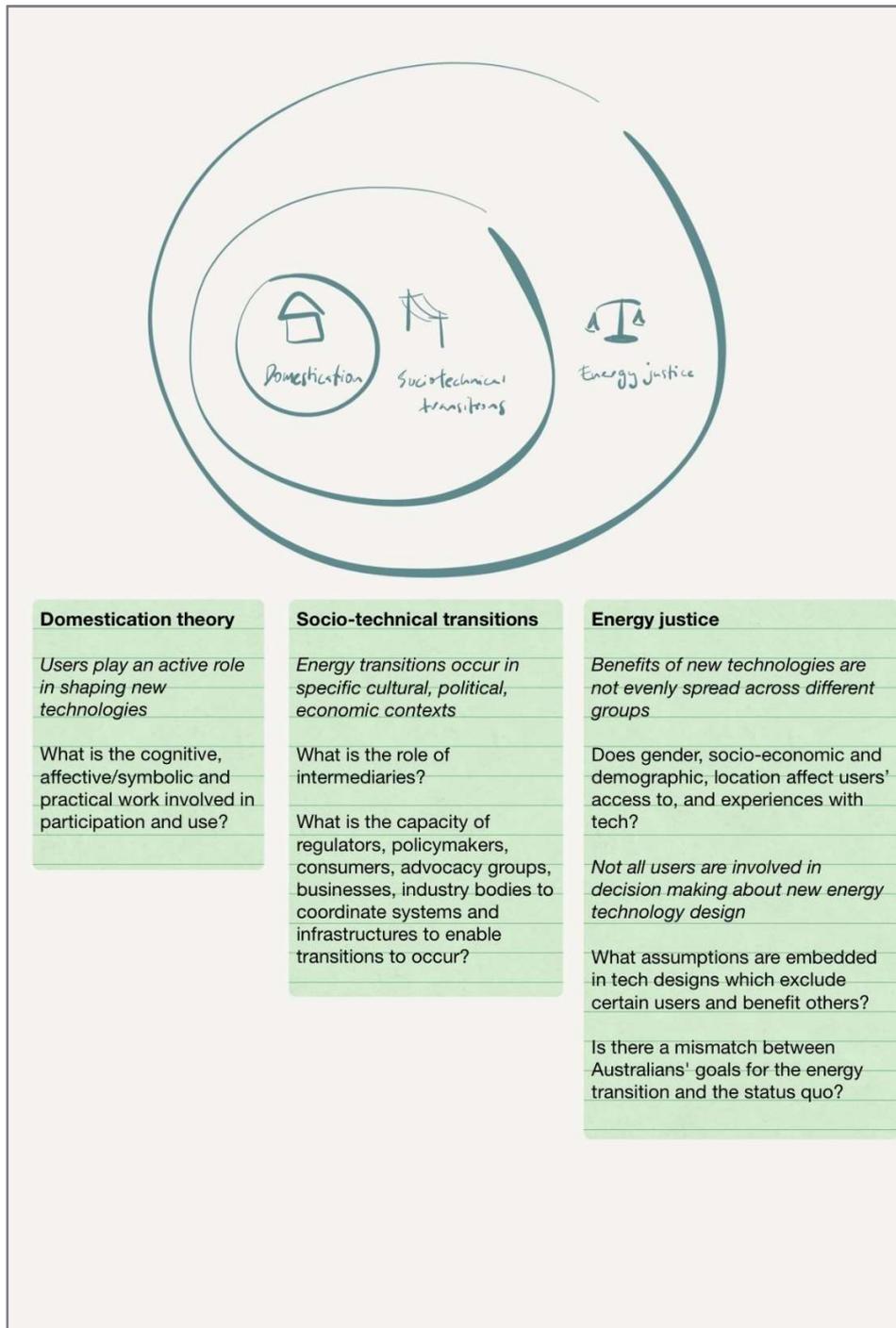


Figure 1.1: conceptual framing for VOICES research design

## 2. Methods

*'Zoom's better than a phone call.'*  
—Curtin University researcher

We took a qualitative research approach to the VOICES project. This can generate rich, contextual data and is well suited to exploring in-depth, complex experience. This can be particularly helpful in analysing experiences that are not well understood and changing rapidly – as is the case for new energy products and services. Qualitative research also allows researchers to deepen their understanding of a complex area over the fieldwork period: that is, researchers can adapt approaches and questions as they better understand issues of concern through their interactions with participants. This chapter provides further information on our methods, including recruitment, sampling, data collection and analysis. We also discuss the impacts of the COVID-19 pandemic.

### Summary

Our research into people's experiences with new energy products and services used a range of qualitative methods, including semi-structured interviews, focus groups, 'tours' of householders' installed technology, a content analysis of an online user forum and a secondary analysis of existing data. Potential participants were identified through online groups, personal networks and snowball sampling, with the final participants based on purposive sampling as well their availability and interest. In total, our data covers 92 householders and energy industry and consumer experts. Most participants were based in Victoria, although we recruited interstate where this would allow additional insight to specific technologies. Fieldwork ran from June 2020 until February 2021, and due to the COVID-19 pandemic was largely undertaken remotely using the Zoom teleconferencing program. Data were analysed using the NVivo qualitative data analysis software program.

### Recruitment, sampling and diversity

We recruited research participants through a range of methods, in particular:

- advertising on online user forums, such as My Efficient Electric Home
- advertising in email communications to Australian Electric Vehicle Association and Renew members, and Solar Victoria customers
- through the networks of researchers, project partners, and other relevant organisations
- through the snowball sampling approach, where participants provided us with the details of potential additional participants through their own networks.

Before we confirmed participation, most potential participants were asked to provide some basic demographic information with an expression of interest (the exception was where they had already been identified as suitable for the study). Final participation was then determined using purposive sampling and on the basis of participants' availability and interest. Ultimately, we were able to recruit 68 householder and industry participants. Additionally, Curtin University provided us primary data on a further 24 householders from Western Australia, who participated in two 2018 focus groups on a peer-to-peer energy trading (P2P) trial, bringing total people covered to 92. Table 2.1 shows the number of householders we heard from for each technology type (we do not include a total, as some householders had multiple technologies, and so are counted multiple times).

Table 2.1 householder participants (interviews and focus groups), by technology type

Technology type	Count
Rooftop solar	41
Home battery	11
Electric vehicle	19
Home energy management system	8
Virtual power plant	4
Microgrid	5
Peer-to-peer trading	24

The underlying rationale for our sampling approach was to speak with householders from as diverse a range of demographic characteristics as possible. We specifically encouraged women, renters and people from diverse backgrounds – demographics which were underrepresented in our initial invitations – to participate in the research. Table 2.2 shows a breakdown, by gender, of householder interviewees (we lack demographic data on some householder focus group participants). As can be seen, women made up 13 of the total 38 householders interviewed, or around 34 per cent. Note women were less well represented among total participants (e.g. also including energy industry experts), perhaps reflecting a broader lack of gender equity in the energy industry.

Table 2.2: householders interviewed, by gender

Gender	Count
Male	25
Female	13
Total	38

For the most part, participants lived in Victoria, although we recruited interstate where this would provide additional insight that would not otherwise be available (e.g. the P2P trial in WA and a VPP trial in South Australia). We achieved a good mix of urban and regional households, as shown in Table 2.3 (note the distinction between households and householders, e.g. the individuals living in the home).

Table 2.3: total households (interviews and focus groups), by remoteness (ABS 2016)

Remoteness classification	Count
Urban	29
Inner regional	16
Outer regional	3
Total	48

We faced challenges attracting young people, renters and people from non-English speaking backgrounds to participate in our research, as can be seen in Table 2.4. There are three possible reasons for this. First, limitations associated with the COVID-19 pandemic meant we were unable to recruit in physical locations, such as community facilities. Instead, we relied on online (often energy-focused) groups, membership of which implies a degree of education and affluence. Second, the pandemic has had a disproportionate impact on women and low income households, who may have had less capacity to participate in the study as a result (COVID-19 may also have limited the capacity of some civil society organisations to assist us with targeted recruitment). Third, a major objective of our research was to better understand the experiences of householders who had already purchased new technology. Accordingly, it is likely that our sample is reflective of a broader lack of diversity in new energy technology ownership in Australia, much of which requires secure tenure (for necessary housing modifications), spare capital (for high up-front costs) and spare time (to navigate the technology’s complexity).

Table 2.4: other demographic characteristics

Characteristic	Count
Young people and young adults (<35)	5
Renters	5
Households with a non-English speaking background	4
Households living with disability	2

### Data collection and analysis

Fieldwork for the project comprised 45 interviews, 3 focus groups, an internet user forum content analysis and a re-analysis of primary data, as discussed further below and summarised in Table 2.5 (the methods underpinning our content analysis are discussed in the case study in Chapter 4). Interview and focus group discussion questions were developed within a body of research on this topic (as described in Chapter 1) and a review, for each technology, of common user concerns. All fieldwork was approved through, and complied with, the Australian National University's human ethics approval process (protocol number 2020/077). Our interview and focus group guides are available on request.

Interviews and focus groups were recorded and transcribed for subsequent analysis. Our coding approach combined deductive (top down, informed by prior research) and inductive (bottom up, exploratory) approaches. We undertook a thematic analysis to identify common ideas and issues. All analysis was done using the NVivo 12 qualitative data analysis program.

Table 2.5: data collection undertaken, by method

Method	Count
Interviews conducted	46
Focus groups conducted	3
Content analysis	1
Re-analysis of Curtin University data	1

We conducted semi-structured interviews, most lasting between 60 and 90 minutes with households and energy industry and consumer experts, as shown in Table 2.6 (note, the total exceeds 46 as some experts had also installed the technology in their homes, and so were able to also comment from a householder's perspective). Interview questions with households explored:

- attitudes and expectations motivating their technology purchase decision
- information used in coming to a purchase decision and learning to use their technology, and why
- the extent to which the technology was meeting their expectations, any issues or concerns they had with its purchase, installation or operation, and whether, how, and by whom these were resolved
- monitoring practices, behaviour change, and familiarity with electricity bills and tariffs
- attitudes to, and experiences with, control and solar curtailment.

Table 2.6: interviews undertaken, by group

Group	Count
Households	34
Businesses	11
Civil society organisations	8

Interviews with energy industry and consumer experts were undertaken later in the fieldwork phase so as to explore and test issues raised by householders. Questions covered:

- their existing knowledge of their customers/clients and their motivations
- typical sales/support processes for their business/organisation
- common issues arising for their customers/clients during installation and use, and whether, how and by whom they these issues are resolved
- challenges and opportunities for their business/organisation arising from new energy products and services, including with relation to government policy
- views on existing consumer protection frameworks and any gaps.

Our focus groups were more exploratory and were conducted later in the fieldwork phase so that we could test themes and ideas that emerged during interviews. Following a short elucidation of key concepts, we asked householders to reflect on, in relation to electric vehicles, rooftop solar, home batteries and microgrids:

- practical issues that may emerge as more Australians purchase these technologies, and the advantages and disadvantages of the different proposals for their resolution
- considerations for alternative ownership models for these technologies, and the implications if any of place (e.g. regional and rural versus urban contexts)
- views on existing consumer protection frameworks and any gaps
- the extent to which these technologies might support or detract from self-sufficiency and resilience.

In addition to our own fieldwork, Curtin University provided us with access to primary data from two focus groups it undertook in 2018 exploring attitudes to a P2P trial in Western Australia that, to our knowledge, remains the only example of P2P technology deployment in Australia. This data, comprising transcripts and some audio, was re-analysed using the same approach as for our own data, described above.

#### Fieldwork in the time of coronavirus

Our original research design involved conducting face-to-face interviews and focus groups. But the public health measures put in place for Australia's COVID-19 response meant that such in-person fieldwork became impossible. Instead, we drew on a combination of video interviews – including virtual ‘technology tours’ – and video focus groups, as these most closely resembled our original proposed methods. We used the Australian National University's secure edition of the Zoom video conferencing program, as from our review of the virtual methods literature Zoom appeared to be the most suitable and easy to use. In addition, ‘epistolic’ email and photo exchanges ahead of time helped us to develop rapport with participants. Aside from a few minor glitches, mostly relating to broadband speed, we did not encounter any significant issues with these approaches, and almost all participants expressed confidence in the approach. However, we did find that online focus groups were most successful, with smaller group sizes: four to five participants, including facilitators, seeming to work best.

#### Interpreting the research findings

There are several limitations that are worth noting in terms of interpreting our research findings. First, it is important to note that the intent of qualitative research is to generate depth of understanding, not (necessarily) the extent to which these experiences are experienced across all energy technology owners.

Second, as discussed above, the nature of online recruitment, together with the impacts of the pandemic, and the current demographic characteristics of new energy technology ownership, limited participation by some groups. Accordingly, our findings should not be seen as generalisable to the full range of existing and potential energy technology owners – particularly given the next wave of new energy technology owners is likely to be younger and more diverse than the current cohort.

A final limitation is that non-technology owners are not considered in the following analysis. This is worthy of mention because the emergence of millions of individual new energy technology users is now having discernible impacts on grid infrastructure as well as Australia's rate of decarbonisation. These are questions that all Australians have an interest in – not just those who already own these technologies. As such, future research and policy processes need also consider their views and also take into account the risks that inequalities associated with early adoption can be 'baked in' with long-term consequences.

#### Future research

It is important to note that there are some complex unresolved questions about how new energy products and services can be more equitably governed. This will require significant research and policy attention across multiple scales of analysis (from considering global supply chains of clean technologies, to the interests of future generations). We know, for instance, that while some of their public effects have been invisible to solar owners themselves, adoption (and benefits) of these technologies have been heterogeneous, shaped by income, housing tenure, location and family type.<sup>17</sup> Recently, inequality in access to rooftop solar has surfaced in critical ways as debates about grid integration intensify, as we have seen with the issue of solar curtailment and solar export charges.

### 3. Motivations, attitudes and expectations

*'I've always been interested in how I can reduce my dependence on electricity ... and how I could be a more conscious environmental citizen.'*

—Jenna, Shepparton

The first part of our householder interviews explored people's motivations for their technology purchase; their attitudes towards new energy products and services, and energy more broadly; and the expectations they had for their technology. We also explored wider attitudes to new energy products and services through a series of focus groups. And we asked energy industry experts what they knew about their customers' motivations. This chapter reports our findings.

#### Summary

Almost all householders were motivated to some degree by pro-environmental attitudes, particularly the need for climate action. A sense of what we term 'transition awareness' – knowledge of, and motivation to support, the energy transition, was another significant factor. A range of other motivations, attitudes and expectations were at play, including financial expectations; the desire for greater independence and resilience; community mindedness; enthusiasm for technology; and comfort. Major life events and changes, like partnering, separation, retirement and illness, also played a role in people's technology choices. It is important to note that these motivations, attitudes and expectations were held to varying degrees, in varying combinations, and interacted in complex and sometimes conflicting ways. Householders told us they were investing significant time, effort and funds into researching, choosing and configuring their technology – resources that not all Australians have to spare.

#### Pro-environmental attitudes

As described in more detail below, pro-environmental attitudes were close to ubiquitous, with nearly all householders raising the environment as a motivator for their technology purchase. However, there is some nuance behind his headline. Some householders characterised themselves as 'pale green': willing to support the environmental cause, but only/especially when it came with a financial return. Others were deeply committed to environmental action, almost irrespective of cost. Some households wanted to demonstrate new technologies and hasten their diffusion. Some were engaged in other pro-environmental or prosocial activities and were concerned about end of life implications of solar and battery technologies. A strong theme among many householders was a desire for more government leadership on climate and energy policy.

#### 'Pale greens' ...

Some households reported they were glad to be able to contribute to environmental and climate action now that new energy products and services are increasingly affordable. Raoul, from Melbourne, said he was 'on

board' with environmentalism, but that, for him, financial returns were just as, if not more, important: 'Look', he said, 'I'm a pale shade of green. I'm not a raging greenie.' Harrison, also from Melbourne, told us that while his family's decision to get off gas and install solar was predominantly financial, there was an 'environmental side of it as well, there is a perspective that we would like to avoid using fossil fuels.' And Richie, from Adelaide, told us 'as much as I'm not a greenie, I think it's inevitable down the track that things have to be done.' By contrast, financial returns were less important for Sue, from Woodend, though she told us these were still a consideration: 'Look, it is interesting about the reducing the bills, but actually it's not our main driver'.

Irrespective of individual emphasis, however, it can be seen that such 'pale green' households are trying to balance both of these (and often other) objectives. It is worth noting that most pale green households had not yet invested in other new energy technologies, like home batteries or electric vehicles (EVs), which were generally seen as less affordable. Aidan, an experienced solar installer, told us that over the past five years he had seen an increase in households making technology investment decisions on the basis of environmental reasons, even in the outer suburbs of Melbourne with less disposable income. 'But', he said, 'like everything that everybody cares about, the financial stuff does matter.'

#### ... and true believers

For other householders, environmental and climate action were seen through a moral prism, with an attendant imperative to 'do the right thing'. Many noted the projected impacts of climate change on future generations, and some the importance of this consideration in shaping their own views. A few householders appeared to want to make up for previous, carbon-intensive lifestyles. Some in this group argued that financial motivations were not a consideration for them. (Note this view was not well known across most of the energy industry experts we spoke with, perhaps as it conflicts with a prevailing framing of consumers as 'rational', self-interested consumers – a mismatch we explore further in Chapter 6.) This group was also more likely to have purchased other new energy technologies like EVs and home batteries and/or be participating in virtual power plants (VPPs) and other trials. Some illustrative quotations from this group follow:

It's not economic. It's environmental concerns, and concern for the future. (Jan, Melbourne)

Yeah, I'm a bit more worried about climate change than I was a few years ago. Like, the more I know, the more weird it gets. And things seem to be moving faster. So I want to do as much as I can. (Rae, Melbourne)

Philosophically, I think we need to stop mining coal and energy sources that are damaging our Earth. And I think we need to look at other forms of energy if we possibly can, because we're destroying what we've got, basically. So I try to do the right thing in all areas, in as many areas as I can, to try and look after the planet. (Janet, Melbourne)

I've got two young kids. My whole view on life has changed. I'm sort of thinking, you know, of the future, and what's it all going to be looking like.' (Alex, Euroa)

I hate to see what's going to happen for my kids, your kids, where it's gonna go to. (Chris, Smiths Lake)

### A holistic perspective

Several householders stressed that energy efficiency and conservation – including behaviour change – were just as important as new energy products and services in achieving environmental and financial outcomes. Some noted the importance of other prosocial and pro-environmental activities like recycling, composting, and volunteering for environmental organisations. A few drew a link with resilient farming and land management practices. Some households were concerned about end of life arrangements for solar panels and (particularly) home batteries. And the origin of lithium and other rare earths was a concern for some given human rights and environmental concerns in their supply chains. These wider considerations are reflected in the following:

So we're continually looking at, you know, saving energy in different ways in our life. Or saving packaging, or recycling stuff, or stop[ping] getting things that need recycling. Just sort of changing our whole lifestyle around that. So this—the car just fitted in with that as well. (Lachlan, Melbourne)

And you can see with all the stuff we've done in the house, the water [usage] has gone down with the tanks. The gas has gone down because we have double glazed the windows and we've, you know, stopped all draughts and sealed all the gaps in the ceiling and walls. So basically, all of us in this house have been on a pretty big sort of sustainability journey for the last 12 years or so. We've done a lot of little things and big things in the house just to try and get off fossil fuels. That's been our push. (Kathy, Melbourne)

It's perhaps the recycling of those components. I mean, I know at the moment solar is really too new just to have hit a problem, really, with recycling the panels. But you can imagine in perhaps 20 to 40 years there will be—I mean, that's obviously a far less severe one, but it will ultimately be quite a substantial issue. (Anthony, Melbourne)

### Laggards and local leaders

Many households expressed a very strong desire for Australian governments – particularly at the national level – to do more on climate change, with some speaking enthusiastically of the economic and employment opportunities for Australia in doing so. But many were highly sceptical about the current federal government's record on climate change, and its close ties to the fossil fuel lobby. Relatedly, some households were dubious about the current levels of climate ambition shown by the electricity industry and the efficacy of existing offset schemes, with some households switching, or considering switching, to electricity retailers perceived to be more 'ethical', or 'green' (this distrust in the sector has wider implications, which we discuss in Chapter 6). For example:

It [renewable electricity] makes a huge difference. I think it's a question of learning to live in our country. (Linden, Greendale)

I'm just terribly disappointed about [the] renewable energy ... attitude out of the government. They're obviously getting fostered by the fossil fuel organisations and the same as electric cars are getting battered by the ICE [internal combustion engine] engine manufacturers. And maybe they should, maybe they shouldn't. But I'm certainly for an electric car as soon as I can afford one. (Bill, Ballarat)

Well, we are going to change our [energy] companies. We just haven't got round to it. We're just trying to figure out which is the best. We want to change to the best ethical electricity retailer. And that's a hard one to find at the moment. So if you've got any recommendations, I'm happy to hear them! (Lachlan, Melbourne)

When you see [the] Queensland government, they spent—was that federal?—four million dollars to do a sustainability study in Queensland to see if they wanted to build another coal fired plant. And then others have come out and said, well, actually, they don't even need any more electricity. We have no faith in them making decisions and moving forward and making long term decisions and even do they accept climate change is there? And why [should] we, if they don't even accept that climate change is real, and they're taking political donations from the fossil fuel industry. (Jan, Melbourne)

### Technology champions

Many householders hoped their new technology purchases would have a demonstration effect among others. These householders appeared to hold a narrow, more instrumental objective – to show others that particular technologies were acceptable, useful, and (sometimes) enjoyable, and so hasten their diffusion – as well as a wider, more strategic aim: to model the importance of environmentalism and climate action. There was also particular enthusiasm in (and outside of) Yackandandah and Euroa about their local models for technology deployment, which some felt were a great example for other rural communities to follow. The following quotations are illustrative:

We didn't put in panels to make money out of it, we put in panels because we wanted—this was happening, we wanted to push it along ... And now, if we were to buy an electric car now, the technology—I mean what we feel we've helped contribute to is something we believe in. And we've helped demonstrate to many people it's a very workable solution. We can shoot down any of the naysayers on whatever topic they say, except for range. (Greg, Melbourne)

Well, we'd rather be doing it than just talking about it ... I've noticed this, that when you make a change that is positive, then other people are slightly more likely to make that change. Like, if they see that it works. Because they might be thinking of moving that way themselves, and if they can see that it actually works, then they're more likely to shift that way. And it's that 'be the change you want to be see' type thing. I think it's that sort of approach, I suppose. Or 'act locally, think globally' .... love those sort of aphorisms. (Lachlan, Melbourne)

The fact that we're almost setting an example by showing other country towns and other places around the country that you can do this ... it's a small lesson that you can do this and have renewable energy and all that comes with that. (Guy, Euroa)

If society wants to change, we have to do it ourselves and then we tell the government how it's going to work. The motivation for joining the trial for me ... was all about making sure that the technology got the help that it needs. But the long-term view, from the very beginning, the answer is, 'Yeah, this is going to change the way economics works as well as [far as] electricity is concerned.' (Peer-to-peer trading focus group participant, Western Australia)

### Transition awareness

Many householders had a strong awareness of the energy and mobility transitions currently underway around the world as governments, industries and communities ratchet up their responses to climate change. We argue this 'transition awareness' is related to, but distinct from, concerns about environmental degradation and climate change, and provides another angle to understand Australian householder motivations with relation to new energy technology. As explored further in this section, some householders argued that these transitions were already underway in Australia, and that they were probably inevitable.

Others drew inspiration from previous transitions in history. Transition awareness also provides insight into householder attitudes towards the current electricity grid, which are highly nuanced. Many householders would like to see a deeper and faster grid reform effort, but absent this some are taking their own action.

#### The revolutions will be electrified

For some householders, the energy and mobility transitions are already underway. For example, Luca noted that in his Melbourne architectural practice,

Definitely in the last 5 to 10 years, people have been far more open to something [solar] that's no longer a fringe element. It's become mainstream and everybody's fairly happy to do their bit for the cause as much as possible, whether it's, you know, upping their insulation levels or putting solar [on] or having a more electric home rather than relying on gas and, you know, that sort of thing. It's all sort of a multipronged approach.

Similarly, other householders argued that a transition to EVs in Australia was inevitable – and would likely be exponential – as more people are exposed to them and their costs continue to come down. This, however, raised questions for some about possible implications for the grid, as well as for government revenue:

So people are really interested because they've now seen that the cars are coming. The change is happening. It's inevitable that you're going to have this transition ... And all of a sudden people will look out and go, 'Where did all the petrol cars go?' And you look at the road one day and it's all EVs! And that might only be 5 to 10 years' time. (Barry, Melbourne)

That whole electric car thing—and I'm like, where are they going to find the power for that? (Georgina, Yackandandah)

I think that's just inevitable. I mean, I think they've gone past the cusp now, despite politicians having to be dragged kicking and screaming to do something. I'd say 40, 50 years' time, this might be a different place. As far as that's concerned, yeah ... It's just the reality. (Richie, Adelaide)

I think that electric cars will become more common because more people get them and have good experiences with them and therefore more people will get them. So it'll start exponentially growing. And then the government will have to decide how they're going to get the fuel tax to pay for the roads. Because when we all stop buying petrol, who's going to pay for the roads? (Lachlan, Melbourne)

#### Learning from the past and reform for the future

A few householders drew inspiration from other successful transitions in history, including *to* coal fired electricity and ICE vehicles in the late 19th and early 20th centuries. Other points of comparison were prominent failures, such as the first and second waves of EV adoption in the early and late 20th century. In this vein, the concept of transition awareness also foregrounds attitudes towards, and expectations for, the current Australian electricity grid. These attitudes are complex, and included enthusiasm, gratitude and (again) a sense of intergenerational obligation:

Which goes to show, we were able to build the grid, make the grid, to what it is now. We should be able to transform it for the next generation. (Carol, Bendigo)

We've also got the ability to pass the stuff around ... They're going to put the second one [Bass Strait interconnector] in because of course when it breaks down, then one's not really a great way to do it. But we have the ability to do—like, think about that! Think about putting a power cord between Victoria and Tasmania. That is an amazing piece of infrastructure. (Kane, Melbourne)

However, some householders argued the grid was no longer fit for purpose in a carbon constrained world. In particular, these households raised concerns that the grid's 'legacy' physical and regulatory structures were ill-suited to accommodate current and projected take up of new energy products and services in Australia. And a few householders noted the risk of technological 'lock in' given our grid has been developed around technology that is, increasingly, obsolete:

And here we are a hundred years later trying to get it to do the 21st century thing ... all these transmission lines, they're all in these places, they peter out at the end ... They get really thin where the sun is and they're trying to pump all these electrons in from the thin end. I would never have built it that way if I did it now. (Howard, Melbourne)

It's totally embarrassing that you put up a wind turbine or a solar panel and you're not allowed to use it because the grid's got too many electrons at the moment. That's just dumb. So we need battery storage somewhere in the system somehow to store all these electrons! (Kathy, Melbourne)

#### Privatised benefit, public risk

As explored further in Chapter 6, many households were concerned by the electricity system's complexity, and, relatedly, with privatisation, which they saw as conflicting with their own collectivist values:

But I think that if we could all cooperate, there would be good if we used the grid because not everyone's gonna be able to afford all of that technology or want to manage it. But they [energy companies] have to prove that they're trustworthy with that as well! (Jane, Adelaide)

Privatisation ... has been a big negative thing since the '90s. And whether or not consumers have got a better deal out of having this so-called competition happen with all the different energy providers, it's just increased complexity massively and has it really improved anything? I don't know. So there's a lot of issues. But in theory, it's a very smart system but we have a very dumb grid still at the moment. (Kathy, Melbourne)

When I was growing up, we had the State Electricity Commission in Victoria and we had brownouts quite a lot. Things that went wrong. But we also had brownouts and blackouts to do with strikes. So we had a lot of union activity in all those fields that were a problem, particularly electricity. But the world's changed so much in all those things. I don't know. But I do think the whole 'markets cure all approach' has been a mistake. (Sally, Melbourne)

It just seems a crazy system. (George, Ballarat)

Some householders raised concerns that, while seemingly separate issues, are actually linked to broader management of the grid for public good. Grid related concerns included efficiency losses associated with transporting electricity over large distances; distributional justice concerns as new transmission infrastructure impacts local visual amenity to transport energy to distant population centres; and the

vulnerabilities of edge-of-grid communities in regional Victoria to outages and bushfires, and of the La Trobe Valley's coal generators to extreme heat.

