

# Understanding information needs for consumer electrification decisions

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## Executive Summary

Transitioning household and small business heating, hot water, cooking and mobility from fossil fuels to electricity is necessary to achieve Australia's 2050 net zero emissions targets. Electrification also offers a pathway to empower consumers through both greater affordability and improved access to emerging consumer energy products and services. However, household and small business consumers face significant complexity in navigating the electrification process and there is growing consensus among consumer advocacy, industry and government agencies that highlights the need for consumers to have access to information to support decision making about electrification options.

Findings collected through 26 semi-structured interviews, 3 focus groups and 389 survey responses, describing the experiences of a diverse range of household and small business consumers and electrification professionals, have been distilled into high-level insights about the role of information in empowering household and small business consumers to take action on electrification. These form the basis of 29 recommendations in three categories: to support consumer awareness of electrification opportunities and benefits; for development of credible and decision-making tools to provide consumers with tailored information; and towards holistic electrification policy.



## KEY INSIGHTS

### Why and how consumers electrify

- **Consumers typically decide to electrify for a combination of reasons**

Our research shows that decisions to electrify are rarely triggered by a single event, but rather are the outcome of an accumulation of factors.

- **Household electrification journeys are diverse**

While some households are able to fully electrify in a day, we encountered others who had taken 10 years. Major life events, such as preparing for retirement or a major home renovation, can create specific windows of opportunity for rapid, comprehensive electrification. However, for many consumers, the process is more iterative, with electrification of each appliance considered separately and driven by different triggers.

- **Small businesses are focused on minimising operational disruptions**

Although disruptions to daily routines can be a challenge for household electrification, for small businesses, any prolonged disruption can have severe financial impacts.

- **Home batteries are joining solar as a common catalyst for electrification**

Batteries are now commonly seen as the second step in electrification, after rooftop solar, and provide additional motivation for households to increase electrical loads (particularly during non-solar periods), such as induction cooktops and EV charging.

- **Induction cooktops and EVs are commonly considered the final step**

While electrification of space and water heating is relatively straightforward, requirements for transport and cooking are more closely connected to personal circumstances, needs, and preferences, and so electric vehicles and induction cooktops are often the last household electrification upgrades.

- **Incentives can shift both the pace and character of electrification**

For example, as well as accelerating battery deployment, the Cheaper Home Batteries programme may temporarily divert consumer investment and tradespeople from other electrification projects.

## Consumer understandings of electrification

- **The concept of electrification is relatively new**

While it is commonly used in industry and policy circles, the term is unfamiliar to many consumers, including those who have installed rooftop solar or started to electrify, and even some tradespeople.

- **Misunderstandings are common and need to be addressed**

These include myths that heat pumps are unsuitable for colder climates, that EVs always need fast chargers and that electrification requires three phase power or upgrades to the electricity supply. The efficiency of electrical appliances compared to gas appliances is also poorly understood. Common sources include tradespeople as well as online misinformation campaigns.

## Consumer Information needs

- **Electrification is complex and the information can be overwhelming**

The sheer quantity of information available to consumers is one significant constraint on electrification, as are their diverse circumstances, changing needs, and varied financial and technical capacities. Consumers do not simply need more information; they need information that is trusted, timely and relevant to their circumstances.

- **Consumers need guidance about the electrification process**

There is an evident desire for simple and clear guidance from trusted parties about how the electrification process works, what steps consumers need to take and in what order, and which appliances they should prioritise.

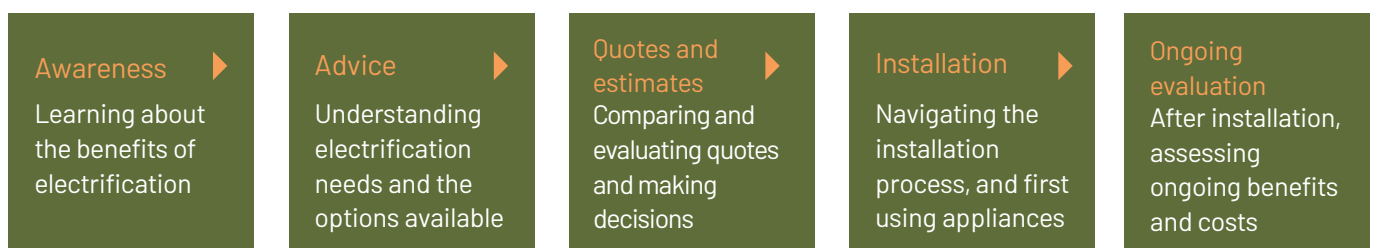
- **Information needs are highly diverse**

The type, timing and quantity of information wanted differs substantially between households. Some want highly detailed information to remain in control of decisions, while others prefer to delegate some of the complexity to experts.

Business electrification and information needs are even more diverse and are highly specific to the sector and to the particular business.