#### Distrust in the energy sector

Many households were realistic about the scale of the challenge – that is, reforming the grid to integrate new climate technologies at scale – and wanted stronger leadership from government and industry. However, some were not confident this would occur, and worried about undue influence from incumbents:

The system needs to be designed rather than just evolve. And I think the system's just evolved for us at the moment. And now that the limits are becoming very apparent, we now need to really design it differently, but there's a lot of different competing interests in the whole grid anyway. (Kathy, Melbourne)

We really don't have a power problem. I think we have a management and an addiction problem to fossil fuel. (EV focus group participant)

And, perhaps because of this, a few householders expressed a desire to contribute to the grid reform challenge through their own actions. As Rae, from Melbourne, put it, 'If the grid is getting unstable, I'm happy to get a battery ... I just joined for the good of the grid. I don't need to get any kind of money for it. If I got money for it, that would be great.'

#### Financial expectations

This section explores financial expectations, which were also a significant motivator, and were widely observed among most householders. These usually revolved around savings on electricity bills and other similar outgoing expenses. Rebates available under Solar Victoria's Solar Homes and other programs brought down the up-front cost of solar, and, to a degree, home batteries, for many households. This has greatly expanded access to these technologies. Most households appeared to consider solar, and to a lesser extent EVs and VPPs, to be the most cost effective investments on current pricing, and were more circumspect when it came to batteries. And despite strong support for environmental action among most households, there is little appetite for going backwards financially. But while some households have managed to strike a good balance, uneven access to technology by vulnerable Australians remains an issue.

#### Affordability and accessibility

The perceived affordability of new energy technologies was a factor for many householders, as, together with the cost of retail electricity, it was a major driver of expected return on investment. Many households felt their technology 'made sense', and expected a positive financial outcome, usually as a result of a combination of technology cost reductions and rebate schemes. Many householders we interviewed, and some industry experts, credited the Solar Homes Program with making new technology much more accessible for many Victorians. Jenna, from Shepparton, described the impact on her and a number of her friends, who went through the purchase and installation process at around the same time:

I guess you could say we're all of a similar mind frame, in that we're all environmentally conscious to some extent. In Victoria, the grants that were available and the rebates were a significant reason for a lot of us to uptake. Because they're financially—a lot of us wouldn't have been able to do it without that assistance. For me, I have a mortgage on my own and so laying out ten grand at once for technology would have been pretty

much impossible for me. But to be able to do it with a grant and with the loan scheme that the Victorian government provided made it really—it made it feasible.

However, some householders noted that the geographic targeting of Solar Victoria’s solar battery rebate (at that time) meant they were unable to access the rebate. Most households felt that unsubsidised home batteries, and many EVs, remained out of reach at their current price points. And a few householders and one industry expert raised concerns with installers *increasing* technology prices in response to rebates, or at least not passing rebates through in full.

‘We’re basically hoping just to annihilate our power bills’

The desire to reduce electricity bills and similar outgoing expenses appeared to be the most salient financial motivation, particularly so among South Australian households, who are exposed to retail electricity prices that are significantly higher than the rest of the country. The desire was most commonly expressed by owners of solar, which was perceived to be furthest along the cost curve. But lower vehicle running costs, increased solar self-consumption and improved reliability were also favourable financially for many EV owners. (Interestingly, for some these only became apparent *after* the point of purchase – e.g. they were not always motivations for the purchase.) As we heard from these householders:

It’s so much cheaper. There are people who spend a couple of hundred dollars a week on fuel. When I tell them I drove my car—my Tesla—from Melbourne to Adelaide and it cost me nine dollars for a hamburger and a coffee, they can’t believe it. (Michael, Eurobin)

And the fact now we can charge it off solar means that the running cost is tiny for this thing. (Howard, Melbourne)

While heat pump and energy efficiency technologies were out of scope of this research, they were also common choices to reduce household costs. Other technologies considered and sometimes chosen for financial reasons included peer-to-peer trading (P2P), some (simpler) home energy monitoring systems, and VPPs. However, many households appeared underwhelmed with the actual financial returns on these technologies, particularly when set against their returns from straight rooftop solar (when it was possible to discern them in the absence of production estimates – this issue is discussed further in Chapter 5). As Georgina, from Yackandandah, put it:

On my last bill, which is the first time I’d remembered to look, it said, okay, your electricity was 60 dollars, but with the discount, it was forty dollars, and if you pay on time. And they said, your income from your battery, from them taking power from the battery, was about oh, I can’t remember if it was two bucks or four bucks or six bucks. Well, I’m like, well what’s the point of that? Like, is that all I get?

Purchase decisions are a balancing act

Despite wide support for environmental and climate action, described above, for most householders the technology still needed to ‘make sense’ from an economic as well as an environmental perspective. While modest additional financial costs appeared tolerable for a few householders with the means to bear them (and where they felt they were contributing to broader goals), most householders felt that technology should

not require them to make sacrifices in terms of their finances or thermal comfort. However, it seems that, at least for rooftop solar, some were able to strike this balance:

I'm green. I want to be—I want to be as environmentally friendly as I can. But ... it's got to make some sort of sense ... You know, you sort of find that economic gain versus getting some benefit from it and obviously helping the environment along the way. (Lou, Mornington)

[It] doesn't need to be a radical greenie who only runs candles. It's everybody, and it can save money. And it doesn't need a particular change in life either. You know, it's just switching your energy source. And you're being mindful about when you're turning energy on and off. (Charlie, microgrid expert)

### Resistance is not futile

We also observed other financial motivations that, while related to bill savings, appeared to appeal to some householders' wider political objectives. These householders were particularly pleased that their own bill savings came at the expense of energy companies. As Howard, from Melbourne, put it, his technology purchases made:

Environmental sense ... and secondly, economic sense. You can go, well, I've invested in this technology. I ought to be squeezing as much out of it as I can because that's money in my pocket, not just shipping it out to some distributor of electricity. So I think that's where the attraction is once you get involved and you start to go, you know, 'There are things that I can do here.'

### Independent and resilience

This section explores the strong desire among many householders for more independent and resilience in terms of their energy generation and use. For most of these householders, it seemed that partial, or even symbolic, steps like the purchase of solar and (for some) a grid-connected home battery seemed to speak to this desire. (That said, some householders commented they continue to watch technology developments with a view towards further investment in off-grid technologies.) Some wanted to make a political statement about their relationship to the grid; others were more interested in addressing practicalities and reducing risk. More generally, it is possible that some Australians are consciously making financially (and environmentally) disadvantageous decisions in pursuit of greater self-sufficiency, but we did not observe direct evidence of this in the households we spoke with. As reported by participants, the barriers to greater self-sufficiency included cost, technical challenges and a lack of appropriately skilled/motivated installers. (Note, when we refer to 'political' motivations, this is a reference to householders conveying values about what ought to be - not a reference to party politics.)

### Nice oligopoly you have there, shame if something happened to it

For some householders, the desire for greater independence appeared to be both a political act, responding to distrusted energy companies and conflicting values, and a practical one, responding to grid instability (the latter motivation was, unsurprisingly, more common with households in regional, fringe-of-grid communities). This is evident in the following quotations from householders:

I mean, I would love to be independent of the grid. [But] that won't happen because there'll be legislation that stops you doing that anyway. But if everybody did that, then the capitalists wouldn't be very happy! (Janet, Melbourne)

We've had blackouts here before and we've lost product because we've got four fridges and freezers. We lost thousands of dollars' worth of product ... And then you've got to go back to the power company because they didn't supply the power and you gotta put in the claim and nah nah nah nah nah nah nah. Just a nightmare. Very, very hard. (Chris, Smiths Lake)

But to me, going off grid is a bit of a—not off grid, I'm not off grid, I've just got a battery—but it's a little bit of a 'stick it to the man', so I'm not relying fully on the power, of which there is so many power cuts here anyway ... especially during the bushfires last year. (Georgina, Yackandandah)

Some householders were more motivated by increasing their solar self-consumption, which they achieved through a combination of larger systems, shifting their generation into the evening through batteries, and shifting their load into the daytime through behaviour change. This seemed to speak to both financial and environmental aims. For example, we heard that the off-grid Licola Wilderness Village had achieved significant cost reductions through adding solar and batteries to their genset, displacing their diesel generation.

Of course, it's complicated

As with other motivations, however, householders' views on energy independence were highly nuanced, with some happy (or at least, grudgingly accepting of the need) to remain grid connected once additional financial and environmental costs were considered. For example, Jane, from Adelaide, told us that for her,

It's just all about freedom. I really, really object to being hooked into a giant centralised system where a group of rich people benefit. You know, it's a kind of an ideological position, I guess [but] I think in practical terms at the moment, it's probably more sustainable to join a well-managed grid than have everyone over-specifying their own equipment and go off grid. So I'm happy to contribute to a more sustainable grid.

A few householders told us that they had started down the path of grid disconnection but had not followed through. This appears to have been for three main reasons: cost, technical challenges, and a lack of support from installers. Interestingly, a few householders pointed out to us that batteries need to be specifically set to be islandable in the event of a blackout, and that many installers do not do so (or do not know they need to). And Georgina, from Yackandandah, told us that, while she was attracted to the idea in principle, in practice she felt it sounded too much like hard work:

In an ideal world, one of my favourite sort of fantasies used to be completely off grid and not relying on anybody ... But of course, without power, if you don't have the heating, you've still got to go out and chop wood and you've always got to do something. There's nothing for nothing!

Resilience in sharp relief

The need for greater individual, community and national resilience was also highlighted by many householders, particularly in regional and rural areas. In addition, Australia's social, environmental, economic and geopolitical vulnerabilities, highlighted during the catastrophic 2019–20 fire season, the

COVID-19 pandemic, and recent heightened tensions with China, were front of mind for many. Technologies like rooftop solar, household batteries, microgrids, EVs and vehicle-to-grid (which, while outside scope of our research, was raised by some households without prompting), were seen as a possible way to reduce national and local risks:

Guess what: we live on an island. (Kane, Melbourne)

Reliability and taking control of your power generation and supply into the future is gonna be more important, isn't it? I mean, us country folk like to think of ourselves as sort of self-reliant, we can manage things ourselves. I think a community microgrid kind of thing makes sense, doesn't it. (Guy, Euroa)

The fact that they had to drive tankers full of petrol through bushfire ... seems very dangerous. (EV focus group participant)

I think in another way it [electrification of mobility] contributes to the country's energy security because it's not importing as much oil if it's generating its own, if its transport is powered by electrons ... As an extension of that, it also improves the balance of payments. (EV focus group participant)

Importing fuel ... is a big risk if someone doesn't like you ... [there is an] opportunity for making the world more peaceful. (Linden, Greendale)

#### Mixed motives

For some Australians households, the desire for self-sufficiency and resilience may outweigh simple cost-benefit calculations. According to Dean, from a new energy technology consumer group, such is the power of the idea of self-sufficiency that some Australians are making investment decisions that are inimical to their financial interests, and to their wider environmental objectives:

There's a bunch of people out there who feel like they want to go off grid because they hate the energy companies and they don't care if it's worse for the environment, or it costs more than the benefit that you can materially get, because it's super expensive to do it and you waste all this renewable energy ... The only benefit of it really is ... There's that sticking the finger to the man ... there's also that self-sufficiency. Which to some people is of great value.

Guy made a similar point. He had attended an information session on a solar bulk buy program that his council was running, where another participant asked:

'Look, what's it gonna cost for me to effectively be off grid? You know, get batteries, et cetera.' The guy from the energy place was like, 'Look, to be honest, it's not very economic at the moment. Batteries are still coming along, their costs are starting to come down, but they're not there yet.' And this guy was like, 'I don't care. I just don't want to have to pay the power company.' ... There's this real [sentiment], 'I just don't like them, I don't want to deal with them anymore, I don't care what it costs.'

Unlike pro-environmental attitudes, however, we did not see direct evidence of people prioritising self-sufficiency *over* their financial interests in the households we spoke to. However, some had certainly opted for somewhat larger systems than a purely economic investment case might warrant. But, as Alex, from

Euroa, suggested, increased self-sufficiency may even prove an effective hedge against future price increases for grid supplied electricity.

### **Community mindedness and collectivist values**

This section explores community mindedness, which was another strong motivation among many householders for new energy technology purchases. On the surface, this could perhaps be seen in opposition to the desire for self-sufficiency discussed above. But resilience, in particular, has a strong prosocial, community-minded element. We heard from some householders who wanted to share their energy and expertise with their families and wider communities. But it was not always clear to householders how energy sharing would be achieved. Many householders were very attracted to the idea of community energy, suggesting benefits could include cost savings, flexibility and accessibility for renters and lower income households. Risks and issues raised included securing technical expertise, volunteer fatigue, inclusion in design and governance, and fair distribution of benefits.

#### **Sharing is caring for householders and industry**

Some householders had a desire to share their energy and expertise with their families and wider communities. For example, some participants in the P2P trial were also enthusiastic about the prospect of energy sharing, with one female focus group participant saying that, for her, 'It's about helping people to connect with their neighbours.' However, it was not always clear how energy sharing would be achieved. For Rae, from Melbourne:

In summer it just seems like there's a vast amount [of energy] that's not wasted, but it just goes out to the grid. And I don't know where it goes, but somebody uses it! That's good, but if that could go to a battery someplace and be saved for when it's really needed, you know, in the peak times, I would be happy. I would give it away for free. I would love that.

Rodney told us he is the full-time carer for his wife, who has a cognitive impairment. Around two years ago, they moved to Hepburn Springs in central Victoria, where their daughter lives on a property with her family, and built a small cottage directly next door to the main house. As a result, their daughter is now able to provide them with additional support, and Rodney's new solar panels, which were installed on the new cottage, provide energy to both houses, which share a meter.

Interestingly, many of the smaller technology providers – often solar retailers and installers – we spoke with were also engaged in their own sharing practices. This often comprised provision of pro bono advice and discounted work, often to rectify problems with defective installations by other providers. As Aidan, a solar technology provider, told us:

You've got a lot of what we call solar orphans, that have been installed, and the retail company and/or the installers are out of business .... In a way, if you're genuine in the solar industry you kinda in a way sort of feel obligated to help these people because it's—it is what it is, they've been left high and dry. And so we can do stuff to help. But like I say, the margins typically aren't flash and, yeah, so you've just got to get that balance right.

Similarly, Chris, an energy efficiency expert, told us that complexity, of both new energy technology and the wider electricity market, was a problem for most Australians, and that he did what he could to help:

I actually think that the knowledge base in the domestic market is pretty poor. Guys like me, I'm five hundred bucks an hour ... But Mrs Jones can't afford that. Around here I do it for nothing, for people I know. But fundamentally, it's too hard ... People need help.

'It's the community, stupid!'

Relatedly, many householders were attracted to the idea of community energy, most raising it unprompted, and provided us with thoughtful and wide ranging feedback on various aspects of the concept. As summarised in Table 3.1, this ranged from ownership and operation through to benefits, issues and risks. It is notable, however, that no participants proposed a private ownership model for community. (While superficially a non-sequitur, models have been proposed where the privately owned schemes would operate for community benefit.) As Sally, from Melbourne, told us, 'I think that there are some things that need to be on a much more shared basis.'

Table 3.1: householders' community energy considerations

Ownership	Operation	Returns	Benefits	Issues/risks
Subscription model All ratepayers <i>'It's just how that is created with the community rather than for the community would be a really important process.'</i> (Laura, Euroa)	Volunteer led With/without paid positions Local councils <i>'I mean, if you're relying [on] some sort of volunteer set up, I think you'd be wanting someone with the technical nous, someone like maybe a retired electrical engineer, who's been in the industry who isn't quite ready to get off the tools.'</i> (Guy, Euroa)	To subscribers To all community members <i>'However they want to organise it so someone who can't afford a solar system can take part in our community batteries so that everybody can feed in when they can and take what they need.'</i> (Rae, Melbourne)	Cheaper than individual batteries Cheaper than diesel Flexibility, e.g. if you move house Accessibility for renters & lower income households <i>'Good for the shared cost.'</i> (Rae, Melbourne) <i>'Construction of minigrids and shared local assets ... you're not excluding people, you're drawing them in.'</i> (Charlie, microgrid expert)	Securing technical expertise Volunteer fatigue Inclusion in design & governance Trust in local councils Fair distribution of benefits Resistance from some community members Reliability, safety – incident could undermine support for future projects Regulatory barriers

But perhaps the final word on community energy should rest with Laura, from Yackandandah, who said that, for her:

Even with just the launch of Helen Haines' local energy template thing ... It feels like this is happening in Australia on a community level, even if it's not at a federal level ... They [communities] are no longer just gonna stand by and accept the status quo and [be] willing to accept whatever the government's going to do, you know, mine more coal and gas.

## Comfort

Householders' unique family, cultural, economic, and health circumstances were reflected in myriad attitudes towards, and expectations for, thermal comfort, explored further in this section. In general, comfort was a significant motivator for many, who did not want to make sacrifices to achieve reductions on their electricity bills – but sometimes had to. Some householders were quite strategic about when and how they ran their heating, cooling and hot water, and felt that rooftop solar (in particular) and home batteries (to a lesser extent) would help them to be more comfortable. Householders living with disability and illness had particular thermal comfort requirements, as they spent more time in the home and could be more sensitive to cold and heat. But many other households had similar, if time bound, experiences during the COVID-19 lockdowns. Renters told us of their very poor thermal comfort and their limited capacity to advocate for improvements.

### Family, caring and business responsibilities

Rasike, from Melbourne, told us that his two young children tended to feel the cold during winter and heat in summer. Accordingly, his family used quite a lot of energy to keep them comfortable. The expense associated with this was a major factor in their decision to purchase solar panels. Jane, from Adelaide, told us that her household tried to avoid running the booster for their solar thermal water heater during the summer months. This, she said, was 'particularly annoying to our 17 year old, but anyway! Occasionally we have a cold shower, but only occasionally. I'm very conscious of that and try really hard to make it not happen because I'm not a hair shirt person.'

Lachlan and his partner, from Melbourne, delighted in being able to use the family EV as an 'air-conditioned living room' while driving an elderly parent to and from appointments. As the car was emissions free, they felt able to leave the car's air conditioning running while the car was stopped in car parks and traffic to keep their passenger cool: 'that has actually been a real benefit at times. Electric cars are good like that.' And Chris, from Smiths Lake, told us about the success he and his partner had had installing rooftop solar, home batteries, thermal blinds, air-conditioning and fans in their home, where they run a commercial baking business from home: 'So now the whole space is comfortable!'

### Disability, illness, and pandemic power use

Householders living with illness and disability have particular thermal comfort requirements, partly as they can need to spend more time in the home, and partly as they can have greater sensitivity to cold and heat. Raoul, from Melbourne, told us that his partner lived with disability and so needed to work from home, even before the COVID-19 lockdowns. Accordingly, she needed to run their air conditioner throughout the day to remain comfortable, with attendant implications for their power bill. And Heather, from Kerang, told us that, following an injury at work, she needed to run her air-conditioning overnight, both for comfort and to mask the nearby road noise:

I'm very close to a highway here. Unfortunately, when I bought the place, I didn't realise, and also I have trouble sleeping. So I wanted to use my air conditioner overnight to block out the noise and just make me a bit cooler so I could try and sleep better.'

Some householders told us that their energy use had changed during the COVID-19 pandemic. More hours at home during the extended lockdowns in Victoria led to more heating and appliance use, and so higher bills. As Georgina, from Yackandandah, told us:

The heat was on because it was such a cold winter here on my own, the lockdown, 'You know what, I'm turning the heater on. I'm not getting in a sleeping bag again' ... I was also doing a lot of cooking, you know when you are sitting at home, and I was like, 'Oh, what can I cook?' The freezer's full of course, [I'm] still eating all this stuff I cooked! ... And because I was home all the time, I was just using power like—.

But Jenna, from Shepparton, told us that her new solar had helped insulate her from higher bills as a result of working from home: 'My electricity bill has not spiked, which I'm really thankful for because I'm sure a lot of people will be experiencing significant bill shock.' And many with new EVs commented they were driving them much less than they had anticipated, and so were paying less to charge their cars.

#### Renters get a raw deal

Renters face particular difficulties in relation to thermal comfort for a range of reasons, including poor-quality housing stock, weak standards, limited access to capital for upgrades, and uncertain tenure arrangements. These challenges were recognised by many of the households and experts we spoke with, but we were unfortunately only able to speak with a small number of renters themselves. Luca, who rented in Melbourne's inner west with his partner and child, told us:

[We] always struggled, especially in Victoria. When we first moved we were in an older, weatherboard cottage in the west, which used to be, I guess, a miner's cottage, and had never been properly insulated. So the walls were poorly insulated and you really felt [cold] in the winter, where it took a lot of heating to heat up the home. And as soon as the heating was off, the heat exited through the walls, and it was then, straightaway, cold. And now at the moment we're in a house where it's [got] a lot of north facing glass. And in the summer, the heat load ... creates a greenhouse effect and it cooks the living room to the point that it's too hot to be in it until when the sun moves over the house.

Luca said he and his partner had not attempted to raise this issue with their landlord, as it was hard enough to get other, more pressing issues attended to. Luca also made the point that it can be hard to persuade property managers to escalate concerns to property owners in the first place:

I didn't think there was going to be much that could have been done about it, because the constraints of the house, given we had other issues with the rental that were never attended to that might have been a bit more urgent, such as leaks in the shower and other things ... And I think that a lot of time with a rental, you might be going through an agency. It's hard to then [get] the tenant's voice heard higher than the agent, because [they are] the intermediary ... between the owner and the occupiers.

Both Luca, an architect, and Dean, from a new energy technology consumer organisation, emphasised the importance of high quality design, siting, orientation, and tree planting, which can help to prevent heat from hitting the building envelope in the first place. Other 'softer' technological solutions to increase thermal

comfort include quality building construction, insulation, and draught-proofing. However, some experts and householders argued that building standards are failing on these measures (this is explored further in Chapter 6). As Luca put it, the current regulatory settings are ‘definitely not good enough for the current climate challenges we’re facing.’

### Personal transitions as triggers for technology purchases

It is important to note that many of the households we spoke with credited significant life events and changes with their technology purchases. These ‘personal transitions’ – like partnering, separation, changing parental responsibilities, relocations, illness, injury, retirement, and indeed the COVID-19 lockdowns – are not motivations per se. However, they seemed to bolster householders’ other, often pre-existing motivations through a combination of the following:

- making available additional financial resources and/or time to be invested in the technology
- requiring additional resources to support the changed circumstances, that could potentially be freed up through the technology
- providing an inflection point in households’ lives that seems to prompt, and create space for, reflections on new possibilities in configuring their lives.

The following quotations provide a good sense of these:

So we’re toward retirement. We had money in the bank. (Rae, Melbourne)

He [my then husband] had no idea about it [new energy technology] ... he didn’t think about the environment. You know, we didn’t have the same politics and there were a lot of things we couldn’t agree on! And when I divorced him, I realised what I wanted, you know. (Rosemary, Portland) [Rosemary installed solar panels and put in place other passive energy efficiency measures.]

I knew there was a date I was coming back [to Australia from overseas] and I had to have purchased the vehicle before I arrived. I was thinking about an EV for a good—at least a year or so before I got back. (Kane, Melbourne)

When I sold my house in Melbourne and built this house in central Victoria and I had a lot of capital leftover because I sold it at a very good price in Melbourne and built a house for very much less. Having the capital, I thought, what can I do? I’d long been interested in solar and the importance of climate and greenhouse gases. (Rodney, Hepburn Springs)

I was nursing for 30 years and lifted a hundred and sixty kilos, finished my back, and so I’m on a disability pension now forever. And I’ve got thirty thousand dollars from the hospital in compensation. So I thought, well, I’ll, you know, try and make my life more comfortable and economic and I’ll spend big bucks on a decent solar system. Because I haven’t got any other income. (Heather, Kerang)

I think I’d already decided that, if we ever got enough money, then we would buy that car. Like when I retired or something like that, I said, ‘Yep, fifty thousand dollars, yep we’ll spend fifty thousand dollars of the retirement, the superannuation, and buy that car. And then we’ll just own that car. So, it was sort of like an aim, and suddenly it became possible. So it was like something we’d aimed towards. (Lachlan, Melbourne)

And with the current virus, we decided that it would be a good time to get that [solar] installed and set up, especially during winter. (Harrison, Melbourne)

### **Effort and implications for equity**

Many householders were investing significant time, effort and funds into researching, choosing and configuring their technology. This required careful calibration of complex, sometimes opaque and occasionally missing or misleading information – issues considered further in Chapter 4. And, discussed further in Chapter 5, there is a similar effort required to manage these complex technologies and behavioural changes. That many householders were able to make this effort often reflected a position of relative socio-economic privilege, particularly in terms of income, age, and education, which meant they had more time and resources to invest. Many Australians are not in a position to make a similar investment given competing family, caring and work responsibilities, varying income and education levels, or vulnerabilities. And beyond this, the high up-front cost of many new energy technologies (even with subsidies) and their fixed physical presence on and in the house can put them out of reach for many Australians, in particular renters and low income households, an issue noted by many householders. As Laura put it:

[The up-front] cost is quite high, but then your payoff cost is really quite [beneficial] if you put that over a long time, so that's always a complex one ... especially when, you know, when faced with the reality [that] not everyone has the financial capacity to be able to put that money up front. And I know that, yes, there are great benefits and refund schemes in Victoria, but they, like some of our COVID lockdowns, they, you know, one side of the street will get it, one side won't.

## 4. Information sources and preferences

*'I was confused and it wasn't adequately explained to me.'*  
—Rodney, Hepburn Springs

The second part of our interviews with householders focused on the information they accessed in considering their technology purchase; what information they preferred; what information they trusted; and why. We also asked what information was provided to them by their technology provider. We asked similar questions in our interviews with industry and consumer experts. Responses, set out in this chapter, reveal some significant gaps of concern to policy makers, regulators and industry. This chapter also includes a case study presenting the results of our content analysis of the online user forum, My Efficient Electric Home.

### Summary

Many households and experts spoke of the importance of experiential information in purchasing a new energy product or service, and in learning to use it. Information from, and participation in, community groups was also highly valued by many households, and helped with their purchase and use of technology. Governments and industry also have a number of informational roles, but one in particular – leadership – is currently underdone, and some technology providers are failing to provide adequate information to new owners. Information quality and availability can be an issue, particularly for regional technology users. And vulnerable users are particularly exposed – sometimes deliberately, by unethical providers – to information asymmetries.

### Seeing (and touching, hearing and remembering) is believing

Many householders and experts spoke of the importance of experiential first-hand (and trusted second-hand) information in purchasing a new technology, and in learning to use it. As discussed further in this section, this included 'observability' and 'trialability', word of mouth, and background with technology, whether gained through education, employment, interest, or previous experience. Some householders also seemed to triangulate different information sources. For example, for Rasike, from Melbourne, seeing a recommended installer's name come up on a government approved list was a 'moment of relief'.

### You can't buy what you can't see

First, the ability of householders to observe technology in action appeared important in subsequent purchase decisions. This was particularly the case for rooftop solar and electric vehicles (EVs), perhaps because of their prominence on/from the street, and less relevant for home batteries and other new energy technologies. Kane, from Melbourne, told us his decision to purchase an EV was in part spurred by their observability in London, where he was living at the time:

So I was living in the UK, and as you may know, the electric vehicle movement has got a lot further down the road than what it is here ... I came out the back of the office one day and I wasn't paying full attention. But—and it's one of those places that you don't get many cars—there was no road noise happening. And I went to step out onto the road ... then just at the right moment, looked up as this little milk truck zipped past me ... and it made no noise. Like it literally zipped past me with no noise at all and I was ... fascinated.

Others pointed at the particular role of Tesla in raising the profile of EVs in Australia. As Greg told us, 'It's great to see many of them [Teslas] on the market now, and lower cost models out there, they made electric cars sexy—Elon Musk did.' (On the subject of sexiness, we asked female Tesla owners about Tesla's masculine image, and whether this was a concern for them. Interestingly, these women either disagreed with the premise of the question, or felt that the issue was immaterial, and outweighed by their cars' benefits.)

Relatedly, 'trialability' also seemed important for some, with Sue, from Woodend, telling us her experience with an EV at a farmers' market helped demystify the technology for her:

So I started talking to him about his Tesla, and said, 'Oh, you know, we were thinking it's about time that we started looking at electric vehicles.' And he said, 'Oh, come for a ride!' So he had it there that night when I was talking to him, so we went out and he just took me for a drive and I—it was a bit over my head. You know, he was showing me different features and things that could do. And it was just like, oh, you know, this is actually kind of like a normal car. It's a bit different. But, you know, it drives, and, well, OK, why don't we kind of look at this?

Conversely, the lack of visibility of existing EV chargers – even where these were available in the right places (the availability of EV charging is discussed further in Chapter 5) – was raised by some EV drivers as a concern, particularly when contrasted with the visibility of petrol stations for internal combustion engine vehicles. Paul, from Melbourne, who with his partner had owned EVs since 2014, noted:

Even to this day, I haven't happened to notice a charger anywhere. I have actually charged the Model 3 at a destination charger in Eastland, purely because I knew it was there and the parking was seven steps from the escalator. And it's a handy place to get a top up for nothing and get a good parking spot. But it took me three days to find the thing! ... So my complaint, if I had any, about the efficacy of charging stations, was that they're not visible, apart from the fact that there's not very many of 'em. The ones that are there you just don't see.

#### Talk of the town

Many householders and technology providers also told us of the importance of word of mouth as a source of information on new energy products and services. Word of mouth was valued from friends, family, neighbours, and colleagues, particularly (but not solely) where the source had a technical background. Word of mouth was used by householders in coming to their technology purchase decisions, and to a lesser extent, in learning to use their new technology. Technology providers also highly valued word of mouth, as it is trusted by potential buyers, and so can be more effective than paid advertising. As Aidan, a solar retailer and installer, told us:

So we actually—we don't advertise. Most of the customers that call us either know us directly or indirectly through word of mouth or whatever. To be honest, I don't even have sign writing on the vehicles at the moment, which I'm actually not happy about ... Our website could do with a refresh, that's for sure ... And look, there'll be the occasional people that find us on Google. But again, that's not where our bread and butter comes from ... there's a trust element with us.

#### Experience is instructive

Finally, we heard from many householders and experts about how a technical background can be an asset in the lead up to and following a new energy technology purchase. But it is also important to challenge the received wisdom that all technology users are, as one industry expert we spoke to put it, 'retired engineer types'. While we did hear from a number of (current and former) engineers, we also heard from many householders who did not have a traditional technical background. We argue it is helpful instead to think more broadly in terms of 'background with technology', which can include a diversity of experiences, including:

- education or on the job training in 'engineering adjacent' fields (we heard from new technology owners who were architects, electricians, dentists, IT professionals, microbiologists, physicists, pilots and teachers)
- volunteering with community groups working in energy, climate change and sustainability
- personal research/self-education – one particularly enthusiastic householder told us she regularly attended energy industry conferences
- Prior experience with new energy technology, often with solar in the first wave of adoption in the early to mid-2010s.

#### Powering people's passion: energy community groups in Victoria

We heard from many householders that information from, and participation in, community groups helped with their purchase and use of their technology. These groups are diverse, and include formal organisations, such as the Australian Electric Vehicle Association and Renew, through to more informal groupings of like-minded people, like Jenna's group of friends in Shepparton who all purchased solar at a similar time:

There were three of us who got it [solar] at the same time ... So we could compare experiences with accessing the finance grants and going through the online system ... My other two friends were all the same age. We're all in a similar financial position in life and we all knew about the grants' availability. And that was probably a significant reason for a starting point or an incentive to do so. (Jenna, Shepparton)

Some groups are national, often with state branches, while others are highly local, such as Totally Renewable Yackandandah and similar sustainability groups in Bendigo, Euroa, and the Macedon Ranges. Many groups are volunteer run, but a few are professionalised. And while many of the groups had some connection to energy, climate change, and environmental sustainability, others had a wider remit (such as the Australian Citizen Science Association and the YMCA), which further underscores the community mindedness and collectivist values held by many householders. (As a further example of these values, Carol and Bruce told us they had donated the small-scale technology certificates – the national government's rebate for rooftop solar – to their local sustainability group.)

#### 'Tactical' informational roles: provision for buyers and users

Community groups appear to have a number of informational roles in common: some tactical, and others strategic. Tactical information roles include the provision of information to help people considering a technology purchase. As Raoul, Rae and Howard told us:

I used to think that Renew was like a big group of enthusiasts, and they are. But the thing is they also provide advice to people who are just starting out. (Raoul, Melbourne)

The closure of Hazelwood and the things that were happening in South Australia made me wonder if it wasn't time—we had thought about getting a solar system. But we really didn't know anyone that had one. We didn't have any idea about really how to go about it. So I joined what was the ATA [Alternative Technology Association], I think it's now called Renew ... And so I started to get a little bit more educated about things, enough to feel competent to go ahead and get the solar system. (Rae, Melbourne)

And then once you've got a bit of information, then you can talk to people about, like, talking to electricians or talking to builders or talking to suppliers around, 'Well what sort of things have you got that might do this job? Because I've heard about this.' (Howard, Melbourne)

Another tactical informational role played by community groups is the provision of information for people who already own the technology – in particular, providing information about how best to operate the technology to their advantage. Many participants, for example, told us how discussions within AEVA had helped them to navigate the complexities of EV charging, particularly at public charging outlets.

#### Strategic informational roles: promoting transition awareness and demonstration

But community groups also seem to play some wider, more strategic informational roles. One of these is the provision of information about the wider grid and energy transition. (This might be one factor in the high levels of transition awareness we discuss above in Chapter 3.) Another strategic role is the provision of information, education and training for industry itself, with the aim of increasing technology uptake and improving consumer outcomes. (A good example is the Australian Electric Vehicle Association's training for EV dealers.) The final strategic role is demonstration: the groups – and the events they regularly run – provide an opportunity for individuals and communities to raise awareness of, advocate for and champion the use of technology. (While in-person events ceased during the COVID-19 lockdowns, they continued online using video conferencing programs.) Examples of these strategic roles can be seen in the following:

I was always going to the electric vehicle meetings and [my partner and I are] talking about, you know, reading their bulletins and magazines and things like that. So we're always talking about issues related to electric vehicles in Australia and what's available and what's coming. (Lachlan, Melbourne)

Then when you see our current government saying that we're going to have a gas-led recovery [to] COVID-19, that's really scary. Because that is the absolute opposite that what we should be doing ... This was in a previous Renew publication ... And it's called *Transition delayed*. And just the headline there: 'A recent plan by the energy market operator shows that a 90 percent renewable grid is entirely feasible. But there are roadblocks delaying the transition.' (Jan, Melbourne)

And we're all members of the Australian Electric Vehicle Association and [my teenage son] Brendan and I are involved—well, we go to all the meetings, and Brendan and I are involved with—what was it, EV week last year? So we were at the expo and we did some driving and went to a show up in the hills and showed off the car. (Kathy, Melbourne)

We've worked quite hard at being an exemplar for other towns and we have spent a lot of time ... we worked really hard to support other communities to get started on their own programs. (Charlie, microgrid expert)

It is important to note that information from community groups was much more likely to be trusted by the householders we interviewed than information from government and industry. In part, this might be because some of these groups helped facilitate recruitment from within their membership, and so many of our participants might already be favourably disposed towards these groups. But householders, and indeed some industry experts, emphasised the importance of independent groups that are free (or perceived to be free) from political or commercial bias. As Rae, from Melbourne, told us:

I was just trying to find a group that didn't—that they weren't selling anything. They were just there to educate. So I just felt like I needed to educate myself before I went down the path. So they seemed to be, I guess, the best organisation for that. I didn't feel like they were pushing any barrows and they had a service where you could call them up as a member.

### **State your case: the roles of government**

Like community groups, governments also have a number of informational roles to play, and, as with community groups, these are both tactical and strategic. As discussed further in this section, these include information provision, accreditation, engagement and leadership. But leadership is a missing link, particularly for the national government, which was seen by many householders and experts to have absented the field.

#### **Tactical informational roles: information provision and accreditation**

The first tactical role is information provision: many householders told us they had accessed government information on new energy technology – and also on energy efficiency. This information comes from all levels of government, but these are not all seen equally. But, as has been discussed above, many householders, and some industry experts, were sceptical about the national government's bona fides on energy and climate change policy, and so discounted information from this source, as can be seen in the following:

There is so much marketing and misinformation mixed up with the realities that we need to get a really robust means of capturing the various merits and weaknesses of different appliances that people can make well-informed decisions ... I mean, it's probably self-evident, but I also think that we have been fed quite a dosage of confusing data about climate change, because if we really understood how easy renewable energy is and how frightening climate change is, I don't think we would have our current dilemma. (Charlie, microgrid expert)

But then there's kind of conflicting views in the market. I mean, thankfully, the election – [the] last federal election is behind us. But that was kind of the height of misinformation. Some of it wasn't deliberate, I don't believe. I truly don't believe it was deliberate. But the level of—I guess the level of commentary it caused and the misinformation that then sprouted from it probably set us back. (Ben, EV expert)

This hesitancy towards national government information was not universal, however, with Raoul, from Melbourne, commenting he and his partner had made use of information available at the national government's energy information site, [energy.gov.au](http://energy.gov.au).

State governments, too, play a critical role in information provision, with many Solar Homes customers noting they accessed the solar purchasing guides on the Solar Victoria website. However, there did not seem to be a wider awareness of Solar Victoria's resources with non-Solar Homes householders, and a few householders commenting that Solar Victoria's 'communication' could be improved. The Victorian Energy Compare website was another common source of information on retail offerings, but as discussed further in Chapter 5, one householder expressed frustration that it was not easier for her to find 100 per cent renewable offerings. We did not hear from any householders that they had accessed the energy efficiency information available on the Victorian Energy Saver website (but this does not mean that no one did). At the local level, councils were seen by some householders as reliable sources of information, often coupled with council-led bulk buy programs. This said, a few householders noted that councils can have their own issues with accountability, communication, performance and legitimacy. This could mean that councils are less trusted by some people as sources of information (or indeed as governing bodies for community energy, as explored in Chapter 3).

The second tactical role played by governments is accreditation (and accreditation-like practices), in particular the pre-approval of technologies and technology providers by Solar Victoria and some councils and community groups for participation in their rebate/bulk buy programs. Many householders indicated they greatly valued this role, which seems to be a good way to reduce some of the information asymmetry – and so risk, and stress – involved for householders in complex technology purchase decisions. As Alex, from Euroa, told us:

I think in the end, as a quick market check, I did end up spending more on the system that I got through them [council] than if I was just trying to pick the cheapest supplier. But really ... you're paying for ... ease of mind ... All this has sort of been done for me, as far as not having to worry too much about suppliers going belly up, and not being able to support me in the future, and that kind of thing.

Accreditation – by government or perhaps an industry body like the Clean Energy Council (CEC) – may also help build trust in aggregation and control. As Rasike, from Melbourne, said, 'So you asked if I'm comfortable ... Yeah, I would [be]. I would, as long as [the company was] accredited by a recognised authority or body like a state government or whatever, I [would] think then they are doing the right thing.' (Note, while industry does have a role to play in accreditation, for example the Approved Solar Retailer scheme run by the CEC, only a few participants told us they were aware of this scheme, or checked that their technology provider was a member. Industry accreditation seemed more important for householders in determining whether their charging technology providers were accredited by their EV manufacturer. In a similar vein, one electricity retailer told us they were working on a 'preferred provider' type arrangement with a solar technology provider.)

Some experts, however, argued that the existing regulatory framework for new energy products and services was inadequate. Dean, from a new energy technology consumer organisation, questioned why the New Energy Technology Consumer Code, as a set of minimum standards – was not mandatory. And a number of experts asserted that the enforcement, by state and national regulators, of existing frameworks relating to consumer protection, electrical safety, and workplace safety was inadequate.

#### Strategic roles: energy engagement and leadership

Another role for governments – at all levels – is energy engagement. As defined in Strengers et al.,<sup>8</sup> this includes communication, engagement, and research to better understand householder needs and aspirations, and specific projects to increase participation. However, many householders and industry experts felt this role was not currently receiving the attention it needs. In particular, these participants saw the need for more engagement on new energy products and services (and also on energy efficiency and conservation), as well as regulation:

By really giving consumers clear information about how stuff works and what its impact will be on the things that count for them, which is, ‘What is this going to do for my energy bills, and how does this stuff work, and how do I need to work with this equipment’, that really helps people make better choices. (Dean, consumer expert)

We’re not educating the public to lower their power usage. Whether we’re going [with] LED lights and all that sort of stuff. But the fact that we’re allowing big houses to get built. But we’re not setting the industry standards for building them green friendly, doing proper insulation and the likes. (George, Ballarat)

This obviously represents a missed opportunity to improve outcomes for users. And, a researcher from Curtin University told us, energy engagement also presents a strategic opportunity to build trust in the broader energy transition, and in the reshaping of the traditional energy consumer/producer dichotomy that it may entail:

More and more and more, they’re active participants in an electricity system as producers and users. Their role is different. They’re taking on a role closer to what a traditional coal power plant was. They’re pumping electricity in. They need to participate in the market in some way. And they need to be rewarded for it. But they need to have trust that the service that they’re providing is being recompensed; that they’re not being taken for a ride. Which really means they’ve gotta trust the providers of those services, and they’ve gotta trust the technologies that are manipulating those things ... That’s where I think there needs to be some really long term, proactive stuff, that needs to have started already, to be educating society around the changing role so that when these things start happening, there’s fertile ground.

However, as many participants indicated, it is very difficult to promote – or indeed even just manage – a transition when there is no consensus on the need for one. Rae, from Melbourne, suggested that greater government leadership could help unlock more rapid household decarbonisation. This could be the missing fourth role:

You know, we have money. We want to do it. We just need some kind of guidance [like] an ombudsman or some sort of a solar cheerleader or something that could get out there and just talk about the benefits of solar ... ‘These are the good things. Here we go. This is why we’re paying for it. This is the way we’re paying for it.’ (Rae, Melbourne)

### **‘Anything that’s obviously spin, I just glaze over’: industry information and marketing**

Like community groups and governments, it seems that industry also has both tactical and strategic informational roles. As explored further in this section, these include marketing, handover, engagement and leadership. It appears that some technology providers are failing to provide adequate information to new owners. And information quality and availability seem to be an issue, particularly for regional technology users. Finally, we heard that vulnerable users are particularly exposed – sometimes deliberately – to information asymmetries, including through unsolicited, and sometimes unethical, sales tactics that can target vulnerable people and communities.

#### Tactical informational roles: marketing and handover

Industry, too, appears to have a number of tactical and strategic informational roles. Information provision for prospective buyers (including marketing) is the first, and provoked some strong responses from householders. Although some householders seemed relatively comfortable relying on company websites, brochures and sales representatives for (some) of their information, particularly on relatively uncontested technical points, others were more sceptical that the interests of the technology provider would intersect with theirs. This seemed partly to be associated with general wariness of commercial imperatives, marketing and ‘spin’ but might be exacerbated, in the case of new energy technology, by its complexity, which limits people’s ability (or belief in their ability) to cut through it. As Raoul, from Melbourne, put it, ‘You go out into the commercial marketplace, there are a lot of porkies being told to people who—well, it’s like anything. If you’re not well researched, you’ll get run over.’ And Brad, from Melbourne, reflecting on his own negative experience with his first solar installation, worried that others may be more vulnerable:

I had no idea about solar panels and [am] probably still very naive on them as well – [I’m] not saying I’m an expert or anything. So I think people can get sort of sold that way [by misleading marketing] and maybe not so much my sort of age demographic, but maybe older people as well can get sold very easily and get sold a lot and get absolutely done over with it.

The second tactical role for industry is the provision of information to people that have already purchased the technology and (in the case of solar, batteries and EV charging stations, had it installed). Ben, from the head Australian office of an EV manufacturer, told us that his company puts a lot of work into this process:

We’ve tried to build in, particularly into the sales process, quite in-depth layers of steps for them [dealers] to go through to make sure that they’re covering things off ... There’s things like customer information, forms that we use that we review with the customer before they sign and contract. And that talks about, you know, just life with EV charging and the levels of charging and public charging and how to maximise your range and how to look after your battery, battery life and battery degradation. You know, that it’s a thing. And this is why it is a thing. And it’s the same as your phone or your laptop. Here are strategies that you can [use] that we recommend to help you maximise [it] and all those things.

Ben, and other experts, noted there could be additional risks for subsequent owners of new energy technologies who may not receive this level of information.

Some rooftop solar and home battery technology providers provide similar information: on how to measure performance, maintain the equipment, on warranties, and on estimated production and return on investment.

These requirements are regulated by the CEC's (voluntary) Approved Solar Retailer scheme – and so, by extension, by Solar Victoria, which requires CEC accreditation from technology participants who wish to participate in the Solar Homes program. Unfortunately, we heard from some householders and experts that technology providers will often fail to comply with these informational requirements. This makes it very hard for householders to determine the performance of their technology. As Aidan, who also undertakes audits of solar installations, told us:

Over 90 percent of the audits I do, they don't have, either no documentation at all, or [it's] completely inadequate ... it's just something that's not getting done, it is really—it's a bit of a joke, to be honest ... One of the questions that we ask them, and that we have to ask them as part of the audit process, is, 'Is your system performing as expected?' Now, what sort of response do you think we get to that, when they [householders] have no reference point? ... So they're supposed to be given a performance estimate, month by month of what it should be doing. And that's based on that site. So how it's installed, the tilt angle, the orientation, the system size and all that. Without that reference, how are they supposed to know? They don't know. In their eyes, they've saved money because they've got a cheaper system for them and they might have saved two thousand dollars, but they actually haven't. Because it's not working properly, they haven't saved money at all. It's all smoke and mirrors.

And even where information is provided, it needs to be delivered in the right way, in the right format, at the right time, to the right person. For some householders – and likely many Australians, with other demands on their time, and varying technical backgrounds, education and literacy levels – simply leaving behind complex written material at the point of installation will not meet their informational needs. As Heather and Rodney told us:

They sent me this—all technical stuff, basically, anyway. You know, 'certificate of suitability', 'Australian safety approval' and all stuff like that, you know. Well, it says 'user manual', but I don't really understand it anyway. 'Specifications' from [company name withheld] and that. 'Start-up procedure' and 'shut-down procedure' and stuff like that. I mean, it's way over my head. (Heather, Kerang)

I was confused and it wasn't adequately explained to me, or—nor was I given literature, except if it was in fine print, that made me fully understand just how the system worked. I'm a reasonably intelligent, well-educated person, and if I could make that mistake, [I'm] sure a lot of other people wouldn't have the clearest understanding of how the system works. (Rodney, Hepburn Springs)

#### Strategic informational roles: industry engagement and leadership

As with governments, it seems there is a role for industry in providing wider energy engagement, and leadership, and that this may help build confidence in the energy transition. Also as with governments, it seems this role is currently underdone. As Ryan and James, from an electricity retailer told us, the lack of understanding among Australians about new energy products and services and the wider energy transition was a 'commercial problem' that was hindering mass adoption. Addressing the problem, they argued, will require a concerted effort by industry, government and community groups: the latter because customers 'won't trust us [electricity retailers] as much as we'd like them to and we say that it's really simple. They will still prefer an independent source of information. So to the extent that those organisations can provide independent information, then that helps.'

However, we heard it can be very difficult to explain concepts like new energy products and the energy transition. An aggregator told us that their script for recruiting VPP participants took an extraordinary 40 minutes because, in the view of their lawyers, the sheer complexity of the technology meant the company could not claim to have received explicit, informed consent in a shorter period:

Now, part of that could be our inefficiencies. We could do it better. But there's a lot of customer information that needs to be provided around these products because they're so new and evolving and we're risk averse ... I've listened to the customer calls where the customers got frustrated and angry by the end of it, because it's taking so long to get their consent. So we're sort of overcompensating [because] this is such a new industry and the general public just don't know about these sort of products. So you can't rely on general knowledge for customers to have a reasonable amount of knowledge about these products ... So I think we do need to find ways to sort of communicate with customers more broadly about new technologies and what they do and how they work.

But good models do exist for bringing users along with the transition: a peer-to-peer trial in Western Australia showed that involving users in the design of technology can be an excellent way to build enthusiasm for a technology but also to raise awareness of wider energy issues. As a researcher from Curtin University told us:

Part of the value of the trial was people could say, 'Right. We're all exporting electricity at the same time. Energy [exports] is under the background tariff paying seven cents a kilowatt hour, which is [the] equivalent of 70 dollars a megawatt hour. And at that time of the day, in spring and summer, Synergy could be buying electricity off the market either for nothing—like, being paid to take electricity, or it would be at 30 dollars a megawatt hour.' So everyone was actually getting a good deal with their seven cents a megawatt hour, even though previously they thought they were ripped off by the energy incumbents. So the education process ... was really valuable for them to understand the value of energy and the value of supplying electricity to them.

### **The medium is the message – but some are missing out**

The above information sources, whether family, friends, community groups, governments, or industry, use a wide range of media to disseminate content, including oral communication, events, social media, and print media. However, it is important to note householders did not enjoy equal access to these media, as this section discusses in further detail.

#### *Accessibility and quality*

For some, distance from urban or regional centres made it hard to access information in person. And the COVID-19 lockdowns put an end to in person information altogether for a time. Some householders found it hard to access online information, particularly video, due to slow internet speeds in their area (an issue even in some larger regional Victorian towns). Finally, the high complexity of product information, and the sheer quantity of information available online (often of varying quality) can be confronting and off putting. These challenges – limited accessibility and quality – are clearly articulated in the following:

You know, I'm sort of quite isolated here. (Heather, Kerang)

And there's a lot of websites that give you information ... Some of them are sponsored websites and some are not. And it's knowing what good quality information [is] and what isn't. (Lachlan, Melbourne)

I just wish sometimes that more could be done to actually make [ICT] infrastructure work properly rather than kind of supporting the idea that supporting the largest number of people, maybe 80 percent of people, to get really good access. We spend the money on making things better for them. But then what happens to the 20 percent of people that don't have good access? There's a lot of equity and equity things about it as well. (Sue, Woodend)

Look, there's so much noise on social media ... that the general consumer doesn't know who to believe, what price they should pay ... could be bullshit. (Aidan, solar technology provider)

#### 'You can only do so much research'

It is also very important to underscore the amount of personal research undertaken by many householders. As can be seen from the following statements, while some householders appeared to enjoy the task, it seemed more like a necessary chore to many:

I've probably researched the EV market for about two years. (EV focus group participant)

That's the thing is you do actually have to do a credible lot of research to find out what's best, not this cheapest. And that involves quite a bit of background in science or mathematics or anything like that, to be able to do the research. So be it. Not the best system we have at the moment. (Lachlan, Melbourne)

You can only do so much research. (Raoul, Melbourne)

It is also important to note that, even where people have the appetite for, and access to, information on new energy products and services, they may not always have the financial or social capital to act on it.

#### It might get worse before it gets better

The risks to consumers as a result of uneven access to, and quality of, information are likely to increase as new energy products and services grow in popularity across Australia. This is breaking down the dichotomy between 'essential' retailer-supplied electricity and 'luxury' technologies, and increasing risk – particularly to vulnerable households. The following explanation from Dean, from a new energy technology consumer group, is worth quoting at length:

The new energy market has been seen as a different sort of market: that is, a market where you make a choice, you go to a place, and buy something, to do a thing for you. And that's much more like every other sort of market, and it hasn't been seen to need the same approach as energy consumer protections, energy specific consumer protections ... it was seen as a luxury market of informed consumers. So it's 'buyer beware', basically, and it's still subject to regular consumer law about false advertising, and that should be enough. And I think that, for me, the thing that changes [is] how it's becoming mainstreamed and it's no longer a luxury good. It's no longer just for informed consumers. It's becoming mainstream. It's going down the socio-economic spectrum ... You've got the generous state government subsidies, people on low incomes who own a house can get solar. And it can be a really smart thing for them to do, because it lowers their future exposure to energy prices ... It's actually become so accessible and such a no brainer for people who can afford it and who own a house that it becomes part of their energy supply ... so that's where I would go, 'Well, we've moved out of the informed consumer. We've moved out of the luxury good. We've moved into a part of the mixture of stuff I use to meet my basic essential energy needs.' The consequences of market

harm in that market are becoming worse. And it's not because there are suddenly worse consequences in themselves. But it is because there's exposure of people who can't wear the consequences.

And many industry experts shared their concerns that unsolicited (and sometimes unethical, pressured) sales tactics – themselves driven by the expanding, and currently unregulated 'buy now, pay later' finance sector – were further compounding risks to householders, particularly vulnerable ones. This is because such tactics, which sometimes target vulnerable people and communities, can mean people's decisions to buy what is expensive and complex technology are being made *before they have had time to properly consider them*. To reverse Dean's formulation, above, such buyers did **not** make a choice, they did **not** go to a place, they did **not** go to buy something and they did **not** want a thing done for them. As a consumer advocate told us:

I think that complex and expensive products like new energy tech—unsolicited selling exacerbates the disconnection between someone knowing back to front how these products work and someone just being sold them on the spot. So the harm there is much greater. And how much these things cost is a big thing. So if you've never researched solar panels, you don't know how much a five kilowatt system costs. But if some bloke's on your front door saying 'We could do it for 10 grand, if you sign it today', you don't know if that's a good deal ... it's too complex ... With the unsolicited selling stuff, I guess that [information] asymmetry tips even further. So you've got someone that knows everything, and someone that's never looked into this. That's really exacerbated.

For these reasons, some experts were concerned by the recent decision by the Australian Competition Tribunal to overturn provisions in the New Energy Technology Consumer Code banning unregulated finance in unsolicited sales.

## Case study: My Efficient Electric Home

My Efficient Electric Home (MEEH) is a peer-to-peer information exchange site hosted by Facebook for consumers of new energy technologies and those interested in energy efficiency. While consumers will access other information sources for specific technologies (e.g. SolarQuotes.com.au or Tesla forums), MEEH appears to be one of the most popular internet forums for peer-to-peer learning and knowledge exchange for energy technologies (another known site is Whirlpool). Internet forums for new energy technologies have led to high-speed transitions in other countries (the best known is heat pump technology in Finland where 33 per cent of all Finnish householders installed heat pumps in the space of 18 years).<sup>18</sup> As such, this analysis of MEEH reveals the potential for internet forums in market formation and consumer protection in Australia. It is important to remember the functions that MEEH currently provides – even to a small proportion of energy technology consumers – are provided without remuneration by its volunteer member base. As such, internet forums such as these are providing ‘free’ consumer protection and ‘free’ marketing by consumers motivated by cooperative and collectivist values.

### Summary

The MEEH forum provides important functions to consumers of new energy technologies, not easily found in the market. These include:

- providing accessible information about ‘where to start’
- providing personalised and context-specific information
- directing other actors in the market and correcting or qualifying commercial claims
- providing evidence of realised value
- assisting with tech-support/troubleshooting problems
- connecting peers that share the same values
- providing a space to deliberate possible energy futures.

MEEH is, however, limited in a number of ways:

- it is not as accessible to non-English speakers, those with lower rates of literacy, younger and older groups
- the Facebook interface makes it difficult to search and find information
- the ‘tone’ of the discussion can be exclusionary
- concerns among participants over the ethics of Facebook as a company may limit the group’s growth.

This case study explores:

1. What functions does MEEH provide in terms of enabling uptake of new energy technologies and reducing risks of harm to consumers?
2. What functions is MEEH less well placed to provide?

The methods used to explore these questions included ‘participation observation’ (time spent observing interactions on MEEH over several months), thematic coding of extracts of posts on nine topics, and one interview with a volunteer moderator. In line with ethical internet research practice, we do not use direct quotes to illustrate our points to preserve the anonymity of forum participants (since they are searchable).

While we never specifically asked participants about MEEH, it is worth noting that one of our householders raised the group’s value spontaneously, in a discussion on the problems associated with legacy infrastructure and wastage in the existing system. The following quotation illustrates the role of MEEH in informing people’s deliberations about the energy transition:

My Efficient Electric Home: fantastic resource ... There’s tens of thousands of people on it asking all sorts of questions, how to solve things from an efficient electric home perspective. But this question ... comes up time and time again where people are moving into new estates and because the local developer has done a deal with the gas company, everyone is forced to get gas hot water or gas heating, and they can’t put in heat pumps and things like that because ‘No, that’s not the cookie cutter that we’re rolling out here.’ And so, they’ll have their gas instantaneous put in, and what they’re forced to do is then remove that and stick in their heat pump afterwards. But, of course, there’s a lot of cost and waste. Yeah, just stupid, crazy things that we continue to do. And we’re wearing it as society. (Peter, Geelong)

MEEH was established in 2015 to provide information to consumers about heat-pump technology. It has since expanded its technology focus to include most energy technologies – so long as they are electric! – but also focuses heavily on ‘basics’ for improving home energy efficiency (e.g. insulation). It is moderated by three volunteer admins, Jenny, Richard, and Tim (two of whom also have full-time jobs). While it has three official moderators, various industry experts (for instance, staff from Renew or the Energy Efficiency Council) will also contribute advice and expertise, which is especially useful if other contributors may have (inadvertently) provided outdated or incorrect information.

MEEH membership has now grown to over 25,000 subscribed members. Activity in the group primarily comes from Melbourne, Sydney and Canberra, with Melbourne having by far the largest membership cohort (Table 4.1). Importantly, however, there are also members and posters who are located in regional areas. More recently people in other states have also begun contributing. Internet forums may be particularly important to householders located in areas with fewer options (for solar retailers, energy efficiency consultants etc.). Some members also run energy product businesses, but the guidelines clearly state these businesses may contribute thoughts and can use the group to spruik their products and services, but not as spam and so long as they are clearly transparent about who they are.

Table 4.1: top 10 geographic location of members (data supplied by MEEH moderators)

<b>Top Cities</b>	
Melbourne, VIC, Australia	8,325
Sydney, NSW, Australia	3,158
Canberra, ACT, Australia	2,165
Brisbane, QLD, Australia	1,227
Adelaide, SA, Australia	1,202
Perth, WA, Australia	928
Geelong, VIC, Australia	426
Newcastle, NSW, Australia	337
Gold Coast, QLD, Australia	279
Bendigo, VIC, Australia	274

When the group originally was established it was composed of 80 per cent male users. Now, group members are roughly evenly split according to gender, as shown in Figure 4.1 (56 per cent are female). Females in the 35–44 age group represent the most active user group. At the same time, however, the most active posters and commenters are male (9 out of 10). Participation by age is also not evenly split, with poor representation of under 24 year olds and over 65 year olds.

One of the group’s moderators shared a few general observations about patterns of questions over the group’s inception. First, the weather can be a trigger for people to make energy efficiency changes in their homes. For instance, during a heat wave, there will be an increase in questions about shading, air conditioner type/brand, and other retrofits (e.g. whirlybirds). Likewise, when the weather cools down, questions are posted about condensation on windows, wall insulation and heating. The moderators also noticed an increase in questions about sealing the home during the bushfires of 2019–20. Popular questions year round are on rooftop solar, hot water heat pumps and understanding household electricity usage (wondering if it is too ‘high’). The site is also popular for people embarking on new builds who are keen to have feedback on their proposed floor plan design. Finally, according to Dean, from a new energy technology consumer group, MEEH has now become a site that other community groups, such as Renew or other local neighbourhood Facebook groups, will refer to as a source of information.

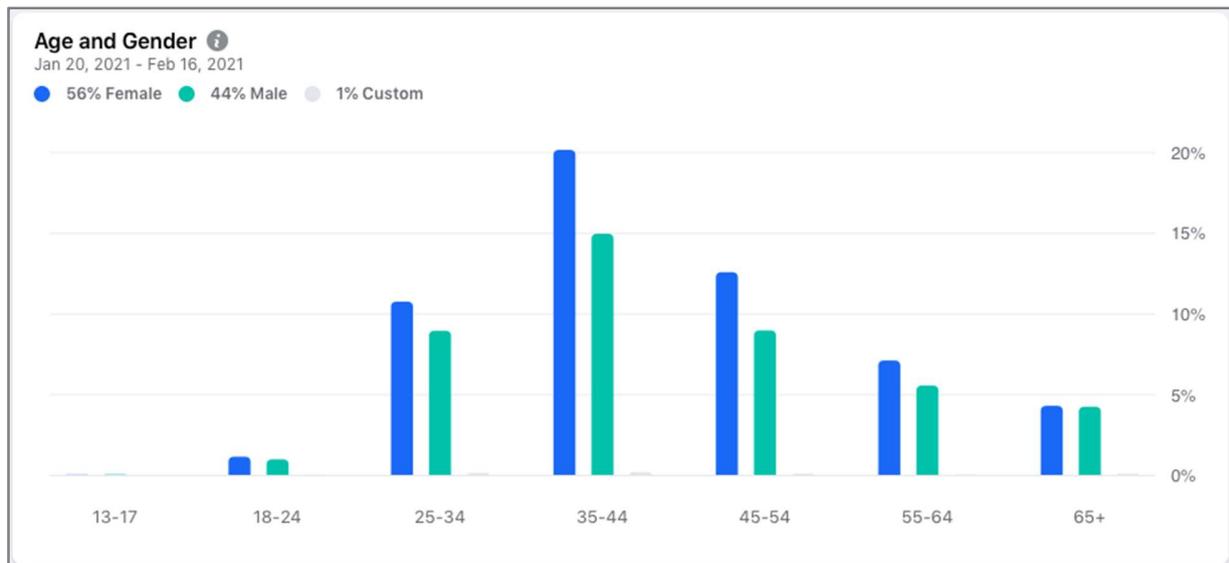


Figure 4.1: age and gender breakdown of participants (data supplied by MEEH moderators)

## MEEH's role in market formation and consumer protection

Function 1: providing accessible introductory information about 'where to start'

Once people have made a decision to invest in new energy technologies – sometimes informed by a deliberation process on MEEH itself (see function 7 below) – they often report being 'overwhelmed' by the choice, and complexity of options. As such, there is a high demand for accessible, introductory information that is not currently being met by the market. We cover here common questions for three of the seven technology types within scope of this research. Members also post many questions about other topics such as energy efficiency and heat pump hot water technology.

Common member requests for information include:

**Rooftop solar:** information to help with confusion about variation in quotes, and about how to assess their merits. Often, posters will provide the specific technology configurations and associated quotes.

**Common responses from peers:** referrals to Solarquotes.com and the Solar Q&A forum on Facebook, warnings of 'dodgy' companies/brands, sharing success stories of own system brand, warnings that 'cheap quotes' are likely not to provide quality technology or installation, suggestions that the installers do a site visit to the home, advice on possible government subsidies or loans, advice of importance of monitoring performance function, system size suggestions, 'correcting' impression that the tradies are 'doing well', explaining that the solar market is already very competitive, and recommending smaller local installers.

**Home batteries:** questions about appropriate size, how to configure black start, usage in an outage and environmental benefits (or otherwise).

**Common responses from peers:** referrals to Solar Q&A, referrals to specific brands that have capability (e.g. for micro-outages), providing a ‘quality’ rating or a range of brand options (i.e. Brand X is ‘number 1’, Brand Y, ‘number 2’), explaining economies of scale (typically recommending a bigger system size as much of the associated costs are fixed), recommending the poster chooses an installer that can configure for blackstart), suggesting alternatives like a generator in cases where the poster has a small budget, explaining technology maturity of various options (e.g. vehicle-to-home technology is not available yet), discussion about the various parameters to consider in weighing up the choice as to whether a home battery is of net environmental benefit.

**Electric vehicles (EVs):** questions about preparing the home for EVs (questions about cables, circuit selection, and phasing), environmental benefits, viability of vehicle-to-home, solar size required to power EVs, hybrids, performance/savings and technological maturity.

**Common responses from peers:** recommending three phase grid connection, advice on available EV brands and general status of charging infrastructure, referrals to an EV Facebook group, the Australian Electric Vehicle Association and The Driven website.

**Virtual power plants (VPPs):** questions around whether participation is worthwhile financially, and whether it is of benefit to the environment.

**Common responses from peers:** general advice that it is hard to gauge whether VPPs are worthwhile (and for who). Some VPP participants advise they are happy with the technology's performance (but received significant subsidies), provision of problem solving calculations to help the author work out whether it is ‘worth it’.

We can see from the above that unsurprisingly the ‘crowd-sourced’ expertise is richest on rooftop solar since it is the most mature technology. Questions about rooftop solar tend to be more related to performance, quality and suitability. The questions for newer technologies tend to be framed more around initial personal research as to whether or not this technology would be suitable, or highly technical questions for other niche users.

Function 2: providing personalised, niche, and context-specific information

The function of providing personalised and context-specific information appears to be a particularly important and valuable offering provided by the MEEH group. While the moderators recommend people use the ‘search’ function since many of the questions are common, it appears people often still prefer to ask their questions directly to the group. We have not conducted interviews with users but preference may be because Facebook’s ‘search’ function does not always lead them to the advice that they are looking for, and/or that people have a preference for one-on-one engagement with peers as a way to process information in relation to the particularities of their situation. It is also possible that many users directed to ‘posts on common questions’ are satisfied with the information they find, but we have no means to verify this.

People often have highly specific questions around technology choices because their context will determine how useful/beneficial the technology will be for them. Considerations that people refer to include:

- budget
- house size and/or orientation
- climate zone
- available state-based loans and subsidy schemes
- energy usage patterns
- future plans (e.g. would like to buy an EV down the track)
- location (remote, regional)
- how critical reliability of electricity supply is for their household
- driving patterns (in case of EVs).

The desire for tailored advice from trusted sources is well documented in literature on historical energy transitions.<sup>19</sup> The comment function on Facebook allows the author of the post to enter into a dialogue with various peers. This can be really helpful to allow the original author to digest new information, check with how it fits their context, and perhaps have several follow-up questions and conversations before reaching a conclusion or decision.

The MEEH group is also used by some members to ask very ‘niche’ questions – for instance, exploring how various members might have configured their home energy management systems, or in the energy efficiency space, what tree species might be suitable to grow for providing shading to the house in a specific geographic region of Australia. These topics are either highly specialised, or so highly context-specific, that this information is hard to find.

### Function 3: directing other actors in the market and correcting or qualifying commercial claims

Many members of MEEH have in-depth expertise about certain products including their functionalities and expected performance. This expertise becomes helpful in the context of correcting or qualifying the claims that other members post from their solar retailer. Members – and sometimes solar retailers (with disclaimers about being a business) – will warn against specific brands that have a negative reputation. Expert members also tend to explain parts of the installation process that are complex and may lead to consumer protection issues. For instance, one member warned of solar retailers that subcontract out the compliance certificate required to get the small-scale technology certificate rebate, explaining this made it difficult to seek resolution with the original retailer. Other examples include members warning about ‘no interest’ loans, explaining that these can increase the price of the system to recoup costs.

It appears that one of the attractive features of the site is that the information is curated by existing technology users who have no specific commercial gain from the information that they share (moderators tend to crack down strongly on commercial entities that are using the site for marketing). In addition, the forum covers a range of technologies, services and brands. This means householders can get a broad sense of what is available as well as the connection between the different technologies or home retrofits they are planning.

#### Function 4: providing evidence of realised value – ‘it works!’

Providing evidence of realised value is the flipside of warning against misleading commercial claims. Many members will share their successes with others on the site, often sharing pictures and even graphs of the reduction in energy consumption and/or bills (from data that they have compiled). Members are very generous with the level of detail about how they use the technology and its impacts. Members will present these as ‘testimonial’ posts, or share their experience in response to a question. Another source of information for ‘success stories’ is a shared spreadsheet of members’ homes where they list the details of their renovation to inspire other members. The generous sharing of information has the effect of providing confidence to new consumers considering whether or not to buy a specific system. More recently, the moderators have begun providing ‘polls’ so that users can report on the success of a particular product and as a way to inform new consumers of popular choices.

#### Function 5: assisting with ‘tech support’ and troubleshooting

Members also use the forum as a way to troubleshoot issues they have with their technology. For example, they might provide a screenshot of their solar monitoring app or hot water consumption showing unusual behaviour. While it is possible that occasionally members’ responses may be incorrect or misleading (inadvertently), most of the time it appears there is enough expertise within members to reach a conclusion about the problem or at least to provide next steps to resolve the issue.

#### Function 6: connecting with peers that share the same values

Connecting with peers appears to be a highly important function of the group. While more research would be needed (for instance interviews with users) it appears that connecting with others with shared values around efficient, electric homes brings a lot of enjoyment and sense of connection between users. Members will be motivated by a wide variety of concerns, but there is a general desire in the group for the energy (and home building) policy context to change. In the group, householders making these consumption decisions or retrofits can meet people who are at the same stage of the journey, or have been there and understand parts of their experience. This gives them a sense of feeling part of a bigger community of householders interested in making more efficient, comfortable and environmentally less impactful homes. While these are positive experiences, this is also a dynamic that might lead to affirmation, or strengthening of one’s position, and less tolerance for householders that make different choices (as discussed under limitations, below).

#### Function 7: providing a forum for ‘figuring out’ what the energy transition should and could look like

Finally, MEEH provides an important civic space for Australians to deliberate broader issues in the energy transition and Australians’ particular roles within this. Members in the group are generally highly motivated to see change and critically reflect about the different merits or risks associated with new technologies and possible government interventions. Occasionally there are important conversations about inequality of access to energy efficiency and new energy technology products and services. This function in the group serves to inform important public dialogue around key issues in the renewable energy transition.

## **MEEH limitations**

While there is no doubt that the MEEH group has contributed significantly to reducing consumer harm and expanding the market for energy technology and energy efficiency, it is still important to explore some features of the group that may be limiting the accessibility and usage.

### Functionalities are limited by being hosted on Facebook

It is conceivable that being hosted on Facebook makes the forum accessible because of the ability to bring people into the group via ‘tagging’. It is also easy to post photos (an important feature for many group members), and have a dialogue with other peers via comments. However, it is also valuable to explore the limitations of Facebook as a site for hosting energy forums more generally:

- functionalities within the Facebook interface change, which moderators have no control over
- people who have actively chosen not to have a Facebook account, cannot post and comment (they can still view the posts) – indeed, in February 2021, one member asked moderators about MEEH moving out of Facebook as she would like to ‘boycott’ the site
- the Facebook interface is not well designed as a database to search for, and organise information
- independent researchers cannot access the detailed user data because this would not comply with Facebook’s terms and conditions
- it is not possible for the Facebook interface to host the site in multiple languages.

### The emphasis and tone of the group can exclude

We observed that many group members are supportive of one another on their journey towards installing new energy technology products and services, or making modifications to their home. However, there are also occasions where participants are anti-social (in particular, dismissive or condescending). It would be impossible for volunteer moderators to remove all such content, even while they (and other members of the group) frequently remind participants to keep the tone and content polite and respectful, it is not always possible to do so. This occasional negativity can have the effect of discouraging people – for instance who would like to improve their home efficiency but enjoy having a wood combustion stove. One woman described feeling ‘dejected’ by the comments of others which undermined her efforts to purchase a more sustainable mode of transport. Peers had left comments questioning her efforts and suggesting their own choices were superior. This ‘one-upmanship’ does emerge occasionally between users and can make people new to the area feel less welcome.

### Technological biases

Consensus on a few key issues have appeared to have become orthodoxy within the group (though there is always ongoing discussion). A common attitude, for instance, is that ‘bigger is better’ in regards to solar size for households. Members cite the need to future proof the household in anticipation of purchasing an EV. Yet this assumes that charging will tend to take place at home, and that householders have the flexibility to charge when there is solar energy.

## **Opportunities for future expansion of internet forums for energy technology**

MEEH is, for many inside the group, a community of like-minded people that can share stories, and validate their own household decisions. Its growth shows its success and attractiveness to many Australians.

Whether or not a more ‘mainstream’ energy user forum could be designed that overcomes the limitations of MEEH remains an important area of consideration and research.

MEEH provides a valuable insight into the attractive features of internet forums or energy technology, although more research would be required to find out more specifically the features that people enjoy, and those that frustrate and turn people off. Initially features that appear important are:

- trustworthiness
- ease of finding relevant information
- accessibility
- engaging.

Moreover, unlike a government-run site, users can recommend specific businesses and products – which they often do in MEEH through the poll function. Government information is necessarily generalised, impartial and ultimately less useful in this sense. Finally, it is also important to consider that internet forums as a general category will likely always exclude certain people and that other ways of providing information and support to those groups will be needed to ensure equitable access to information and advice.

## 5. Experiences with installation and use

*‘The solar panels are lovely and boring because they sit on the roof.’*

—Kathy, Melbourne

This chapter sets out what we heard from householders, industry and consumer experts about the installation and use of new energy products and services. We document first the critical role of technology providers, then report on householders’ experiences of technology use, including practical, emotional and sensory aspects. We then discuss the roles of bills, tariffs, and electricity retailers.

### Summary

It is difficult to overstate the centrality of new energy technology providers, particularly solar installers and car dealers, in determining whether householders’ experiences with new energy products and services are positive. Good providers seem to be making the time to understand householders’ contexts and objectives; helping them to navigate complex technological (and non-technological) choices; providing transparent generation estimates; and (attempting to) simplify the processes of installation, rebate application, and grid connection. Post-installation roles, in particular handover and after-sales support, were also crucial. Turning to technology use, we heard that many householders were employing a diverse range of monitoring strategies, and some – who were in a position to – were working to change their energy use practices to make better use of their new technology. EV charging was mostly done at home, but was complex and poorly understood, even by EV owners. Householders’ emotional and sensory experiences were shaping, and shaped by, their technology use, as are experiences with tariffs, bills and electricity retailers, which can provoke strong responses.

### Technology providers as critical transition intermediaries

This section explores the different functions played – and gaps – by new energy technology providers, particularly solar installers and EV dealers, as transition intermediaries: helping householders navigate their technology purchases, installation and subsequent use. Prior to installation, the roles undertaken by providers include working with householders to understand their contexts and objectives, and assisting them with decisions about technologies, sizing and placement. Another important role – and one that does not seem to be fulfilled by all providers – is giving householders transparent estimates of the future electricity generation and financial returns of their equipment. Installation is another important role, of course, as is helping householders to simplify what can be a very complex process. Post-installation, good providers are giving householders accessible information to help them with the ongoing use and care of their technology, and providing extensive after-sales support. But not all providers are performing these roles, with serious implications for householders.

### Understanding household contexts and householder objectives

As one of the first steps in the technology purchase process, technology providers like solar retailers and installers and EV dealers work with householders to get a better understanding of their current electricity use and/or driving habits, their site (including any constraints), and their objectives. As Ben, from the head office of an EV manufacturer, explained:

In terms of the sales process ... we've got a pretty in-depth process. There's things like customer information forms that we review with the customer before they sign and contract. And that talks about just life with EV, charging and the levels of charging, and public charging, and how to maximise your range, and how to look after your battery, battery life and battery degradation, you know, like, it's a thing. And this is why it is a thing. And it's the same as your phone or your laptop. And here are strategies that we recommend to help you maximise—and all those things. So we try and put as much [information] upfront.

With the exception of EV dealers, most technology providers would (pre-COVID) generally gain this understanding through an in-person site assessment. According to Bobbi, who runs a solar retail and installation business in Wodonga, this is a much more thorough and personal approach than remote alternatives:

We don't do desktop analysis. And desktop analysis is something that really shouldn't happen anyway. The amount of customers that we had years ago that would come in and say, 'Oh, they – I signed up to X, Y, Z, and they showed up and they told me it was going to cost me another thousand dollars because I need extra work done in my meter box.' You know, there's only so much that Google Earth and Nearmaps will show you. And you don't get that rapport with the customer or anything.

Indeed, one householder stressed how important their technology provider's site visit was for building her confidence in the installation process:

I was really surprised at how professional and thorough the installer was ... They had asked questions about our house. They came out and did a look at the roof. And actually, I think that's important. I know IKEA can sell you a solar system now, but I like having someone come to the house and see what my particular situation was, because IKEA can't tell me if I've got a tree in the way or a chimney in the way ... I felt more confident knowing that someone had actually looked at what my house looked like. (Rae, Melbourne)

We did hear from some householders whose technology providers had not undertaken a physical site assessment prior to installation commencing, and this did seem to be associated with some poorer outcomes, in particular cost variations and physical placement of the technology in places that conflicted with householders' preferences. And one householder, Luke, from Melbourne, who had participated in a bulk buy program for solar panels mentioned that the 'cookie cutter' approach made it difficult to customise his technology for his particular circumstances. This is a real issue, as Jane, from Adelaide, explained, because 'Every house is really peculiar, and has its own peculiar stuff.' Plate 5.1 shows some of the installations we heard about from householders.

Plate 5.1: aesthetics in action



Pest gum trees in Adelaide’s eastern suburbs. Jane had to go through a lengthy court battle with council before she could remove one for her rooftop solar installation.



Black panels cost a little more and produce a little less than ordinary ones, but are sometimes chosen for aesthetic reasons. But they were a surprise for Victor, in Numurkah, who had not seen them installed elsewhere.



Jane’s front door had quite a lot of technology installed adjacent to it (there is also a Tesla Powerwall hidden by the Strelitzia). Fortunately, the work was well done.



Richie’s place, also in Adelaide’s eastern suburbs. The smaller windows would increase the energy rating but are unprotected by eaves, perhaps for aesthetic reasons.



Racking for solar panels, shown here on Howard’s house in Melbourne’s eastern suburbs, can require additional (and lengthy) council approvals.



Howard’s home charging setup, complete with ‘EV only’ sign! Note the cement sheeting, required under the new battery installation standard.



Lachlan's plug-in hybrid EV at his home in Kallista in the Dandenongs, where he can 'smell the wet leaves' on frosty mornings.



Jan and Rod were able to install their bulky air-conditioning equipment out of sight on their flat roof in Black Rock ...



... but the same flat roof did create challenges for solar panel placement. Jan and Rod were unhappy with the process they needed to go through with their provider to get to an optimal installation for the conditions.



Form and function combine in Sue's working shed near Woodend. Sue's name for the car (all Tesla owners are prompted to name their cars on first use) was apt: 'Whoosh'!

### Helping navigate technology choices

New energy technology providers also seem to play an important role in helping householders consider the various, and highly complex, technical options available to them to meet their objectives – and some non-technological options, too. For example, one focus group participant told us their provider recommended they install new ceiling insulation before considering further technological interventions. The provider also recommended against a battery, suggesting it was not economic for the household at that time. Similarly, Jenna told us she received helpful advice from her provider on how to shift her load to maximise her self-consumption, and Georgina told us her provider had talked her through the different options available to her, and helped reduce (some) complexity and decision fatigue:

They were very good. Took me through the process. They'd obviously installed quite a few, so they knew exactly what I needed and gave me some really good advice in terms of especially about shifting my daytime usage to predominantly daytime. To make the most of the system and to have a better impact on my bill. (Jenna, Shepparton)

He was just trying to sell me the right thing for me. He'd come and say, 'Well, do you have ten kids and have you got a laundry business, because you'll need bigger batteries' ... I [said] 'I live here pretty much on my own. I've got a boyfriend who shows up occasionally ... my kids have left home'. And so he just showed me—I had an option of two different batteries and two different solar panels or three different—you know what I mean .... if you gave me 15 options of each thing, I just would have said, 'Don't worry about it, too hard.' (Georgina, Yackandandah)

But not every provider was so professional and knowledgeable, and Jane told us she had great difficulty even finding providers in Adelaide that knew enough about the specific technology configuration she was hoping to achieve (connecting her wood stove to her solar thermal water heater to provide hot water boosting instead of her older electric resistance water heater). Reflecting on similar challenges in getting her windows double glazed, Jane bemoaned the lack of knowledge among some providers: 'The double glazing took me years and years! Because no one would retrofit ... and now I could tell people how to do it at half the price that I spent ... I don't find that people around me know enough.'

We also heard from many EV owners about very low levels of knowledge about EVs among many car dealerships. Our EV owning participants were able to overcome this challenge, often on the strength of their own personal research and information from community groups. We also heard from a few participants about EV dealers who, due to a lack of knowledge and (possibly) perverse incentives, actively steered potential EV buyers away from EVs and towards internal combustion engine (ICE) alternatives. Some of these stories were anecdotal, but Kane, whose household in Melbourne owns two Mitsubishi Outlanders, one a plug-in hybrid, one an ICE, told us of a mystery shopping experiment he had conducted when his partner's car was being serviced at the dealership:

And so whilst that was happening, I thought I'd go around the front and find out what they're doing. And I walked around the Outlander and I was looking at it ... And so I actually said to the salesman, 'What's the story with these, in the electric?' He said, 'Oh, nah, we don't really sell many of those. And to be honest, I don't know that much about them. You're much better off going for this, go for the 2.4 litre, rah rah rah.' And I said, 'Oh, yeah, but I'm actually looking for the plug in hybrid.' He said, 'Well, we haven't got any here. You know, I'm not too sure where you'd go.' And I said, 'Oh, what do you know about them?' He said 'I don't know too much.' But he really tried to move me off this idea of the plug-in.

This all clearly represents a barrier for less committed EV buyers as the technology moves into the mainstream.

#### Production estimates

Good technology providers will also provide households with written estimates of energy production and payback periods (this is a requirement for Clean Energy Council, and therefore Solar Victoria accreditation). These estimates are generally developed using software that analyses households' historic energy use, together with Bureau of Meteorology and other site-specific data. Where this is provided to households, it provides a transparent way for them to evaluate the actual performance of their system against

claims made by the provider. Where actual system performance is under the production estimate, this can both identify technology faults and provide a basis for householders to approach the provider for compensation. We did hear from some householders and experts, though, that this information was not always provided to them, or at least not in an accessible format. As discussed above in Chapter 4, a lack of compliance with this requirement is a major issue facing the industry.

### Simplifying the process

Like new energy technology itself, installation and grid connection processes can also be highly complex, with a large number of actors (indeed, we heard there can be as many as 12 in a typical installation, as shown in Figure 5.1), a large amount of associated paperwork, and lengthy time frames associated with processing and approvals. Many householders told us how their installer had provided valuable information and advice on these processes, and also helped simplify them by managing some of the paperwork themselves:

So about two weeks prior to the installation, they sort of went through the process of doing the Solar Homes rebate, the process of getting the deposit put down, how it would all run, it was all explained through their phone representative ... They were very good in terms of explaining the installation process and what was involved. (Harrison, Melbourne)

I had no idea that we had to get our STCs [small-scale technology certificates] and that that was a separate process that might take a few weeks or a few months. I didn't realise how long things would take, that we had to get our poles and wires distributor to say, 'Yeah, you can do this.' So there's this process that I had no idea about. And the installer sent me a list and he said, 'So here's 10 points. This is the way it's going to go. We're going to start here and then we'll end up with a solar system. But these are the steps through the way.' And that helped a lot ... They'd obviously had people ask them what's happening before, so they put it in a list. They gave me probably ten or twelve pages worth of information about how solar systems work, what to expect in the process, what we could expect in production. (Rae, Melbourne)

The expertise of my installer ... is probably something I relied on in terms of knowledge of the industry and what was going to happen. (Jenna, Shepparton)

But not all providers took ownership of the process in this way, and experts told us that the one actor incentivised to ensure successful resolution of these processes – the householder – typically has the least knowledge and power. According to Dean, from a consumer group, this is an area of 'particular harm'. It was also of particular concern for the VPP participants we spoke with (see pull-out below).

### Installation, obviously!

It goes without saying that the installation itself is an important role played by technology providers, either by an in-house installation team, or by a subcontracted third-party installer (note this latter arrangement seemed to increase risk, according to some householders and experts). Some householders characterised their installations as smooth, with Harrison and Jenna's stories fairly typical for these households:

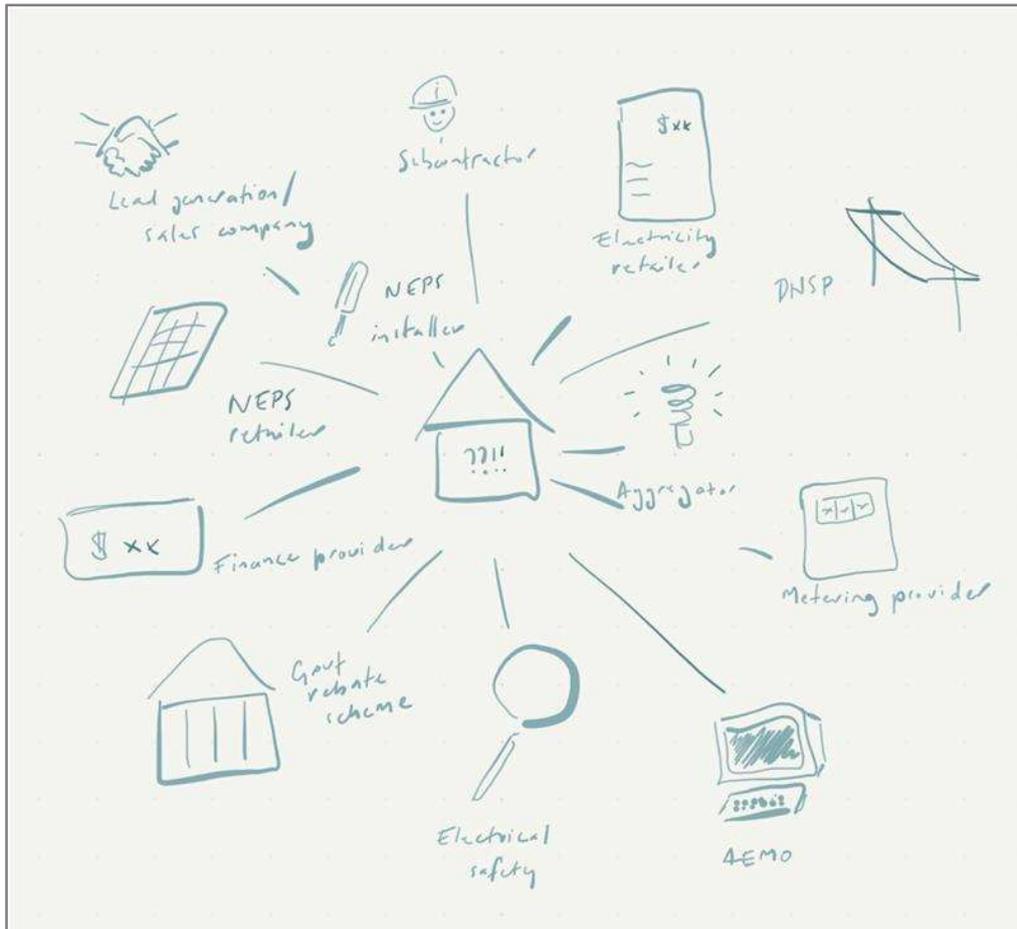


Figure 5.1: the ‘circle of confusion’ (note AEMO, the Australian Energy Market Operator, currently only has a peripheral involvement in rooftop solar through its Distributed Energy Resources Register – how visible this role is to householders might depend on the provider)

I kind of expected during that process that the power would be out, or there’d be interruptions to normal, everyday activities. But it really was pretty non-invasive. They just basically—did all the installation, didn’t enter the property at any time [important during the COVID-19 lockdown]. They just worked from the garage. And then, come time to connect it all, they just said the power would be off for 30 minutes, did the connection to the grid and were on their way. So the installation was very smooth. There wasn’t too many hassles. (Harrison, Melbourne)

It was very smooth ... they just turned up, said ‘Yeah, we’ll be on the roof for the morning’, and they came down and said ‘Yeah, we’re all done, you’re all set up, you’ll hear from your electricity retailer once it’s been connected to the grid.’ And that was it! It was really hassle free and kind of it just happened in the background and I didn’t have to worry about anything. (Jenna, Shepparton)

Clearly, though, not every householder had a smooth installation experience. We heard of a range of issues. For example, Carol and Bruce, in Bendigo, had their roof damaged by their solar installer, leaving it open to the elements (fortunately, this was quickly resolved). Kane, from Melbourne, had a lengthier experience to resolve his installation issues, in part because of complex subcontracting arrangements:

The [solar installation] process was a shambles. They had to move it three times, they installed it incorrectly. So I've got the Dandenong Ranges right behind me. They initially put it in facing east ... so I then went to the foreman and said, 'Hold on mate, you might just want to stop there.' Rang the guy that I'd done the deal with, said, 'This is ridiculous, you guys [have] got no idea about what you're doing' ... So that crew got sacked. So the installer and the people that I purchased from were two different businesses. That crew was removed. Another one came in. So I talked to the new head. He was worse. They went out, because they made some mistakes, set up some stuff and whatever. So there's been a whole lot of repairs to the roof and the house because of this. Then got the third guy in and I was talking to the third guy and he was like the fix-it guy that they sent in last to fix up the mistakes of everybody else. He had a permanent job fixing other people's solar mistakes.

Concerningly, Aidan, a solar retailer and installer, told us of his concern that the rapid scale-up of new energy products and services was creating safety risks for householders and installers:

Everyone's just in a hurry. It's just a smash and grab bloody mentality that – if you're in such a hurry, your focus is not on the customer. Your focus is not on quality or safety. Your focus is on you, and getting out of there to earn a dollar ... And it's been like this from day one, because the big [solar] retail companies come swooping in, they secure the volume of work and then they'll ring around for their installers and it just keeps going on and on. And the other thing, too, would be the height safety, now that that should be implemented. Yeah, I still think there's a lot of people not doing it. I think, really, to summarise, the main issues are that the rates people are getting paid, and everybody is looking to get things done as quickly as they can.

#### Handover

Households told us that the handover process was very important, both in helping them understand how to operate their product, but also how to access help if required.

So they came back ... and walked me through the system as well. So they explained what the inverter was, why it was in my garage, because that wasn't supposed to be there to start with. But they ended up thinking it was the best place based on where panels were in relation to the house. Also, no one will steal it! And they explained how it would work, how to access the app, where the—how it connected to my electricity metering on the other side of the house. How to take care of the panels. I was really happy. (Jenna, Shepparton)

I think there's a manual, too, I could probably get—I've got an email, I think. I think Jake sent me an email, so I'll just follow that again. It's not difficult. I can never remember the sequence, but if I've got it there, it's fine. My memory is not as good as it used to be! (Janet, Melbourne)

But, as already explored in Chapter 4, it seems there are a number of technology providers who may not be fulfilling their obligations in this regard.

## After-sales support

Finally, good providers seem to be providing extensive after-sales support for many of the households we spoke with, even outside of formal warranty claims. After sales support covers both advice on how best to operate and care for the technologies, but also assistance dealing with issues. This is the case for EV dealers as well as for fixed household technologies like solar and batteries. However, the actual installers themselves appear to be playing a particularly important role here, perhaps because of their expertise but also perhaps their familiarity to the households from having undertaken the site assessment and installation (where these steps were not skipped).

They follow us up regularly with emails just telling us what they have, and how to look after the panels. (Carol, Bendigo)

When they come back for their kind of thousand kilometre check at the dealership, which is like that opportunity just to make sure that everything's running okay with the car, but also the customer. 'Is everything okay? Do you have any questions?' Yeah, that's a really nice touch point, I think, more so just to make sure that the customer is okay because you know that they won't go out of their way to come and ask the question again, they might just try and deal with it themselves and it could be just an easy thing. (Ben, EV expert)

So we had a week of beautiful, sunny weather where we weren't generating any electrons. And then when we realised that, we called the guy the next day, who was the managing director of the company, and he went up on the ladder himself and fixed it. And it was just like, 'Wow, that's great!' And then when the inverter switch failed, I rang them again. The guy came out within a day or so and I asked him if I could pay for it. And he said, 'Well, you know, blah, blah, blah, whatever, whatever. If you get a bill, pay it, if you don't get a bill, don't pay it' ... So, yeah, we didn't pay for that. And I was impressed and flabbergasted. (Kathy, Melbourne)

If I had any questions, I'd ring up Brett. Who's the guy who installed it, who pretty much knew everything about it ... he's the guy who was here and I used to ring him with any questions, like if something wasn't working or if there was a light flashing or an alarm going off ... Because we did have a few hiccups, where it wasn't charging and I had to keep resetting it and, you know, like turning your phone off and on when something doesn't work, that's all it took, but I still didn't know how to do that! (Georgina, Yackandandah)

And the company itself is really helpful. I still contact them if, you know, if I need to reprogram the battery or something, I just give them a call, and Jay is the guy's name, and he just walks me through it. (Janet, Melbourne)

I said to him, 'Do you have to clean them? Like, is there any maintenance I have to do personally?' The guy goes, 'Mate, if you walk past and you see there's a bit of dust and a bit of bird poo ... get out there with a hose and just wash them ... these ones are waterproof, you know, everything's—they're sustainable.' And he said to me, straight away, he goes, 'Mate, if you ever have any problems, any hesitations, please just flick us an email or send us a text or even call us, whatever, we'll come out, mate, and have a look at them. We guarantee our work.' (Brad, Melbourne)

However, we also heard of a number of issues with after-sales support. These include providers refusing to take responsibility for failed technology, even within warranty periods – failures with inverters and batteries appear particularly common – instead referring householders to technology suppliers. (Note, even where

technology faults occur outside warranty periods, providers retain some liability for the ongoing performance under Australian Consumer Law).

A number of householders and experts raised concerns with the lengthy timeframes needed to resolve issues, even once formal dispute resolution had been initiated, a cause of significant stress for these householders. Some householders and experts raised concerns with high rates of bankruptcy among providers, which can make support harder to access, particularly when issues are discovered late (as can be common due to the technology's complexity). However, while the practice of 'phoenixing' – where a director of a company illegally transfers assets to a new entity, and liquidates the old one – was raised with us as a risk by householders and experts, we heard no direct evidence of the practice affecting the householders we interviewed. We heard from many regional householders about their difficulties accessing support in the first place. And, finally, Dean, from a new energy technology consumer group, told us that many technology users are not even aware of their existing consumer rights, let alone how enforce them:

Look, the average person doesn't really know that consumer protection rights generally, right? If you buy, I don't know, something from The Good Guys, and it doesn't work, and you take it back, and they tell you to get lost, a lot of people don't know that they have a right to a refund and that there's all these rules. And actually going and getting that remedy through the consumer law framework, in Victoria that's Consumer Affairs Victoria, it's not easy. You have to really—it's not really designed to make resolving disputes easy.

### **Technology use: practical, sensory and emotional aspects**

This section explores the practical and emotional aspects of technology use. Householders told us they were employing a range of monitoring strategies. Some householders, with the capability, resources and interest, were also working to change their energy use practices to make better use of their new technology (but not all people and practices are so flexible!). Householders' EV charging habits also varied, but on balance, this was mostly done at home. Charging remains complex, poorly understood, and frustrating, including for existing owners of EVs. Householders encountered a range of emotions as part of their technology adoption, which can shape, and are shaped by, experience.

#### **Monitoring strategies**

Many householders were employing a wide range of different strategies to monitor their technology and energy use. These included:

- monitoring the instrument cluster on EVs, in particular range remaining and battery charge
- monitoring household energy use via their electricity retailer's web portal, or even just their bill
- using home energy monitoring systems (HEMS) and other 'smart' devices that integrate disparate sources of energy data, and in some cases, allow for centralised and even remote control of some energy use
- monitoring generation and battery data via their inverter's app
- reading the physical display on their inverter
- keeping logbooks, spreadsheets and similar to record their usage and generation
- using council-provided energy audit toolkits
- using their senses to detect unusual flashing lights, beeps and alarms emitted by their technology.

We heard there are a range of reasons why householders were undertaking, or wanted to undertake, monitoring activities. First, many householders told us monitoring could empower them with information to help make energy use and driving decisions:

[Monitoring] sort of really helps you take charge of your energy use decisions. (Harrison, Melbourne)

[An EV's] data readouts are pretty much 1:1 analogues to a petrol car's. So instead of litres per 100 kilometres, you've got kilowatt hours per 100 kilometres. Instead of distance to empty, you've got range remaining. You've got a battery gauge instead of a fuel gauge. (Barry, Melbourne)

I didn't realise how much of a difference monitoring would make ... I know that I've turned on the air conditioner and it's sucking that much power or [I've] put on the oven—oh my god, I didn't realise how much ovens [use]! So it's been a really good training device ... I feel a lot better about turning things on and I'm a lot more aware of what it's costing, you know, in terms of electricity to turn things on. So I think there's been a lot of good learnings from it. There's been just the awareness of when you flip [the] switch. (Rae, Melbourne)

We're really interested at the moment in how we're using it [energy], so that's ... my motivation, to get information about our own usage. (Peer-to-peer trading focus group participant)

This potential to empower was also echoed by the founder of a HEMS technology company, who told us that their customers wanted a better understanding of their energy data and to reduce/manage their usage without impacting their lifestyle.

Another important reason householders gave for using monitoring strategies is that they help them know when something goes wrong with the technology. Jane, from Adelaide, told us that she did not trust her rooftop solar and home battery technology (or her technology providers, or her electricity provider) sufficiently to 'set and forget':

You can't just say, 'Okay, we've got our solar panels now. Cool. Let's go. We can go do stuff we like doing now because we've sorted that out' because it doesn't work that way. You've got to constantly monitor. So my husband [and I] are both all over the apps. You know, I'm like, 'What's that about? Why is it doing [that]?' You know, because we're concerned that it's—something's gonna go wrong and no one's gonna bother telling us.

Brad told us of his experiences with monitoring – and with not monitoring. Around five years ago, he financed solar panels following an unsolicited approach at a supermarket near his home in Mernda, in Melbourne's northern suburbs. After the installation, Brad 'thought nothing of it' until, years later, a work colleague suggested he should be seeing more savings on his bill and should have the panels checked for a technical issue. Subsequently, a nearby electrician told him that the entire system was 'shot, no good, not working'. The panels had cracked, were not working at all, and presented a fire risk. After a lengthy process, Brad learned the original technology provider had gone bankrupt, and so his warranty was unenforceable. Brad contacted the Energy and Water Ombudsman Victoria, which referred him to the Consumer Action Law Centre, which was successful in securing a settlement from the finance provider, which he put towards a new solar system.

Brad explained that for him, solar panels are different from other household appliances in that they are somewhat removed from observation and other interactions of everyday life. Having learnt from his first solar experience, he had his new system installed with additional monitoring capacity, which he is currently using to review his household's energy use and bill savings:

So the old panels, I never—with the solar panels, it's one of those things. You put [them] up on the roof and that's it, you forget about them. Because they're on there, it's not like I deal with them every day. So it's definitely a bit different that way. But [now] I've changed power companies, I'm looking at the bill on my phone, and I can see already how much money I'm getting back from it already. You can see the difference in about the usage and where it's coming back. So that is definitely a lot ... better.

Finally, some householders seemed to be gaining a sense of enjoyment from monitoring their technology, and deducing which appliances were causing which usage spikes, all (relatively) easily:

But every now and then there's a spike in the blue [line], which is the grid power coming from the grid, which fascinates me. (Janet, Melbourne)

If you just look at the graphs, you see nothing, nothing, nothing, [then a big spike]... you can tell when it [the EV] has been charged overnight. (Brendan, Melbourne)

[My partner] likes looking at the display. She's curious about where the energy is coming from and how we're going. So we will make joint decisions on what we think the weather's [like] tomorrow. Should we import, or export or should we be running something now or should we wait for it? So there's a joint conversation there. (Howard, Melbourne)

[Monitoring] technology is fantastic ... Yeah, I definitely recommend something that you can use electronically on your iPhone. Just a quick glance and you know exactly where you stand. Sort of. (Tanya, Adelaide)

As a result, some householders are monitoring regularly – typically, somewhere between daily and weekly. A few very keen householders told us they monitored multiple times a day. On the other hand, some told us they monitored only rarely. For many, enthusiasm for monitoring appeared to wane over time. It is important to note individual household members may have varying degrees of commitment or time for monitoring. For example:

So if not daily, five plus five times, four or five times a week. Not too many days go by without me having a look to see what's happening. (Janet, Melbourne)

Every once in a while I get into the app that goes into the interface box on the wall and I just have a look in there. I don't see anything change anymore, so I've got into the stage of being comfortable with the installation and how it's all running. (Lee, Melbourne)

I don't look at it as much as I used because it was really not—it was a real novelty thing when it first got installed ... But now I kind of check it every couple of weeks or every [other] week to see how it's impacting bills as well. (Jenna, Shepparton)

My wife keeps a close eye on electricity use just generally in the house ... She's always trying to look for opportunities to reduce something somewhere, and we can see when the car charging kicks in ... [we monitor about probably more than once a week. It won't be daily. (Lachlan, Melbourne)

Importantly, at least for our small sample, enthusiasm for monitoring did not seem to have a gendered element – in fact, women were some of the most engaged users that we spoke with. For example, Jane was so determined to understand her household's energy consumption that she and her husband spent an afternoon painstakingly turning switches on and off on their walls and on their switchboard to reverse engineer a circuit diagram. But, Jane told us, others tended to assume her husband was the technically-minded one in their household:

I was a bit more determined of the two of us. He was happy mostly to go along. But it's really curious, you know, a lot—whenever we are in social settings, everyone assumes that he knows everything, you know, just standard, you get used to that.

Nevertheless, monitoring is not for everyone. For some, it was confusing and time consuming. Conflicting information between different information sources (e.g. a solar inverter's app and an electricity retailer's portal) was a common issue. And while some householders persisted, others did not have the necessary time, bandwidth, or even the interest – a position that may be more common as these technologies are brought to scale. Even more technically-minded householders, who were the most motivated to monitor, and found it enjoyable, found that the available technologies were difficult to coordinate, provided at-times conflicting information, and generally lacked necessary functionalities, in particular, the ability to more easily control load. For example:

And I got the Ubi [smart device] and I got the solar—I never really worked it out, I never really looked at it very often (Georgina, Yackandandah)

I hook into AusNet every now and then to see how I'm going. But the data is so confusing. Usually I look at it at night when I've had a big day and, you know, I think 'Oh this [can wait until] another time,' you know? (Janet, Melbourne)

Most of it [energy data] is not coordinated into one point ... It [HEMS] has given me better data, it's given me a better understanding of how I'm using my power, but it hasn't—all it's done is indicated what I need to do. (Chris, Smiths Lake)

James, from an energy retailer, concurred, telling us 'So just think although there are lots of retired engineers out there with spreadsheets that are really interested in [monitoring] and trading [most] people just aren't that into it, right?... And that's fine.'

'The washing never ends!': behaviour change and immutability

Some householders told us they adapted their energy use practices after the installation of their technology, often in tandem with the adoption of new monitoring practices. This was sometimes as simple as looking up at the sky: as Janet, from Melbourne, told us, 'Well, you know, if it's a nice day, if I've got sun, I'll put the washing machine on.' The most common strategy was to shift appliance use into the daytime,

particularly washing machines, driers, and dishwashers, and water heating, to maximise solar self-consumption. As Jane, from Adelaide, put it:

We've changed our practices ... like, you know, you have to do your washing on a sunny day, have to vacuum in the daytime. A bit, you know, a bit Nazi like that. We just don't want to—we just want to use our own energy if we can.

Another common approach was adjusting thermostat settings to reduce energy consumption from space heating and cooling. And many EV owners on time-of-use tariffs told us they charged their cars overnight to minimise expense and impact on the grid.

However, some practices, particularly related to food preparation and storage, are less flexible. Many householders told us they were not able to shift their evening use of ovens and stovetops into the daytime. One householder, with a swimming pool, noted her pool pump could not run solely during the day; that it was 'constantly going around'. Equally, people's personal, family and employment circumstances can limit their ability and/or desire to shift their load. As we have discussed above, Rasike's family, in Melbourne, needed to maintain a certain level of heating and cooling for their young children's comfort. Equally, reflecting on his partner's disability, Raoul, from Melbourne, whose household was with a retailer that tracked wholesale electricity prices, told us: 'I might manage my own behaviour, but I don't manage [my partner's] behaviour. So if she decides she wants to turn the heat on, and it's 300 dollars a megawatt hour, well, that's just what's gonna happen.'

As a participant in the peer-to-peer trading focus group asked, 'Unless you can work from home, what—can you put a load of washing on halfway through the day?' Additional insightful feedback from householders on their contexts and constraints can be seen in the following:

One solar system ... it'll suit a lot of people, but everyone's household needs are going to be different. (Charlie, microgrid expert)

I guess you could say it is that basic expectation that when you turn something on, you just need it to work. (Jenna, Shepparton)

We try and do things during the day. [But] because I work random shifts, if I'm home during the day and we've got to do the washing or whatever ... I've got three kids, so it's on like Donkey Kong, the washing never ends! But yeah, so there's no, 'Oh, we can't do that because it's night time now.' I've never ever been like that, so I don't think it's ever going to change. I'm like, if the kids wanna use the spa, 'Look, go, whatever.' So it's there to be used ... 'Just do it, whatever.' It's life, you know, whatever. You don't know what tomorrow's gonna bring! Well, actually I do, it's sleep and work! (Brad, Melbourne)

## Charging

The first point to make about EV charging is that it represents a huge increase to household energy use. As Greg, from Melbourne, told us:

Our consumption is comparatively low, it is typically around five to six kilowatt hours per day for a three person household. But that's a combination of all of the things we do ... To charge our electric car now is 30 kilowatt hours per charge to charge. So it's a big, big hit on our electricity consumption in the house.

Accordingly, many EV owners told us they generally programmed their cars to charge overnight using off-peak rates, which helped them to minimise their associated costs, and, as one EV focus group participant told us, their impact on the grid:

Yeah, I use the reduced tariff for electric charging and it's only between midnight and 4 am ... The car's programmed, so you can set the car up that it only starts at that point. So I don't think it's a drain on the community ... We only rent when we are, and the owner of the house was kind enough to say, 'Yes, I can put the destination charger in, I paid for the install, and the saving in fuel has more than paid for itself.

Most householders were charging at home, with some notable exceptions. One EV owner, whose home did not have rooftop solar installed, told us he liked to charge his car while caring for his elderly father at his farm, which did. Some owners of smaller cars were using standard 10 amp wall sockets to trickle charge their cars. Those with larger cars were more likely to have installed specialised home charging equipment for faster charging. We learned that one car manufacturer had partnered with a provider of home charging equipment, and offered buyers the option of a coordinated purchase and installation to reduce the stress of a new EV purchase. One EV expert suggested deals like this were potentially problematic: 'They're saying that there's some special magic about installing a charger and only they can do it.' But the manufacturer told us that buyers are made aware that other options are available, and we heard from one owner that the joined up approach was indeed quite helpful.

In terms of charging at other locations, one focus group participant told us he sometimes charged his EV at the office. Another stated he only ever charged at public charging stations, partly to prove the point it was possible, and partly because he enjoyed the discount on electricity that was often available at these sites. Another told us working out where to charge on a longer trip can take some time and effort, but if repeated over time this knowledge can become habitualised, much like knowledge of petrol stations already is for many. However, we heard considerable frustration about high speed public charging in Victoria due to three main limitations: availability, reliability, and interoperability:

- Many owners told us of Victoria's high speed charging 'desert', in Gippsland in particular, with one stating 'at the moment it is easier for [EV] owners to actually go interstate rather than travel within the state' (Barry, Melbourne)
- Even stations that do exist can be hard to find (although software on some EVs can make this easier). And sometimes, owners would arrive at a charging station only to find it out of service, vandalised, or even 'ICEd': an unsafe practice where the station has been blocked off by another car (on purpose or inadvertently).
- Many owners raised issues with interoperability between proprietary stations. Similarly, there was evident confusion, even among EV owners, about differing charging connectors, standards, and charging speeds. This is concerning, given owners could be expected to have a more sophisticated understanding of these issues than people who do not own an EV.

EV owners also told us about their charging routines, and how they incorporated them into their daily lives. Owners of smaller, city cars like the BMW i3, Nissan Leaf, Hyundai Ioniq told us they tended to charge on a daily basis, whereas larger, longer-range cars like the Hyundai Kona or any Tesla could be run for multiple days without charging (a finding which may have implications for the algorithmic prediction required for vehicle-to-grid and other smart charging). Most charging was occurring overnight, for financial reasons outlined above and also for convenience. Interestingly, Sue, from Woodend, told us that in winter she was generally charged overnight only until the battery reached 80 percent charged. As well as for battery conservation, Sue told us she wanted room to top the battery up with excess solar the following day (she planned to leave additional headroom in the battery for the larger volumes of potential solar in summer).

### Emotional and sensory experiences

Householders encountered a range of emotions – which can shape, and are shaped by, experience – as a result of using their technology. Common positive emotions included happiness, satisfaction, enthusiasm, and playfulness. Certainly, many householders, particularly EV and home battery owners, seemed to be having a lot of fun tinkering with their technology. As an EV focus group participant told us, ‘I’m sure it’s somewhere between them: sheer entertainment and just doing the right thing.’ There were also a notable number of households with converted EVs in their sheds, of varying degrees of functionality. And Chris, from Smiths Lake, told us he was considering converting his backup generator to accept homemade biogas (at a safe distance from his home), an example of user tinkering and product modification. While not an emotional response, some EV owners told us of new sensory experiences they had had since switching from internal combustion engine vehicles. For example, Lachlan, from Melbourne, told us of the calm and stillness he has noticed since switching to an EV:

On those cold ... frosty mornings, when you start up a petrol car, you get these fumes going all over the place—all the petrol laden fumes as the car starts warming up. And we have certainly noticed that, too, that driving the—both of them, both of the electric cars—is nothing like that. When you get out and start the car, there’s nothing. The car just—the lights will come on and everything flashes and stuff like that. There’s no petrol engine kicking in. There’s no fumes. You just go off in a, I don’t know, just a silent sort of glide, and smell the wet leaves on the trees ... So it’s been good like that too.

Common negative emotions included confusion, frustration, anxiety, and disappointment, usually as a result of complexity, technology failures, and a lack of support. These emotions can be seen clearly in Heather’s story. Heather, from Kerang, became injured at work, and invested a large portion of her \$30,000 disability payout towards a large rooftop solar and home battery system. She hoped this would reduce her electricity bill, as she now has very little income, and needs to run her air-conditioning overnight to remain comfortable. However, her provider did not consider her needs, installing an inappropriate system, and did not explain how to maintain it. The battery subsequently failed, and remains dysfunctional despite extensive and expensive (\$4,000) repair attempts by numerous electricians. Heather also told us she had to go out of Kerang to find the original battery provider, but this ended up coming at a social cost to her (as well as a financial one), with blowback from some other technology providers in town who were reluctant to provide her with support. Heather told us that some male tradespeople had been reluctant to explain what they were doing or let a woman oversee their work. As a single woman, living alone, Heather also felt vulnerable bringing male tradespeople into her home. Heather’s despair – but also resilience – can be seen clearly in the following quotation:

### Spotlight: VPP participants' experiences with third-party control

We spoke with four VPP participants, all in Adelaide, about their experiences with their technology. Common themes included frustration with the complexity of the installation and grid connection processes; unclear roles and responsibilities; poor communication; difficulty accessing their benefit; and general confusion about the technology and its impact on the household.

**Richie** had a lengthy and difficult installation process, with his technology provider and aggregator both refusing to take responsibility for the installation of his VPP control unit, each claiming the other party was responsible: 'Phone call after phone call after phone call ... I was stuck in the middle.' Afterwards, Richie did not receive his electricity bill for months, and when he followed up with his electricity retailer he was told his meter was not communicating with their system. Months later, after further confusion, Richie's meter was replaced and he received a large electricity bill, which he believed was inaccurate: '[I'm] suspicious as to where all this data's come from, and how they can verify that the data's correct. And I suspect that it's incorrect, which is why I'm getting such an outrageous bill.' Richie told us of 'terrible communication problems' within his aggregator: 'nobody seems to know what's going on' and remains unclear what his control box does: 'I've got no idea ... no one can tell me what it does.' Richie also found it very confusing to determine how much of his energy was being used by the aggregator, and how much was left for his use. Despite this confusion, Richie trusted that no one was trying to do the wrong thing, at least in terms of his data: 'I think it is fairly benign. I hardly imagine [company name withheld] would come in there and try and swipe my data.' Finally, Richie raised the concern that his choice of battery technology constrained his choice of VPP aggregator.

**Tanya** told us she, too, had had difficulties during installation. She had to follow up repeatedly with her aggregator and retailer on the installation of a new digital meter, who then kept asking her to provide the same paperwork, 'over and over'. According to Tanya, it took upwards of three months before she saw a financial return from her participation in the VPP, by which time she was owed more than \$1000. As she had taken the money for her new solar and battery system out of her mortgage, 'You wanna start seeing the money coming back in.' Part of the problem, Tanya felt, was a lack of automation within her aggregator and retailer's systems – they were over reliant on manual processes. She also blamed poorly-trained call centre staff. But irrespective of the cause, as Tanya told us, 'It's really frustrating when you spent a lot of money on the solar system and a battery to just be messed around by them refunding the money that you've signed the contract for. They've got access to the battery anytime they want. But we don't seem to have access to our money back anytime we want. So it's not much of a two way street, unfortunately.' Tanya and her partner were initially concerned that the aggregator would empty their battery 'when we needed it the most.' Living near the Adelaide Hills, they were highly conscious of the risk of power outages during bushfires. However, they were reassured by a clause in their VPP agreement that established a clear limit on how much of their energy their aggregator could take. They were also pleased to learn their battery had a function that enabled them to keep back a certain amount of energy in reserve.

**Jane** also had a frustrating, four-month installation and grid connection process that required constant follow up on her part with multiple parties, including her technology provider, retailer, distribution company and metering provider. Eventually, she had had enough, googled the name of her retailer's chief executive, guessed his email address and wrote to him with her complaint. To Jane's surprise, the executive called her back to discuss her concerns, and followed up with an email outlining the five policy changes he made in response to her complaint, as well as giving her the \$1200 the retailer owed her. But, as Jane told us, 'You want it to work. You don't want people to have to write to the chief executive.' Turning to control, Jane told us she did not really like her aggregator using her battery, and did not feel that it was to her financial advantage. However, Jane said she was 'really happy to go along with the business case if by using back my power at 15 cents a kilowatt hour, they're shaving off the peaks and then not paying fifteen hundred dollars per kilowatt hour at those extreme events, and that makes them it makes the whole thing affordable' – including for those who cannot afford, or are unable to put in the time needed to manage, energy technologies.

**Jeremy** did not have the same concerns with installation and grid connection (perhaps as he had 'brought his own device', that is, his previously-installed rooftop solar and home battery, to the VPP). However, he had major concerns with how his aggregator was managing his battery and engaging with him. First, Jeremy told us that, prior to joining the VPP, he was very cautious in managing his battery's state of charge so as to minimise degradation. But, after joining the VPP, he told us the battery was 'going from one hundred [per cent state of charge] to zero twice a day ... that doesn't make me feel good to start with!' Jeremy felt there was a clear 'conflict of interest' between the aggregator's desire to 'do it as much as possible, because that's the most profitable' and his desire that they 'do it the absolute minimum, because I want my battery to last longer.' Second, he noticed that the aggregator was charging the battery from mains power, rather than his solar, which raised questions like 'Who's paying for that? How much did that cost me? Did I make any money from it? Can somebody tell me what the model is?' Jeremy felt there was very little transparency in how the scheme was operating: 'Nothing [information] was given to me. Zero. So until I got my first bill, I had no way of understanding how they were gonna charge on this.' Finally, Jeremy was concerned that it was unclear who had ultimate accountability for the management of the VPP: his aggregator, based in Australia, or the battery technology supplier, based overseas.

So eventually I went down in tears to the local electrician down here, not one of them that I got a quote from originally because they won't help me anymore in the local area ... So [now] I haven't got any money ... and the inverter for the battery's just sitting in a box out the shed. I don't know what to do with it. Was wondering if I can sell it or something!

It is important to note that, on balance, positive emotions were more common among householders with some combination of enthusiasm for technology and who had undertaken more personal research (indeed, these householders were also more likely to have had a positive experience overall). Interestingly, however, there were no technologies that generated exclusively positive or negative emotions. More details are provided at Appendix A.

### Other factors, other actors: tariffs, bills, and retailers

This section explores tariffs, bills, and electricity retailers (not to be confused with energy technology providers, sometimes also known as retailers), which can also shape householders' experiences with their products. Householders' engagement with these factors (and actors) varied widely. Householders with HEMS, EV, home battery, or VPP technology tended to be more engaged. Conversely, the less engaged householders we spoke with were more likely to be solar owners. But, while quite 'technical', tariffs, bills and electricity retailers have the potential to provoke strong responses, particularly where they intersect – and, especially, conflict – with householders' priorities and values.

'A bit annoyed, really – but, you know, it's a bill'

Householders had a wide range of understandings around their tariffs and bills. On the one hand, some told us they maintain detailed billing spreadsheets, as they found the information provided on their bill and/or monitoring devices insufficient (we discuss monitoring further above in this chapter). These households were more likely to be HEMS, EV and home battery owners, VPP participants, or have a technical background. Other households were less engaged with their tariffs and bills, and told us they were more inclined to simply check their bill when it was received. Some found bills themselves confusing. In general, these households were more likely to be solely solar owners. However, households with premium feed-in tariffs for their solar systems were quite engaged on their tariff and bill, despite telling us their smaller systems (generally in the vicinity range of 1.5 to 3 kilowatts) were not exporting significant amounts of energy to the grid.

Across most households, there was a reasonable amount of knowledge of the Victorian Essential Services Commission's determination in February 2020 to reduce the minimum feed-in tariff from 12 to 10 cents a kilowatt hour for the 2020–21 financial year. However, householders were less certain about the rationale for the decision, and made a number of suggestions, ranging from increased EV uptake through to the impacts of the COVID-19 pandemic. Many householders seemed phlegmatic about the change, even though it meant longer paybacks for their technology investment, with one householder suggesting further falls might help incentivise battery uptake. However, a few householders were quite upset, particularly in the context of increasing retail electricity prices, and told us they saw it as yet another example of the electricity market failing to operate in the interests of householders and the environment. This range of views can be seen in the following:

That's a shame that the feed-in tariff's dropping. But, well, it kind of makes sense. (Jenna, Shepparton)

The situation we're in [is] we don't really need the feed-in tariffs. We've gotten quite a bit back already. Looks like it'll pay for itself after seven years. (Rae, Melbourne)

It is a little bit disappointing, I guess, from our standpoint, because it does mean the payback period is going to be a little bit longer ... I think the system wouldn't be as viable for us, to be honest, just because a lot of our power is fed back into the grid ... again, it's kind of a big investment. So it really comes down to is the way we were going to make this viable for us was being able to use the rebates. (Harrison, Melbourne)

I still felt, in a sense, diddled at the disparate rate between my feed-in tariff and the supply tariff from the grid. I think that's a serious gap and [am] particularly irritated when having started out at 12 cents they then bloody well reduced it to 10.2 cents despite the fact that they're making a handsome ... profit out of my solar

energy ... When you think about it, it's all the same—I mean, electrons are the same, whether they come from your house or from the grid ... From the point of view of physics, it's hard to justify the difference in price. (Rodney, Hepburn Springs)

Interestingly, we did not hear from any EV owners who were on an EV-specific tariff, but this may reflect their relative novelty in the market. More commonly, EV owners told us they were using simple time-of-use tariffs, and charging overnight during the off-peak periods. One EV owner, who was also on a premium solar feed-in tariff, told us he was careful not to charge his EV when the sun was shining, so as not to lose out on his premium rate for exported energy. EV charging is discussed in more detail above in this chapter.

Tariffs were also the subject of much discussion during the two focus groups conducted as part of the development of the RENEW Nexus peer-to-peer trading trial in Fremantle. The trial involved changes to the pre-existing tariff structure in Western Australia, which included a feed-in tariff for solar exports of 7 cents per kilowatt hour. Under the trial, participants would instead nominate their sell price in trade with other participants, who would nominate their buy price. Any unsold electricity was bought by the retailer for 4 cents per kilowatt hour, with this lower price intended to incentivise trading. The trial also introduced a larger supply charge, to better model WA's capacity market (in which energy is a relatively small bill component), and required participants with a premium feed-in tariff to surrender it.

When presented with the final tariff design at the second focus group, participants expressed surprise at the low buy back rate, contrasting it with the business as usual feed-in tariff, and also the retail price for electricity imports. Other concerns raised included the lack of buyers in the trial (most participants in the first iteration of the trial were solar and battery owners, or so-called prosumers, and so would all be exporting surplus electricity at the same time during the day), and the retail monopoly in WA. The following quotations from these focus groups are illustrative:

I was quite surprised with their figures, in terms of their example, to be honest.

But to be honest, you know, 4 cents, 7 cents, is actually really small anyway, compared to what you pay. You know, the 28 or however much it is.

It doesn't really seem like there's enough profit. I mean, you're talking, like, potentially 1 to 2 cents different before—you're better off just selling it to Synergy.

The question is where's the— is there gonna be enough demand?

It's interesting, because one of the questions was whether or not the peer-to-peer trading would increase the amount—create incentives to increase the amount of solar PV, but it almost doesn't seem like it can. Because, in order for the peer-to-peer to work, you need a sufficient number of consumers who aren't prosumers, otherwise the system can't work.

Synergy is the only option that we've actually got with this, we don't have anyone else saying, 'Well, we recognise this and we've got a different network system ... We can offer you actually more.' You're really stuck with that. And I think that's what's going to drive a lot of people away from this idea as well.

Interestingly, a Curtin University researcher told us that this was part of the value of the trial – that it helped participants to better understand the value of energy:

So everyone was actually getting a good deal with their seven cents a kilowatt hour, even though previously they thought they were ripped off by the energy incumbents. So the education process, people being involved was really valuable for them to understand the value of energy and the value of supplying electricity to them.

#### Retailers, ‘death, and taxes’

We observed similar patterns of engagement with electricity retailer selection as with bills and tariffs. That is, some householders were highly engaged with their choice of retailer, and some were more prepared to ‘set and forget’. Again, as with bills and tariffs, this engagement seemed to be correlated with their technology: with more engaged households tending to have some combination of HEMS, EV, home battery or VPP technology – or a technical background. Importantly, however, almost all households expressed some combination of annoyance, dissatisfaction, unhappiness and distrust when discussing their retailer. Guy, from Euroa, expressed a fairly typical attitude:

I’m not quite there [considering going off-grid], but I have had some painful experiences with retailers. Like again, with us, we built our house four years ago. And it’s just ridiculous some of the stuff we had to go through. So on this question of, you know, moving to community [energy], a microgrid, I imagine that that could come into play again with people. ‘What? I don’t have to deal with a bloody retailer anymore and all that bullshit!?’

The only exceptions appeared to be those households with (generally smaller, ‘local’) retailers they perceived to be aligned to their values. Issues of trust and perceived alignment with values are explored further in Chapter 6.

Some householders told us they frequently reviewed their retailer’s offering, and switched to other providers when advantageous, with one householder telling us they review their offer every three months. Another told us he had recently switched using a commercial electricity comparison service. It seemed that many householders were reviewing their choice of retailer as part of having their energy technology installed. This might be as a result of prompting by their technology providers, but (perhaps) could also reflect that householders are thinking more about energy at the point of installation.

As discussed above in Chapter 3, some households said their preference was for ethical, Australian or green retailers. However, a few households found it quite difficult to find them (two households asked us if we were able to provide recommendations). Sue, from Woodend, told us there was no way for her to filter her search results on the Victorian Energy Compare website by the offer’s GreenPower percentage. To get around this, she exported her search results into a separate spreadsheet, which then lacked other helpful information: ‘So there’s really no practical way to find a green plan.’ And other households had concerns with the effectiveness of renewable energy certification schemes in general (again, this could be a symptom of wider lack of trust in ‘duplicitous’ individual retailers and the electricity market more broadly):

You can sign up to a supplier that is, you know, says that they get their energy from wind power or clean energy. The problem is I don’t trust them. I don’t trust that information that they actually do. Because there’s no visibility. It’s just their word ... I think trust is a big issue. (Alex, Euroa)

Relatedly, we heard from some householders who had switched to retailers that offered retail plans that track and pass through wholesale electricity prices. This seemed to be for two overlapping reasons. The first was where householders felt that through careful management they could reduce their overall electricity costs. The second was where households were attracted to values of localism, environmentalism, or independence expressed by the company. However, as recent events in Texas have demonstrated, such products are not without risk,<sup>20</sup> and are probably ill-suited for householders who are not prepared, or able, to exert fine-grained control over their electricity demand.

## 6. Views on emerging business models and reforms for grid integration

*'We really don't have a power problem. I think we have a management and an addiction problem to fossil fuel.'*

—EV focus group participant

As part of our interviews and focus group discussions with householders, we explored emerging responses to, and concerns with, the integration of new energy products and services into the grid, enabled by the digitisation and communication systems embedded in new energy technologies. This chapter reports our findings.

### Summary

Householders have a range of concerns associated with emerging proposals for the grid integration of new energy technologies. These mirror many of their motivations for buying their technology in the first place, outlined in Chapter 3. The root of these concerns is that many householders feel the energy sector's motivations and concerns are not in line with their own. Issues raised include data privacy, and scepticism that third party control of new energy products and services like vehicle-to-grid and virtual power plants would be in their best interest. Many householders did not trust networks or retailers, because they were perceived to hold narrow interests of profit maximisation. Householders also felt a desire to control aspects of their energy use and technologies in line with their own domestic routines and household configurations, which they saw as conflicting with third party automation and control. The national government was singled out by some householders as not providing a 'plan' to rapidly decarbonise because they are beholden to fossil fuel interests. But there were also some concerns state governments lacked a coherent approach to the energy transition. Many householders were wary about the concept of solar curtailment, ranging from doubts that voltage was even a real problem, to a general acceptance as long as there was evidence that alternatives had been explored and that it had been given an independent technical stamp of approval. In general, participants felt that the grid should accommodate rooftop solar as a preference and that the energy sector was not doing enough to ensure the grid was oriented towards a primarily renewable generation mix. Data privacy and misuse were also common concerns. Many householders explicitly said they did not want to trade off convenience for privacy. Our research mirrors other social research in Australia that there are significant concerns about consumers about the way the energy transition is unfolding. A lack of long-term planning, accountability and transparency in the energy sector appears to be a key barrier to grid integration of new energy technologies.

The interviews and focus group discussion questions on this topic were aimed at a general level, although we did provide some context for each concept by explaining that these technologies – from a technical perspective – would aim to support grid management and smooth out grid congestion. We also only raised grid integration proposals that were relevant to the technology that householders owned:

- rooftop solar owners – curtailment
- home battery owners – virtual power plants (VPPs), data privacy
- electric vehicle (EV) owners – vehicle-to-grid, vehicle-to-home, data privacy.

In a couple of instances, when householders had a particularly distressing experience with their technology, we made the decision *not* to cover these themes in what was already a lengthy interview. We did not provide detailed scenarios and time to deliberate at length on these concepts, rather letting each householder explore the issue based on their own understanding of the existing energy system.

### Concerns about third party control of batteries, solar and electric vehicles

Overall, all but one householder had concerns, ranging to serious concerns, about third-party control of household energy technologies and solar curtailment. We have grouped the range of householder concerns into the following issues:

- **not smart enough:** the existing energy system (hard and soft infrastructure) is not capable of delivering sophisticated, trusted ‘smart’ grid technologies
- **not trusted to serve the public/householder interest:** energy companies do not have the same interests as householders and do not act in the public interest
- **concern about data misuse:** privacy, and profiting from users’ data, is a serious concern associated with third-party control
- **‘get your act together’:** grid integration programs, especially solar curtailment, would not be required if there was long-term planning (which reduces householders’ ‘sympathy’)
- **householders should have ultimate control:** householders should be fully in control over the level of automation in their homes.

A significant overall finding from exploring grid integration with householders was that a majority of householders had a high level of grid ‘awareness’, in the sense of some understanding that the grid could be congested, and that there was a need to balance and stabilise various energy flows (for more detail on specific concerns relating to emerging products and services and grid awareness see Appendix B). This is significant because understanding the need for integration in a general sense is an important precondition for any proposed grid integration program or indeed demand response more generally.

### The energy system is not smart enough for ‘smart’ grid technologies

While some householders thought third-party control could be good if it was fair and done ‘in order to balance out the greater good’, they expressed scepticism that the socio-technical infrastructure could deliver these services. These householders tended to have a good understanding of the complexity of the energy system. For example, the idea that an algorithm could make decisions about EV charging based on householder and grid need appeared unconvincing as a proposition, especially in a competitive context without standards where interoperability could be an issue. Some drew on their technical understanding to express this scepticism, and others also referred to historical examples, where technical hype and optimism

did not deliver as promised. For instance, Kathy, from Melbourne, referred to the smart meter rollout, and that certain circuits could be controlled remotely – a promise she has yet to see realised. In her view, the ‘dumb’ grid is simply not ready for the emerging complexity associated with third party control.

Others believed that even if technical hurdles could be overcome, it was unlikely that the energy system could be re-designed to ensure that both technology-owning households and the broader public interest would be protected. A narrow focus on profit motive, elaborated below, may be a barrier to new business models. As Greg, from Melbourne, said:

What their objective is matters. If the objective is—just to go blunt—is to maximise profits for the company, well, then consumers could be at the mercy of that desire. If their objective—and they’re held to it by regulations and law—[is to] maximise the appropriate functionality of their system for the consumer’s sake, and by the way, the consumers will be rewarded with fair pay for the service, then that’s alright. So it’s how that’s set up.

Householders also drew our attention to the complexity involved in ensuring that new energy products and services would be able to contribute fully to the grid. Household electricity infrastructure has not been designed to enable two-way energy flows and host complex communications technologies, and householders were aware that many houses may need upgrades (for instance rewiring) for some energy products that would impose an unexpected cost:

Let me tell you, [company name withheld] are the absolute worst power company to deal with. Apart from taking them five months to reconnect power to the house, 20 meters from the other side of the road. Because we’ve got two phase power and because we’ve also got an electric power, they were incredibly difficult to deal with about how we had to connect that up. And we asked them whether we could get three phase connected to the house and they said, ‘Sure, we’re happy to run it for you, from two hundred meters down the road. That’ll be twenty thousand dollars, please.’ So we said, ‘We’ll stick with our two phase system, thank you very much.’ They’re just all structural disincentives that work against people. (Michael, Eurobin)

Moreover, householders have a range of complex, and changing, energy needs and the ability for the coordination of these and their alignment is likely to be highly complex. As one participant said, ‘I’m just saying that the whole solution is probably not as simple as it looks, in terms of completeness of a solution.’

Householders spoke of frustrating and disappointing customer service from energy providers – demonstrating while some parts of the energy sector may have improved their capacity to sell technology, there is less industry capacity in providing support for customers in maintaining their new energy technologies. This provides a significant risk if these technologies are to be relied on for future supply and grid management. Participants also raised doubts as to the capacity of the regulatory regime to ensure fairness and accountability in such a complex domain. Research on regulatory activity has revealed that rather than reducing regulation, privatisation generally increases regulation.<sup>21</sup> We have also consistently witnessed regulation lagging behind new technologies, with harmful effects on the public. It is likely that such a trend is on the horizon if aggregation services continue to be pursued. Aggregator or third-party use of domestic technologies would require new functionalities within the energy governance regime. Importantly, consumers and regulators need to be able to access and assess the data that is being used by third parties. As a Curtin University researcher, involved in a peer-to-peer energy trading (P2P) trial, put it:

[Aggregators] need to open up their books and let people in to verify it [data]. And that they need to be linked to meters of an appropriate standard. And if you're putting in ubiquitous technologies across the board, that can often be costly. And so that's the thing with your democratising power. Does that mean putting in low-cost devices? Or do you need to maintain a certain standard?

Given concerns about data use and privacy, raised below, the transparency and explainability of data used in new energy products and services are a fundamental, yet neglected, dimension of these emerging business models (exceptions include recent research into smart meter deployment and consumer data protection<sup>22</sup>).

**Mistrust: A lack of alignment between energy companies and the public interest**

From their own direct experience and observations, many householders told us they believe that the energy sector holds a different set of motivations that actively conflict with their own aspirations for both their household and the energy system more broadly.

**Misalignment between the status quo and desired energy systems:** Misalignment between householder visions of the energy system and the status quo was a repeated theme across responses to questions we asked about the range of different network solutions, from solar curtailment to vehicle-to-grid. For many householders, privatisation is directly blamed for what they see as a lack of public interest and desired long term planning reflected in the generation and delivery of energy. For instance, on the question of solar curtailment, the following quotations reflect a lack of trust that such measures are needed within the system:

So [what] the question really becomes, is who decides and who takes responsibility? If it [excess solar] goes back the other way, what do they [networks] have to invest to make it as safe as possible? And the only guys who know are the guys on the ground and all the old expertise, which was independent advice to the government, is gone because they've sold it all off! (Linden, Greendale)

It will be a crying shame if you have to pay to put [solar] to the grid, you know. If it was government owned, if we still had the SEC, it probably wouldn't be so bad. But, you know, it's all about private companies now. And all they are interested in is profit. So we need to bring it back from the profit makers to the users, I think. And I don't know how you do that now, we might have gone too far, I don't know. Mind you, COVID might do that! COVID might make things a little bit more fair in some areas, who knows? (Janet, Melbourne)

For some householders, privatisation has also increased the complexity of the energy system, which subsequently presented a background context of concern for consumer protection around services such as VPPs. Another participant relayed that the regulatory context, which enables the pursuit of private gain rather than broader public interest goals (including decarbonisation), contributes to mistrust in the decision making process. In this quotation, a participant is referring to the promotion of a market logic at the expense of domestic needs around gas:

I think that there are some things that need to be on a much more shared basis. And I think one of the worst things also we ever did was to privatise power poles and wires, supply and the same with telecoms and the same with our water. And, you know, there's mistakes—things coming out of that now, that're the result of the market powers in place. For example, gas. I don't agree with—I mean we shouldn't have the gas anyway. But the fact that you've got private companies that can sell the gas for a lot more offshore, so therefore they make sure that the domestic supply is short and the price is high. Nuts! (Sally, Melbourne)

Privatisation of network companies was also raised as a potential rationale for the (perceived) under-investment in the grid to enable a higher penetration of new energy technologies. As one participant in our solar and battery focus group told us:

It sort of feels like the grid operators are hoping that by sticking their head in the sand, they can kind of force governments to introduce regulations so that they don't have power irregularity when in fact, to my mind, it's actually just that they're not investing appropriately in what is clearly the new form of generation and which ultimately is more efficient, right? Not having to transport power from Latrobe to Melbourne and instead having it that it's coming from your own suburb. There's a lot of efficiencies by avoiding that loss in the grid and by not having to upgrade so much of the high voltage transmission lines further out because more of the generation is happening locally. So, I don't know, I think there's a lot of sort of profiteering, basically, on the part of the grid operators in all this. (Anthony, Melbourne)

This concern around profit motive and its associated barriers also emerged when participants discussed alternative configurations of energy generation, such as community owned generation:

The role for government would be around who then owned that community distribution infrastructure and the hardware and how to make it affordable, because at the moment there are privatised entities that are trying to make as much profit as possible and this would threaten their profit. So it's how do you manage that transition and how do you make the ownership of the investment affordable so it doesn't become a barrier for communities? (Michael, Eurobin)

Many householders believed that profit motive in both the distribution network and generation and delivery arenas have been in direct conflict with the goal to decarbonise and enable new energy technologies more generally. Householders were prepared to support the grid when it framed as a community asset, but expressed to us a range of values and attributes they would like to see reflected in such programs including: collectivism, fairness, accountability, and transparency, which in their view are not reflected in the current energy system. A specific example of how energy sector framings and assumptions may alienate householders, and were at odds with the values of householders themselves, occurred in a P2P trial. When householders were involved in co-designing the P2P program, they emphasised collectivist values for overall community benefit, and told the trial's industry proponents they wanted to be able to give spare energy to nursing homes, schools, and for other charitable purposes. However, the proponents came back with an antagonistic system that emphasised individual financial gain. This disconnect mirrors a common assumption widely held in the energy industry that people are primarily motivated by individual financial gain, rather than more collectivist values grounded in a framing of energy as an essential service.

**Misalignment between households' and energy companies' goals:** In addition, householders also believed that energy companies had different goals than householders themselves. For instance, one VPP participant, Jeremy, from Adelaide, noted the likelihood that his aggregator has different motives for his battery. He believed that aggregators would like to use his battery as much as possible to increase profits, whereas his desire was for the battery not to be overused so it can have a longer battery life. Raoul, from Melbourne, told us he would not trust a large retailer, focused on profit, to control his battery. As he said: 'The last thing I want is a power company taking control of my equipment. I mean, they don't have my interests at heart at all.' EV owners told us they would be open to the concept of V2G but were doubtful whether, in practice, the needs of the grid would align with their own desire for flexibility. Finally, solar owners who expressed a desire to purchase batteries expressed this in terms of a desire for self-sufficiency.

As such, and echoing recent research by UNSW,<sup>10</sup> we suggest there may be conflicts between householder motivations for self-sufficiency, and the request from providers for greater interaction with the grid through participating in VPPs. It is a significant shift to now ask householders to consider their collective impact on the grid and create a new role for them within the broader energy system. The energy sector has typically primarily framed consumers as individuals interacting with the energy system through their retail bill, rather than embedded in specific social and political contexts and in dialogue with one another about desired energy futures. At the same time, because of the deep frustration at the lack of transition happening at the system level, householders have felt they have had to find creative ways to ‘go it alone’ even if this has to happen in the context of maintaining some grid connection: ‘I don’t want to chop off the grid completely. There’s different ways of getting there. And I suppose it’s just trying to work out the way for your individual household, how are you actually going to get there.’ (Sue, Woodend)

#### Concern about data misuse

Householders also expressed a range of views on the importance of privacy and data protection in automation and third party control, although a consistent theme was the need for accountability in data use. Some householders were more relaxed, but others were highly concerned about their data being sold for profit, or deployed for unwanted surveillance. Many householders saw benefits of data aggregation for managing the impact of new energy technologies on the grid, anti-theft and cameras for recording collisions. But householders wanted the data to be private, anonymised, and not used to make a profit – rather, for public interest decisions. A common view was that householders should not be forced to make a trade-off between the convenience provided by digital technologies and social goals and privacy.

This householder was quite relaxed about data being used in ‘normal times’, but noted, in a joking manner, occasions he might not want to be surveilled:

I didn’t hesitate to download the corona app. So I don’t particularly care about the data ... being collected on me, even specifically the destinations and where I’ve been and where I’m going. Because there’s nothing nefarious about what I’ve done and where I’m going. So from that perspective, I’m comfortable with it. I guess if I was to be doing something nefarious, I would change vehicles, or leave my phone at home. (Paul, Melbourne)

Yet others householders were very worried and actively avoided apps that tracked their locations, and well known data mining platforms like Facebook:

Data privacy is a major concern these days. And it needs to be very specifically addressed and managed to make sure that it is appropriately used. (Rod, Melbourne)

There was also an instance of one householder having access to energy data from the system installed in a home that she was renting out, which raises privacy concerns.

#### ‘Get your act together’

A significant theme, when asked about grid integration options or solar curtailment, was concern that there was a lack of long-term planning in the energy system and the sense that regulations and standards are

lagging behind community desires. This view was offered up for a reason that a householder may not be sympathetic to the need for solar curtailment, for example. As Howard told us:

It's almost as if everybody's got to agree, that, look, we know we're gonna head in this direction, we can't be sitting here saying, well, we've got a giant power station. We're making all our decisions based on the fact we're trying to get a return from this thing, and it's a dinosaur, okay, the meteor is about to hit. So this thing is going to die. And it's just a matter of when you shut it down. So can we figure out a way of getting that down, and moving to the other one, and agree on some system?

Householders often held a holistic understanding of the energy transition and veered off the topic of grid integration to make wider points about the need for long-term planning and investment. Examples they pointed to included the need to update building codes, and to stop putting in 'legacy' infrastructure such as gas connections. When presented with new solutions, householders often refer to existing practices that are, in their view, good alternatives to programs of curtailment or control. For instance, householders reiterated the need for energy conservation in the first place (it was in this context where building codes and energy efficiency programs were raised). This shows householders understood an important risk in the energy transition – and one which appears less prominently in energy sector discussions on transitions – that is, the 'rebound effect'. Building infrastructure that assumes an increase in demand, and also aims to push down prices, leads to a lack of incentives and systems to conserve and use less. A householder used the analogy of building more roads – thus encouraging more car traffic – to illustrate this point. One householder referred to public transport as an example of electric vehicles: 'We already have an electric vehicle fleet in Melbourne: they're called "trams."'

Yet other concerns emerged about the overall efficiency of different scale of energy investments, showing how many people hold a collective, rather than individualistic perspective about desired energy futures. One householder, for instance, did not believe that storage should be encouraged at the household scale:

But the economics don't seem to stack up in my mind [for home batteries]. And when you've got a fairly precious resource like lithium, we should be saving it for our mobile applications at the end of the day, because that's where it's best used. It's high density energy storage at the end of the day. And to be bolting it onto the side of a house being used pretty unproductively at the end of the day, because it'll be used heavily in the winter and then hardly discharged at all in the summer months. If we want batteries to stabilise the grid, then we need community scale batteries, to my mind. Local neighbourhood batteries that you subscribe to. (Peter, Geelong)

One householder understood that flexibility needed to be built into the system, not just at a diurnal scale, but between seasons too, implying that household-scale storage cannot be the only solution in providing a constant energy supply. They also raised concerns about battery life cycles and whether home batteries at scale would create a toxic waste problem, illustrating the wide range of environmental and social concerns householders hold about energy futures at different scales.

A lack of long-term strategic planning was also frustrating householders. In relation to EVs, Rod and Jan told us 'we're at the end of the [global] supply chain. We get the dregs.' Householders told us this long-term plan needed to be coordinated across sectors and with the regulatory regime:

It seems to me that there's—you know, it's planning strategy and regulation that needs to come together. And it's not well planned. It's not—there's a lack of regulation and there's no strategic vision as to where government wants to take Australia. (Peter, Geelong)

If everyone put solar panels on the roof tomorrow, if we could just snap our fingers, everyone's got solar panels, the power wouldn't be able to—the grid wouldn't be able to handle it in any case. So what's the plan? If we're going to move forward in a particular direction, there should be a 20-, 30-, 50-year plan for Australia, rather than —otherwise we're just going to be like the Beta and VHS of the, you know, we can just dump whatever we don't want overseas, we just dump it in Australia. (Lou, Mornington)

And it's totally embarrassing that you put up a wind turbine or a solar panel and you're not allowed to use it because the grid's got too many electrons at the moment. That's just dumb. So we need battery storage somewhere in the system somehow to store all these electrons. (Kathy, Melbourne)

The key risk participants raised in relation to a lack of coordination was a concern the speed of the energy transition was too slow. But, as mentioned, they also were aware of social and environmental risks around uncoordinated investment between different scales of renewable generation – individual, community, or large scale leading to inefficiencies and equity issues:

Yeah. I'm probably thinking more where the government money should be going. What's going to get the best outcome for the taxpayers? Is it all doing our own little thing, getting our rebates? Or is it—should we be looking at big picture, blue sky stuff? (George, Ballarat)

#### Automation works when householders are in control

Many householders understood the need for matching supply and demand of energy for grid stability. Generally speaking, EV owners thought this could be managed by a simple overnight tariff to incentivise charging at night – but convenience was at the heart of this, since cars are generally not being used at night. They were less convinced about vehicle-to-grid technology for households, because they believed householders need to have first priority of use, which might conflict with the certainty needed for the energy companies to provide energy at particular times. Ultimately, as one participant said, 'The decision needs to stay with the owner of the car, because if I need to go to Portland tomorrow, I need to be able to say ... I need 90 percent.'

Householders believed that they were generally best positioned to control their energy use, since they had detailed understanding of their own needs. Householders told us of adjusting the controls of appliances like heated towel racks so that it would interface with their solar system. Raoul, from Melbourne, told us that after exploring complicated systems to automate his household's energy use, that a simple timer was the cheapest and easiest way to manage his energy use: 'You can just do that with a timer rather than a fancy, autonomous system.' Householders are often not involved in designing digital systems in the home, and this has been another instance where 'control' has been outsourced to experts, to the detriment of householders. For example, Carol and Bruce, from Bendigo, told us they have smart meters 'and yet we don't feel that we have the analytics, if you like, to use our system efficiently or easily efficiently to see how much we're generating and when we're using it.' One householder was able to switch off a particular circuit (with a specific tariff) over summer for six months of the year and rely on the solar hot water system.

#### Spotlight: solar curtailment

Generally speaking, solar curtailment was not viewed favourably by our participants. Indeed, in South Australia, it is the most common complaint from solar customers to the Energy and Water Ombudsman. Participants expressed scepticism of the underlying need for curtailment. Householders generally believed the grid should accommodate solar as much as possible, and that planners and regulators have not been on the front foot in this regard. Raoul was generally of the view that the lack of planning and grid redesign was the underlying cause of voltage issues. Lee, from Melbourne, believed that solar installers were actively ‘fiddling with the line voltage’ to enable network companies to curtail when they wanted. Lee felt very strongly that the system should accept renewables and voltage imbalances represented a ‘bullshit technical excuse’. Other participants were more open to the idea under very restricted circumstances, if it could be demonstrated: 1) by technical experts that there was a voltage issue; and 2) that it would be cheaper for all energy users. Because Jane generally trusted the South Australian government on energy questions, she wanted to interpret the need for curtailment in a positive sense, because she understood there was a network issue to be dealt with. But the South Australian government’s recent announcements around new road user charges for EVs did not sit well with her, and made her wonder about her ‘sympathetic’ interpretation of the need for curtailment. This demonstrates the need for the policymakers to provide a consistent approach to decarbonisation. Another recently installed solar householder was able to understand the need for solar curtailment ‘for the good of the grid’, but said he would be less happy about the prospect of export charges since it would affect his payback calculation.

While it sometimes led to conflict with the teenage son who wanted a hot shower, she valued this ability to control her energy use herself. These findings, and associated work on automation in the home,<sup>9</sup> shows the complexity of designing algorithms to work for different household contexts, and the importance of centring householder needs in decisions about whether or not automation is desirable or necessary.

#### Conditions for third party control

While some householders were open to the idea of VPPs as a way to support the grid, people articulated concerns that the overarching program goal be linked to overall public benefit. Several householders were adamant that these programs should not be run as a for-profit exercise (for householders or a third party). All householders we asked about VPPs expressed at least some conditions for participation. These included that:

- their energy would not be ‘sold’ for profit
- participation in the VPPs would not reduce the life of their battery
- VPP aggregators would be ‘accredited’ by a trusted authority (e.g. state government body)
- householders’ energy needs would be prioritised
- householders would be fairly compensated
- householders would be given priority in emergency/blackout contexts.

#### Spotlight: energy sector perspectives on VPPs

While the focus on this chapter has been on householder views, we briefly consider energy sector professionals' views of VPP programs. VPPs are a new concept that the energy sector is still exploring. Generally, energy sector professionals believed VPPs had significant potential. This was based on a number of assumptions: 1) aggregators will be more acceptable to consumers because they are not a traditional retailer, and are thus seen in a more positive light than traditional retailers; and 2) user's concerns can be resolved by providing them with visibility of battery behaviour, good customer service and opt-out pathways. That there are generally positive views among industry experts is unsurprising. It has been well documented in research on historical innovations that positive 'hype' often accompanies new technologies<sup>23</sup>. Around the buzz of techno-optimism, the positive dimensions of new technology tends to be overstated, and the risks understated. Yet the closer we get people 'on the ground', the more apparent the risks. The range of risks raised by non-VPP households, as well as the experience of VPP householders documented in Chapter 5, would indicate the need for greater caution. One solar retailer who has also witnessed industry misinformation and poor practice in the rooftop solar market was also concerned about the 'marketing spin' potential of VPPs, and keenly aware of the potential for consumer protection gaps.

The role of a body that can aggregate and act on behalf of householders in enabling VPPs is a key element of enabling this service. The experience of the P2P trial was that many householders did not have the time or inclination to 'directly trade' with either one another or with a wider market. And our participants also made this point:

I have no idea how the power market works, apart from what you read in the press. So I'm reliant on whoever sets something like that up to say, 'OK, this is the way it will work and this is how we can both benefit.' So I think there would—there would have to be a certain level of openness on both sides to say 'Well we're going to show, share our business model with you and tell you "This is how it functions"' and be very open. (Howard, Melbourne)

From both a technical and a user perspective, it appears there may be a requirement for a third party to act on technology owners' behalf. However, our research with existing technology owners shows that a lack of trust in the energy sector, and a concern with how VPPs could impact their batteries, shows that aggregators, especially large retailers, face significant challenges to convince householders that VPPs are a viable pathway.

#### **Solutions should be collective and fair**

Many participants had a sophisticated understanding of the need for curtailment and, for some participants, the regressive nature of the way new energy technology products and services have been rolled out to date (e.g. the early high feed-in-tariff rates for rooftop solar). In this context, for instance, Howard was very concerned that the cost of upgrading the grid to allow more solar (as an alternative to curtailment) should not be borne by people who are already struggling to pay their electricity bills. While he was unsure of the pathway to achieve this, he expressed the desire for an energy system with more new energy technology products and services to bring down costs for all consumers. People understood that a system that only financially benefits technology owners is unfair. As George, from Ballarat, told us in regard to solar

ownership, 'If you've got [solar panels] you're right, if you don't you miss out.' Many householders expressed a desire to be as self-reliant as possible but were concerned that wealthy early adopters have predominantly been able to access this so far:

[I had always thought] having solar would be really cool. And not having to pay for electricity and using it throughout the day and having a battery. Living off-grid, kind of thing, in the electricity sense has always been an interest ... [but] it's something that only people who have mansions and lots of lots of money and yet the early adopters of technology could have. (Jenna, Shepparton)

There's a great quote ... 'The future's already arrived, it just isn't evenly distributed.' And that's true. Like, it's never going to be evenly distributed in the beginning. But a cleverly described design scheme would get someone like me to pay for it but someone that can't afford to pay for it would get the service subsidised. And, of course, if they were building public housing in Victoria, rather than the privatised public-private partnerships they're getting now to build so-called public housing, that would be the place to start. I think there's a public housing block in Windsor that's just covered in solar panels, and that was sort of a pilot project the Department of Housing did. But I don't think it's gone anywhere after that, which is a real shame. (Michael, Eurobin)

#### Risks of responsabilising individuals

Householders want to be part of the transition, and some gain a lot of pleasure from tinkering with the technology. But the regulations and support roles are not in place to ensure that householders can all benefit from technologies such as rooftop solar, home batteries, home energy management systems and EVs. According to one focus group participant:

Most people do not have the technical knowledge we like our group of six has. You know, it's just a matter of consumer protection. I think we need to have, frankly, more rules to put the onus on the more sophisticated commercial parties to make these things work better. (Anthony, Melbourne)

The risks associated with decentralisation are now elaborated in more detail in the next chapter.

## 7. Implications

*‘Look, there’s a great quote ... “The future’s already arrived, it just isn’t evenly distributed.”’*

—Michael, Eurobin

This section explores the implications of our findings for policymakers, industry and researchers, and sets out preliminary thinking on possible responses, many of which came up in our interviews with householders and energy industry and consumer experts. Note we have deliberately avoided calling these recommendations, as some require further, detailed analysis.

Implications of our findings on motivations, attitudes and expectations

Whether ‘pale green’ or ‘true believer’, we heard people want an energy system that

- is affordable – both financially and environmentally
- allows households to achieve their particular priorities: which could, depending on contexts, be any combination of comfort, convenience, self-sufficiency, entertainment, or community care
- is fair, and does not penalise people who are unable or unwilling to engage, or on the basis of gender, income level, housing tenure or location.

While these motivations interact with each other in complex, and sometimes conflicting, ways, we saw more commonalities than differences in motivations between technology types. That is, rooftop solar owners and peer-to-peer trial participants alike wanted to demonstrate technology and save money. Electric vehicle and home energy management system owners wanted more convenience and were enjoying their new technology.

Rooftop solar owners, home battery owners and microgrid participants wanted to increase the self-sufficiency and resilience of their households and communities. This speaks to broader, shared, pro-environmental and prosocial values. But the energy sector is not providing people with a system that reflects these values. As a result, millions of households are taking matters into their own hands, with implications for grid management and for equity. (We wonder, for example, if we would be seeing the same rates of rooftop solar installation in Australia if people trusted the energy system to give them what they say they want and need). Work is also needed to ensure that all Australians can access clean, cheap energy, including low-income groups.

#### Possible responses

1. Consider ways to better support clean, cheap energy for all Australians, including low-income groups, that better manage the trade-offs between risk, responsabilisation, equity and economic efficiency (e.g. social enterprises, community energy, mid-scale generation, neighbourhood batteries).
2. Consider other, non-technology alternatives for increasing energy equity, for example energy efficiency.

#### Implications of our findings on information sources and preferences

We heard that information on new energy products and services, and the energy sector more broadly, is complex and confusing. This complexity and confusion reigns at multiple stages – from considering a new technology, through to learning how to use it, to working out how to seek help – and at multiple levels – from a lack of government and industry leadership, through to the overwhelming amount of information online, to poor practices by installers and dealers. It is hard to see how these technologies will become more widely adopted in Australia before these issues are addressed. We should also be alert to the cumulative impacts of all this complexity, and the effort required to avoid its negative impacts (at the same time householders are being entreated to be ‘good’ consumers dealing with similar complexity in the banking, insurance, and telecommunications industries). Community groups, online forums, and other forms of engagement with householders on new energy products and services may be helpful to reduce this confusion.

#### Possible responses

3. Better promotion of existing Victorian Government information resources (potentially via MEEH, SolarQuotes.com, Renew, technology providers).
4. Better enforcement of existing Clean Energy Council requirements on staff training and information provision covering, inter alia, expected benefit, operation and maintenance.
5. Work with vehicle manufacturers to develop an EV buyer’s guide, setting out key considerations for people considering an EV purchase.
6. Consider providing more support for user-led deliberation, including MEEH and other online forums, community groups, and local governments (also consider physical and virtual alternatives to Facebook).
7. Consider other options for improving energy engagement in the community, in line with the report by Strengers et al.<sup>8</sup>

#### Implications of our findings on experiences with installation and use

Many householders have had good experiences with their new energy products and services. This seems to be more likely though in circumstances where householders:

- had a background with new energy (or other) technology
- undertook significant personal research (sometimes over months and years)
- joined new energy technology community groups and online forums
- went through state government, council or community group rebate or bulk-buy schemes

- had the time, capacity and resources to actively monitor and manage their technology
- had, and knew they had, access to after-sales support and dispute resolution services.

But the reverse also applies. Householders seem more likely to have negative experiences where they:

- did not have a background with technology, undertake personal research or join a community group/ online forum
- did not have the time, capacity or resources to actively monitor their technology
- did not have access to, or know how to access, support
- purchased their technology following an unsolicited approach.

Appendix C details the most common of these negative experiences, as raised with us by householders and experts. These are grouped into five major issue areas: quality (of technology, of technology providers, of information, of regulation and enforcement, complexity, timeframes, accessibility, and culture); complexity (of technology, of installation processes, of information and of business models); timeframes (to identify and resolve issues and new, longer-term relationships); accessibility (of rebates, technology, providers, and support, and to renters and low-income groups); and culture (clashing values, risk aversion, communication failures, and commercial pressures). Without action, these issues can be expected to get worse, and affect more people as new energy products and services grow in popularity across Australia – with vulnerable people at most risk.

#### Possible responses

8. Better enforcement of existing new energy technology consumer protections (especially for responsible sales and marketing, after-sales support and coordinate of the grid-connection process).
9. Better enforcement of adjacent regulations/codes, including around electricity safety and occupational health and safety.
10. Consider expanding the Energy and Water Ombudsman Victoria’s jurisdiction to include all new energy technology products and services.
11. Consider alternative options for timely issue resolution that are more responsive and accessible (e.g. digital) to reflect changing markets.
12. Consider tightening Solar Victoria guidelines to exclude buy now, pay later finance and unsolicited sales – not just high-pressure sales.
13. Consider options for decentralising the national energy regulatory framework to better oversight outcomes for users of decentralised energy technology.
14. Consider options for a compensation scheme of last resort for new energy technology users who are left out of pocket through the fault of their provider and unable to be recompensed through other means (models include the Victorian Legal Services Board’s Fidelity Fund, the ACT Government’s Default Insurance Fund, and the Commonwealth’s proposed Compensation Scheme of Last Resort).

## Implications of our findings on views on emerging business models and reforms for grid integration

Householders' views on grid integration are obviously not static; they can change through dialogue with trusted peers and experts (whether through dialogue on an internet forum, with a friend or reading content online). However, it is worth keeping in mind that some of householders' concerns about grid integration options relate to systemic features of the energy sector, and as such, are more complex to resolve. Concerns around distrust were clearly linked to issues such as energy privatisation, the need for long-term planning in the grid discussed in detail below. Widespread concerns such as these are unlikely to change with 'more information' alone, or even with some simple 'opt-out' options. Building trust in the broader 'energy system' is a long-term project. Distrust in the energy sector, its specific implications and strategies for building trust is outside the scope of this report, but the subject of ongoing investigation by social science researchers in Australia. Briefly, it is likely that increasing different forms of dialogue with all energy users<sup>8</sup> will be a key element. Other key trust building elements include confidence that regulatory agencies will penalise poor behaviour, demonstrated leadership from both government and the sector in planning for the energy transition and a strong civil society they energy users see advocating on their behalf.<sup>24</sup>

### Possible responses

15. Support for new multi-stakeholder partnerships working on value-sensitive design, responsible research and innovation, and social and institutional innovations for decentralised energy ownership and operation.

## Overarching implications

The quotation we have chosen as the title of this report, 'We want it to work', comes from one householder, Jane, who was on one level reflecting on the difficulties she encountered with her VPP. But Jane was also expressing a wider frustration (shared by many other householders) with a perceived energy leadership deficit in Australia – that is, that her personal commitment to climate action was not sufficiently reflected by (current) government policy settings and industry offerings. More and better government leadership – on climate change, on energy, on planning, on buildings – is critical. This is because it can establish the framework for subsequent activity by industry, community groups and householders. But, as well as governments, there needs to be concerted and ongoing attention to the roles of communities, civil society and industry, at all scales from the local to the national.

Addressing the energy leadership deficit in Australia goes well beyond the remit of the Energy and Water Ombudsman and, too, that of the Department of Environment, Land, Water and Planning. But we see a clear role for strengthened, coordinated approaches to energy and climate governance, even at the state level, that:

- reflects the scale and urgency of the climate crisis
- help make the energy system more equitable and just – including for women, renters, regional, diverse and low-income households
- better apportion risk and avoid unwelcome 'responsibilisation' of householders.

Possible responses

16. Ensure all policy making in energy, transport and planning is climate compatible – and coordinated across all areas and levels of government.
17. Invest in research capacity for socio-technical transitions, to more quickly be able to identify governance responses that lead to rapid and equitable transitions.

## References

1. Clean Energy Regulator. Postcode data for small-scale installations. <http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations> (2021).
2. Sunwiz. End of Year Forecast for the Australian PV Solar Market (2020). *Sunwiz - Solar Energy Consultants* <https://www.sunwiz.com.au/end-of-year-forecast-for-the-australian-pv-solar-market-2020/> (2020).
3. Department of Industry, Science, Energy and Resources. Solar PV and batteries. *energy.gov.au* <https://www.energy.gov.au/households/solar-pv-and-batteries> (2021).
4. Household Solar Demand Surges Through the Roof in 2020. *BloombergNEF* <https://about.bnef.com/blog/household-solar-demand-surges-through-the-roof-in-2020/> (2020).
5. Australian Energy Market Operator. *2020 integrated system plan for the National Electricity Market*. <https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en> (2020).
6. Watson, P., Lovell, H., Ransan-cooper, H., Hann, V. & Harwood, A. *Social science*. <https://docs.google.com/document/d/1GfxzlFCN7Vj7d0gCnDLzF-gii0q9S6yid8Weyy50jPI/edit#heading=h.sezgahp70hsn1/57><http://brunybatterytrial.org> (2019).
7. Nicholls, L., Arcari, P., Glover, A., Martin, R. & Strengers, Y. *Engaging households towards the future grid: experiences, expectations and emerging trends*. [www.energyconsumersaustralia.com.au](http://www.energyconsumersaustralia.com.au) (2019).
8. Strengers, Y., Nicholls, L., Glover, A., Arcari, P. & Martin, R. *Engaging households towards the Future Grid: an engagement strategy for the energy sector*. [https://www.monash.edu/\\_data/assets/pdf\\_file/0004/1862833/Engaging-households-towards-the-Future-Grid-FINAL-181219.pdf](https://www.monash.edu/_data/assets/pdf_file/0004/1862833/Engaging-households-towards-the-Future-Grid-FINAL-181219.pdf) (2019).
9. Nicholls, L., Strengers, Y. & Tirado, S. *Smart home control: exploring the potential for enabling technologies in vulnerable, disengaged and regular households*. (2017).
10. Roberts, M., Adams, S. & Kuch, D. *VPP User Research Final Report*. (2020).
11. Sovacool, B. K. & Hess, D. J. Ordering theories: Typologies and conceptual frameworks for sociotechnical change. *Social studies of science* **47**, 703–750 (2017).
12. Haddon, L. Domestication analysis, objects of study, and the centrality of technologies in everyday life. *Canadian Journal of Communication* **36**, 311–323 (2011).
13. Geels, F. W. A socio-technical analysis of low-carbon transitions: introducing the multi-level perspective into transport studies. *Journal of Transport Geography* **24**, 471–482 (2012).
14. Geels, F. W., Schwanen, T., Sorrell, S., Jenkins, K. & Sovacool, B. K. Reducing energy demand through low carbon innovation: A sociotechnical transitions perspective and thirteen research debates. *Energy Research and Social Science* **40**, 23–35 (2018).
15. Hyysalo, S., Juntunen, J. K. & Martiskainen, M. Energy Internet forums as acceleration phase transition intermediaries. *Research Policy* **47**, 872–885 (2018).

16. Geels, F. W. Socio-technical transitions to sustainability: a review of criticisms and elaborations of the Multi-Level Perspective. *Current Opinion in Environmental Sustainability* **39**, 187–201 (2019).
17. Best, R., Burke, P. & Nishitatenno, S. Understanding the determinants of rooftop solar installation: evidence from household surveys in Australia. *Australian Journal of Agricultural and Resource Economics* (2019) doi:10.1111/1467-8489.12319.
18. Sovacool, B. K. & Martiskainen, M. Hot transformations: Governing rapid and deep household heating transitions in China, Denmark, Finland and the United Kingdom. *Energy Policy* **139**, 111330 (2020).
19. Darby, S. J. Coal fires, steel houses and the man in the moon: Local experiences of energy transition. *Energy Research & Social Science* (2017) doi:10.1016/j.erss.2017.05.025.
20. His Lights Stayed on During Texas' Storm. Now He Owes \$16,752. - The New York Times. <https://www.nytimes.com/2021/02/20/us/texas-storm-electric-bills.html>.
21. Braithwaite, V. Trust and governance. 33.
22. Kallies, A., Chandrashekeran, S., Keele, S. & Godden, L. *The Smart Meter Promise: A Review of Smart Meter Deployment Challenges in Australia and Germany*. [https://www.energy-transition-hub.org/files/resource/attachment/smart\\_meters.pdf](https://www.energy-transition-hub.org/files/resource/attachment/smart_meters.pdf).
23. Sovacool, B. K. & Brossmann, B. Fantastic Futures and Three American Energy Transitions. *Science as Culture* **22**, 204–212 (2013).
24. Braithwaite, J. Institutionalizing Distrust, Enculturating Trust. in *Trust and Governance* (eds. Braithwaite, V. & Levi, M.) (Russell Sage Foundation, 1998).

## Appendix A: householders' emotions elicited by their technology

### Positive emotions

Emotions	Sources	Technologies
Happiness, joy, pleasure	<ul style="list-style-type: none"> <li>• With how technology is performing</li> <li>• From using technology</li> </ul> <p><i>'Yes, it's brilliant. Very happy.'</i> (Janet, Melbourne)</p>	Solar, EVs, HEMS
Satisfaction, contentment	<ul style="list-style-type: none"> <li>• Personal mastery of new technology and practices</li> <li>• Knowledge that technology contributing to broader goals</li> <li>• From doing a good job (technology providers)</li> </ul> <p><i>'It's been really, really great. The financial payoffs are already starting to show. I feel good knowing that I'm producing renewable energy and consuming renewable energy rather than relying on coal and traditional methods.'</i> (Jenna, Shepparton)</p>	Solar, HEMS
Enthusiasm, fascination	<ul style="list-style-type: none"> <li>• Discovering capabilities of the technology, considering future possibilities</li> </ul> <p><i>'I love having it—because it's "stick it to the man", yay!'</i> (Georgina, Yackandandah)</p> <p><i>'We don't know ... what's coming into being in the next hour, let alone month or year, as far as technology is concerned. So anything's possible ... We probably can't even imagine what we'll be doing in 12 months on. It's scary! ... I love it.'</i> (Janet, Melbourne)</p>	All
Playfulness, excitement	<ul style="list-style-type: none"> <li>• Tinkering with technology and tweaking appliance use</li> <li>• Speed and acceleration of EVs (EV dealers, too!)</li> </ul> <p><i>'It's somewhere between ... sheer entertainment and just doing the right thing.'</i> (EV focus group participant)</p> <p><i>'I'm looking at these Israeli ones, home biogas systems that basically separate the methane from the waste and you can put meat waste in there as well. And what it does is you can use the gas in barbecues, but eventually I'll probably try to pump mine into my generator and just run my generator every now and then ... basically you run a hose into the side of the air intake of the carburettor and—well, I've seen it online—I've moved the generator from the house in case there's a bang!'</i> (Chris, Smiths Lake)</p>	EVs, batteries, VPPs, HEMS

Inspiration	<ul style="list-style-type: none"> <li>Community groups, champions</li> </ul> <p><i>'I had conversations with Brian, who's my father in law ... he was on a completely different path in terms of battery technology, but they were always kind of inspiring around getting involved in that kind of thing.'</i> (Jane, Adelaide)</p>	Solar, EVs batteries, microgrids
Confidence	<ul style="list-style-type: none"> <li>In the technology, in trusted technology providers</li> </ul> <p><i>'The solar panels are lovely and boring because they sit on the roof.'</i> (Kathy, Melbourne)</p> <p><i>'He's always at the end of the phone if I've rung him and said, "Hey, I've got a stupid question." He's great. You always ring back, and he comes.'</i> (Georgina, Yackandandah)</p>	Solar, EVs
Aesthetic appreciation	<ul style="list-style-type: none"> <li>The beauty of the technology</li> <li>New sensory pleasures</li> </ul> <p><i>'On those cold ... frosty mornings, when you start up a petrol car, you get these fumes going all over the place—all the petrol laden fumes as the car starts warming up. And we have certainly noticed that, too, that driving the—both of them, both of the electric cars—is nothing like that. When you get out and start the car, there's nothing. The car just—the lights will come on and everything flashes and stuff like that. There's no petrol engine kicking in. There's no fumes. You just go off in a, I don't know, just a silent sort of glide, and smell the wet leaves on the trees ... So it's been good like that too.'</i> (Lachlan, Melbourne)</p> <p><i>'There's nothing bad about it. It's wonderful. It works. It saves us money. It's good for the environment. And I love looking at it.'</i> (Rae, Melbourne)</p>	Solar, EVs
Relief, gratitude,	<ul style="list-style-type: none"> <li>For reputable technology providers and good support</li> <li>For subsidy schemes that enable access to technology and positively shape the market</li> <li>For technology that lowers the cost of living</li> </ul> <p><i>'So the ombudsman's great. Really, really grateful for that part of the system.'</i> (Jane, Adelaide)</p> <p><i>'I feel a lot better about turning things on and I'm a lot more aware of what it's costing, you know, in terms of electricity to turn things on.'</i> (Rae, Melbourne)</p> <p><i>'I'm happy Solar Victoria's involved here to kind of keep things safe and above board.'</i> (Rae, Melbourne)</p> <p><i>'Those days we were a bit more conscious, cautious to use [power, now we are] more comfortable. Otherwise we were always checking the bill and prices. I wish I could do the same thing for the gas heating!'</i> (Rasike, Melbourne)</p>	Solar, batteries, VPPs

## Negative emotions

Emotions	Sources	Technologies
Confusion, exhaustion	<ul style="list-style-type: none"> <li>● Complexity of the technology</li> </ul> <p><i>'It's complicated! I should know—I mean, god, I paid twenty two thousand dollars for this stuff and I wouldn't know what to do with it or how to—you know what I mean? ... And I thought it would make things easi—I love having it, but I like to be able to just walk past it and not have to—like, managing things. As we all do, like, this, just everything in life needs management. It's just one more thing. I've paid the money. I just want it to be there and be cheap for me and easy and not break down or you know what I mean?'</i> (Georgina, Yackandandah)</p>	EVs (charging), solar, batteries, HEMS
Frustration, annoyance, anger	<ul style="list-style-type: none"> <li>● Complexity of the technology</li> <li>● Technology failures</li> <li>● Perceived conflict with own values</li> <li>● Perceived lack of energy and climate leadership</li> <li>● Poor customer service and delays to process</li> </ul> <p><i>'It wouldn't make any difference to my bill, but it would make a difference to my peace of mind. I had quite a bit of angst is the way the process was working out because I didn't fully understand how it worked.'</i> (Rodney, Hepburn Springs)</p> <p><i>'The process was a shambles ... I realised that they obviously had no idea .... And their solar architecture was poor. So I then immediately lost faith in the whole idea of what I was doing.'</i> (Kane, Melbourne)</p> <p><i>'I'm frustrated that it's [community energy is] not happening faster.'</i> (Rae, Melbourne)</p> <p><i>'Ruthless, soulless suppliers that are just out to get the rebate and, you know, just suck on whatever they want.'</i> (Luke, Melbourne)</p> <p><i>'My brutal analysis of the dealers is that they are politely useless when it comes to EVs.'</i> (Kathy, Melbourne)</p> <p><i>'So it's really frustrating when you spent a lot of money on the solar system and a battery to just be messed around by them refunding the money that you've signed the contract for. They've got access to the battery any time they want but we don't seem to have access to our money back anytime we want. So it's not much of a two way street, unfortunately.'</i> (Tanya, Adelaide)</p>	Solar, EVs, batteries, VPPS, microgrids
Anxiety, fear	<ul style="list-style-type: none"> <li>● From complexity of the technology</li> <li>● From perceived risk (safety, loss, lack of control, poor governance)</li> <li>● Poor customer service and delays to process</li> <li>● Lack of communication by energy companies</li> </ul> <p><i>'People [chose not to] receive them [smart devices] because of concern over privacy and fear of someone taking control of their energy system ... which is understandable.'</i> (Matthew)</p>	Batteries, VPPs, microgrids, HEMS

	<p><i>'When you're on hold for three hours every time and you dread ringing them, you know, you dread it! There's a lot of companies like that ... Telstra, god!'</i> (Georgina, Yackandandah)</p> <p><i>'You sort of dread it a little bit, and go, "Did we make the right decision?" I still do really think that solar and batteries and that that sort of stuff to make yourself pretty much self-sufficient is a great idea. It's just getting the right company to work with.'</i> (Tanya, Adelaide)</p>	
Disappointment, boredom, Disengagement	<ul style="list-style-type: none"> <li>● Results below expectations</li> <li>● Low perceived benefit of engaging</li> <li>● Distrust</li> </ul> <p><i>'The pay in tariff was just ridiculous. Absolutely ridiculous. I was so disappointed and still am very disappointed. Like, I produce the stuff and get paid about 6 cents a kilowatt hour and I buy it back for 21 to 22 a kilowatt hour. I mean, it's just stupid. Absolutely stupid.'</i> (Kane, Melbourne)</p> <p><i>'I was a bit disappointed by the actual experience of it [the P2P trial]. Well, not so much disappointed. It's like, well, I'm not quite sure what the point is.'</i> (Curtin University researcher)</p> <p><i>'I'm disappointed, too, that the inspector—they can be in the same room with these installers as well, and that he approved the work. That private electrician I got from Bendigo when I was having trouble, he said, you know, it wasn't wired properly and that sort of stuff ... you know, how can someone from the government approve shoddy work?'</i> (Heather)</p>	Solar, batteries, P2P
Sadness, resignation	<ul style="list-style-type: none"> <li>● Complexity of the technology</li> <li>● Technology failures</li> <li>● Feeling alone and unsupported</li> </ul> <p><i>'So he said ... he wouldn't help me anymore. So eventually I went down in tears to the local electrician down here, not one of them that I got a quote for originally because they won't help me anymore in the local area ... So [now] I haven't got any money ... and the inverter for the battery's just sitting in a box out the shed, I don't know what to do with it. Was wondering if I can sell it or something!'</i> (Heather)</p>	Solar, batteries

## Appendix B: summary of perspectives emerging business models and reforms for grid integration

### Concerns and conditions

Business model or network solution	Householders who are highly concerned & sceptical	Specific concerns	Householders who think acceptable under conditions	Conditions
Solar curtailment	Harrison Raoul Lee Battery/solar focus group Howard Janet Sue Brad	<ul style="list-style-type: none"> <li>• Pay-back period affected (if applied retrospectively)</li> <li>• Who benefits?</li> <li>• There are vested interests</li> <li>• ‘Unsympathetic’ – fixing the grid is just what they should be doing all this time</li> <li>• Renewables should be prioritised, export charges ok if the energy system was government owned</li> <li>• Put in batteries rather than curtail solar</li> <li>• Doesn’t believe there is a need</li> </ul>	Rasike Trisha Raoul Rosemary Rodney Sally	<ul style="list-style-type: none"> <li>• Only should be implemented in highly congested areas</li> <li>• Provide evidence that it is for the ‘good of the grid’</li> <li>• Solar owners should be rewarded as much as possible and curtailment as a last resort</li> <li>• Ok if it is a temporary solution but need to fix the grid</li> </ul>
V2G	Lachlan	<ul style="list-style-type: none"> <li>• Competing standards and interoperability are a challenge, unlikely to be overcome in a ‘competitive context’</li> <li>• Would not trust an algorithm to manage the complexity</li> </ul>	EV focus group Kathy/Greg/ Brendan Kane	<ul style="list-style-type: none"> <li>• ‘Comfortable’ with it so long as the final decision stays with the owner</li> <li>• Ok long as does not affect the battery warranty?</li> <li>• Will be easier for householders to accept if there is more charging infrastructure</li> <li>• Perception that it is still some time away</li> <li>• Acceptable if everything is equitable and done in order to balance out the greater good.</li> <li>• Preference for making own decisions but understands that balancing required across larger than household scale</li> </ul>
V2H	-	-	EV focus group	<ul style="list-style-type: none"> <li>• Alternative to an ‘expensive’ household battery</li> </ul>

VPP	Raoul Janet Jan and Rod Energy consumer organisation Janet Sally	<ul style="list-style-type: none"> <li>● Financial benefits to consumer are small and risks are big</li> <li>● Risk of battery being run down</li> <li>● Does not want it to be for-profit (has to be for the greater good)</li> <li>● Privacy</li> <li>● Don't have a feeling that grid management is done for long-term benefit of society</li> <li>● Will conflict with household need</li> <li>● Technical faults with the battery display (not aligned with battery behaviour)</li> <li>● Not if it's being done for-profit</li> <li>● Only if data is being used for public good</li> </ul>	Georgina Jane Jeremy Linden Luke Jan and Rod	<ul style="list-style-type: none"> <li>● If well compensated</li> <li>● Prioritise household need (e.g. during bushfires)</li> <li>● Company has to be 'accredited by a body like a state government'</li> <li>● Well managed</li> <li>● Excellent customers service</li> <li>● Prioritise battery life</li> <li>● Only acceptable if it is not for utility profit, and transparency in how it's done with a real reform agenda and long-term planning.</li> <li>● Privacy and data security, including local (Australian) operation</li> <li>● So long as it's 'fair'</li> </ul>
-----	---	---	---	---

## Attitudes to the grid

Attitude to the grid	Householders	Concerns
<p>Aware that the grid needs to be managed in some way</p>	<p>EV focus group Raoul Kathy/Greg/Brendan Kane Harrison Jenna Solar/battery focus group Rae George Linden Luke Sally Sue Guy</p>	<ul style="list-style-type: none"> <li>• Concern about their EV being a ‘drain on the community’</li> <li>• Aware that the grid needs to be kept stable</li> <li>• Awareness about e.g. aircons putting a stress on the grid</li> <li>• Understanding that load balancing is required across the system (x3)</li> <li>• Clear understanding of voltage imbalances and debate about solar curtailment</li> <li>• Aware from articles about solar creating issues on the grid</li> <li>• Clear awareness about solar impact on the grid</li> <li>• Grid resilience would be very important in bushfire context</li> <li>• Have heard that voltage issues means some householders (near Ballarat) can’t have new solar installed</li> <li>• An understanding about FCAS markets</li> <li>• Explaining the concept of ‘peak shaving’</li> <li>• All VPP householders had an awareness of the grid having particular ‘needs’</li> </ul>
<p>Householders stating they’d love to go ‘off grid’ or semi off-grid</p>	<p>Rosemary Georgina Linden Janet</p>	

## Appendix C: issues and risks for new energy technology users

### Quality

#### Quality of technology

- **Inverter failures** appeared to be relatively common, requiring repair and/or replacement, even where households had invested in a premium product.
- **Solar failures** were less common but were an issue for Brad, who discovered that his system was not generating and – concerning – had become a fire hazard and ended up being repurposed as a table as it was ‘all they were good for’.
- **Battery failures** were also less common, but did affect Heather, whose \$18,000 solar and battery system remained dysfunctional despite extensive and expensive (\$4,000) repair attempts by numerous electricians.
- **Battery degradation** was an issue for one EV owning family, whose battery had degraded to the point that the car’s range was quite limited, prompting their purchase of a new (electric) vehicle. Concerns with prospective battery degradation were also raised by a number of EV owners and many VPP participants.
- We also heard of **damaged, vandalised or otherwise unreliable high speed charging stations**.
- We did not hear of any notable technology quality issues relating to VPPs, HEMS, microgrids or P2P trading.

#### Quality of providers

- Some householders and industry experts raised concerns with some providers not conducting a **physical site inspection** prior to installation (note these instances were prior to the COVID-19 lockdowns, which made site visits impossible for all providers).
- As a result, some encountered flow on issues like **unforeseen additional costs** (e.g. meter board upgrades) and **technology placement decisions** that conflicted with their own (aesthetic, practical or other) objectives.
- **Conflicts with householder objectives** were also evident in the many stories we heard of insufficiently trained or motivated sales people steering householders away from EVs and towards ICEVs.
- Some householders told us their providers did not provide them with a transparent, **site specific, written estimate** of their solar system’s generation and impact on their bill, which made subsequent evaluation of their technology performance difficult.
- A few householders, and some experts, raised concerns with us of **poor installation practices**. These were in relation to roof penetration, which can increase the risk of leaks if not done well, and OH&S for workers.
- Some householders raised concerns with **poor quality handovers** leaving them ill-equipped to operate and care for their system.
- Some householders told us of **difficulties with after-sales support**, and a few had had their provider refuse to repair or replace faulty equipment that was within warranty.

#### Availability and reliability of information

- Some householders raised concerns about the limited availability and reliability of **government information** on new energy technology and energy more widely. The national government was seen as a particularly unreliable source of information by some households.
- Many householders expressed some **distrust of industry information**, which was generally seen as compromised by commercial interest.
- **Mainstream media outlets and motoring magazines** were seen by many EV owners as unreliable sources of information on new energy technology, again due to perceived commercial conflicts.
- Some experts raised concerns with **false and misleading advertising**, especially by solar and batteries providers, and, relatedly, several householders told us that their financial returns were lower than they had expected.

#### Suitability of current regulatory frameworks and adequacy of enforcement

- Some industry experts noted that **enforcement by state and national regulators** of existing frameworks relating to consumer protection, electrical safety, and workplace safety was inadequate.
- However, other experts, and some households, felt that **Solar Victoria had played an important role** in lifting standards in the industry.
- Some experts were concerned by the recent decision by the Australian Competition Tribunal to overturn provisions in the NETCC banning **unregulated finance in unsolicited sales**, arguing this represents a serious risk to vulnerable households.
- One expert suggested the **NETCC – as a set of minimum standards – should be mandatory** for all providers, not optional.
- Some experts, and many householders, flagged concerns with current **standards relating to training of technology provider staff** working in sales and installation.

## Complexity

#### Complexity of technology

- For many households, the complexity of their technology made it **difficult to understand** – this was an issue for all technologies, but particularly so for solar, batteries, and EV plugs and charging infrastructure.
- For some households, this complexity made it **hard to operate the technology to their advantage** – this was a particular issue for HEMS owners and microgrid, VPP and P2P participants.
- Technology complexity – and a relative lack of ‘visibility’ – made it hard for some households to know when **something had gone wrong**.

### Complexity of rebate and grid connection processes

- We heard from some households that the process to apply for a **Solar Homes rebate was complicated** and involved a significant time commitment.
- Many households and experts told us that the **grid connection process was very complicated** and time consuming, with a standard installation easily requiring 10 actors and extending over multiple months.
- Experts told us that the one actor **incentivised to ensure successful resolution** of these processes – the householder – typically has the least knowledge and power.
- According to one expert, this is an **area of ‘particular harm’** and it was of particular concern for the VPP participants we spoke with.

### Complexity of information

- Many householders told us of the overwhelming **complexity of new energy technology information** (for example, Heather was provided with a highly technical manual that she didn’t know what to do with).
- A few households commented that the **sheer amount of information available online** was itself very difficult to sift through.

### Complexity of business models

- Some new energy technologies, like VPPs, P2P trading and microgrids, are **complex financial/legal/market constructs** built on top of other physical technologies, like solar and batteries, that are themselves complex.
- The end result can be bewildering, even for energy enthusiasts, as acknowledged by one expert who described how their company’s on boarding process for new VPP participants involved a **40 minute explanatory phone call** to ensure informed consent.

## Timeframes

### Timeframes to notice issues

- Many householders and some experts told us that complexity and low visibility meant that issues with technology and grid connection **often go unnoticed** for extended periods of time.
- This is particularly likely where households are **not actively monitoring** their technology – as several householders were not. This may also become a bigger issue over time as the technology is taken up by mainstream Australians.
- Delays in noticing issues can make **service/warranty claims more challenging**, particularly where failures are discovered outside warranty periods, as in Heather’s case.
- And while Australian Consumer Law provides consumer guarantees that can extend beyond warranty periods, this **did not seem well understood** by householders in this situation.

#### Timeframes to resolve issues

- Many households had experienced **lengthy delays receiving service** and support from their technology provider, even once formal dispute resolution had been initiated. This was a cause of significant stress for these householders.
- Several householders told us of frustrating experiences **resolving issues with electricity companies** – these often involved a combination of high time impost and low continuity in service.
- A few householders noted that **low levels of familiarity with new energy technology by call centre staff** can exacerbate these issues.

#### Provider bankruptcy and phoenixing

- Some households and experts raised concerns with **high rates of bankruptcy among providers**, which can make support harder to access, particularly when issues are discovered late.
- We heard no direct evidence of **‘phoenixing’** but it was raised with us as a risk by householders and experts.

#### New, longer-term relationships

- We heard from several households and experts that new energy technology products and services introduce **new actors into the household** – aggregators, but also car dealerships (refs).
- Particularly for new energy technology services, this can mean **new, longer-term relationships**, which may over time increasingly resemble the traditional electricity retailer relationship, but without the attendant (mandatory) protections.
- However, some industry experts noted there is a tension between ensuring sufficient regulation to protect users from harm, and allowing sufficient freedom for innovation.

### Accessibility

#### Accessibility of rebates and technology

- We heard from several householders who had been **unable to access the Solar Homes rebate** for a battery installation, generally on the basis of their location.
- Many householders told us that their solar, battery and VPP technology was **only accessible because of their Solar Homes** or other rebates.
- While some households were in a position to purchase an unsubsidised EV, many were not. EVs, smart home charging, and HEMS **may require a combination of technical improvements, cost reductions and/or additional subsidies** before they become feasible for most Australians.

#### Accessibility of providers/technical support/charging infrastructure

- Some householders from regional and rural Victoria told us they had encountered **difficulties finding technology providers who would service their location**. Heather told us she had to go out of Kerang to find a battery provider, but this ended up coming at a social cost to her (as well as a financial one), with blowback from other technology providers in town.

- A few EV owners from regional and rural Victoria told us it could be quite **challenging to have their vehicle serviced**, as it generally required a trip to Melbourne, at least for their make of car.
- As discussed above in chapter 5, most EV owners described issues **finding and accessing reliable high speed charging** infrastructure, particularly in Eastern Victoria.

#### Accessibility to renters

- Some householders (note these were mostly owner/occupiers) and experts were concerned that new energy technology remains inaccessible to renters because of their **lack of long term tenure and split incentives**.
- One renter, Luca, told us that **poor thermal comfort** was also a big concern for his family, but felt that poor building standards, unequal landlord/tenant power relations, and the role of property managers were barriers to improved outcomes in this space.
- One expert told us he was concerned that allowing **tenant co-payments** under the new Solar for Renters program might risk establishing a precedent where tenants become responsible for other improvements to properties they do not own.

#### Accessibility to low income households

- Some households and experts were concerned that new energy technology's high up-front cost **limited its accessibility** to low income households and other vulnerable groups, who would benefit greatly from reduced energy costs.
- Some suggested the technology's **high complexity would also prove a major barrier** for people who are time poor, stressed, and may have low levels of literacy.
- A few householders were conscious of the cross-subsidy paid by all energy users, including low income households, to support premium solar feed-in tariffs.

#### Unfair sales practices

- We heard from many experts and from some households that **unsolicited selling and unregulated finance** is leading to poor consumer outcomes.
- Unscrupulous providers may be **targeting vulnerable people** who are less able to do the intensive personal research we find associated with better outcomes with complex technology.
- We heard, and saw, that **asset rich, cash poor elderly Victorians were at particular risk**, and that providers are **targeting regional communities** where this vulnerable demographic was more likely to be found.

#### Cultural challenges

##### Mismatch between householder values and aspirations and industry assumptions

- Many of the householders participating in P2P and VPP trials expressed concerns that the technologies, as currently construed by industry, **did not reflect their values and aspirations**.

- In the case of P2P, some householders had hoped the technology would facilitate energy *giving* as well as trading, and were **disappointed in the antagonistic, market-based design** ultimately presented by the trial's proponents.
- Many VPP participants, and some other householders, were not convinced that **VPP schemes were operating/would operate in their interests**. For some, this was because they did not trust profit-seeking companies, and for others (particularly enthusiasts) because they felt they would do a better job.

#### Conservatism and risk aversion

- Some householders argued moves to **curtail solar exports** by network business and AEMO were an overreaction by overcautious, risk-averse engineers, who should instead prioritise better management of grid voltage.

#### Communication failures

- Several householders told us they would be prepared to participate in VPPs and solar export curtailment if required to support the grid.
- However, these householders wanted **clearer communication from government and industry on the rationale** for these measures, and more transparent implementation of these and other grid reform efforts.
- Some of the frustrating, lengthy dealings with electricity companies noted above under 'timeframes to resolve issues' appear in part to be driven by poor communication by the companies in question.
- In a one example, the operator of a VPP told us they had undertaken an experiment that caused hundreds of household batteries to start acting erratically – **without thinking to advise affected householders beforehand**.

#### Pressure on providers

- Many households and experts told us of **cultural issues with some technology providers**: the 'slap 'em on, let's go, sort of thing' mentality (Brad) from 'bottom feeders in the industry' (Bobbi).
- But these cultural challenges appear themselves to be driven by **wider structural challenges** facing technology providers, including thin margins, high levels of risk, and unrealistic price expectation from householders.