- **Information needs evolve as consumers move through the electrification journey**

**Figure 1** Stages of a typical electrification customer journey, adapted from [20]



The consumer electrification journey shown in Figure 1 (adapted from de Wilde and Spaargaren [20]) resonates with consumers and can provide an accessible framework to catalyse consumer action. However, there may be different entry points or triggers for this journey, with blurring of the stages and iteration rather than a single, linear process. The type of information and level of detail needed by consumers evolves as they move through their electrification journey, beginning with more general information at the Awareness stage and becoming more detailed and specific to their circumstances through the Advice and Installation stages

- **Consumers place high trust in information from friends, family and personal contacts**

Neighbours, friends, family and social groups are often the first port of call for information about electrification options, and are also used to sense check or validate other information accessed from websites, advertising or tradespeople, or simply to avoid having to wade through technical details. This trust in personal contacts sometimes extends to public personas.

- **The value of information depends on context and individual circumstances**

The information needed by consumers is dependent on their specific social and material context, as well as on their initial level of understanding and their appetite and capability to engage with detailed technical or financial information. Consumers value information that can be readily contextualised to their individual circumstances. This shapes the type and format of information needs, both for consumers to learn about what they should be looking for and how to navigate the process, and in translating technical performance of specific technologies into everyday experiences.

- **Interactive tools are valued and trusted if seen as independent**

Interactive planning tools can support electrification decisions by enabling comparison and prioritisation of different options, and by helping consumers to take more holistic and cost-effective approaches. They are trusted when consumers see them as independent of industry and others who might stand to gain from electrification.

- **Interactive tools that enable engagement at different levels of detail can help users build knowledge**

To navigate the tension between completeness, detail and accuracy of information on one hand, and usability and ease of comprehension on the other, interactive tools should allow users to engage at different levels according to their preferences and stage in the electrification journey. This can help build consumers' knowledge and understanding in a scaffolded way.

- **Consumers need reassurance about performance and reliability of electric appliances**

Consumers are concerned about the performance of new electric appliances (particularly cooktops but also electric vehicles, and water and space heating) and whether they can deliver at least equivalent outcomes to fossil fuel-based technologies. Hands on experience and demonstrations of new appliances, as well as personal recommendations, can help build confidence.

## Information from Consumers

- **The type and detail of information needed *from* consumers evolve through the electrification journey and depend on their specific aims**

As with the information needed *by* consumers, the information needed *from* consumers depends on their specific aims and increases in detail as they progress through their electrification journey. Asking consumers to provide too much information early in the process may be off-putting or overwhelming and can result in the collection of inaccurate or incorrect data.

- **Information needed from consumers varies between appliances and depends on individual circumstances**

In broad terms, air-conditioning and hot water systems can be specified for the building (e.g. number and size of rooms or bedrooms) but their operating costs and benefits depend on the occupants. Specifying EV charging infrastructure is somewhat dependent on driving patterns; and cooktops are perhaps most strongly tied to personal preferences.

- **Consumers are better able to provide information about how they use energy services than technical detail about the appliances themselves**

While many can describe the existing appliances in their home or small business, consumers speak with greater confidence and clarity about how they actually *use* these technologies. Exploring what people know about their home energy use through their own understandings – such as regarding hot water usage, heating and cooling needs, or driving habits – may prove more fruitful for those seeking to support electrification than asking about technical data alone.

- **Information collection can introduce errors**

Because consumers have diverse levels of knowledge and different cognitive styles, it's important to design multiple pathways to collect the information needed to inform electrification decisions, and to consider (and quantify) the potential impacts of collecting erroneous data.



## RECOMMENDATIONS

# Recommendations to support electrification awareness

## Diversify messaging and media

- Recognise that consumer awareness of and openness to electrification is developed through information from multiple sources presented in diverse social and material contexts. Awareness campaigns should adopt a multi-pronged approach across different media to enable varied opportunities for electrification concepts to embed in the everyday life of consumers, including low pressure, low commitment information touchpoints as well as those prompting action.
- Messaging should not rely on environmental messaging alone, nor ignore it and focus solely on financial outcomes. People electrify for different reasons and often it is a combination of factors that drives decision making. It is important to highlight all the advantages of electrification, including improved comfort, controllability, etc., as well as environmental and financial benefits.
- Embed information campaigns in wider contexts
- Support community groups (local and online) to build awareness and mutual learning about electrification through information sharing and feasibility demonstrations
- Align information and incentive campaigns with known electrification triggers, including predictable life-event windows or business cycles such as preparation for retirement or shop fit out processes
- Leverage the role of solar PV and home batteries in catalysing broader electrification efforts through information and follow-up engagement

## Acknowledge concerns and challenges

- Acknowledge the existing low trust in the electricity sector as a starting point when asking consumers to further integrate electricity into their homes and businesses, and address how to ensure accountability
- Recognise and address the specific challenges of rental properties. For residential tenants, this includes short tenure and poor-quality buildings and appliances. Small businesses typically have longer leases than households but also may need to invest in their own infrastructure.

- Acknowledge consumers' genuine and rational concerns about resilience during power outages and extreme weather events. Build community resilience with efforts to reduce the likelihood and severity of power outages and mitigate their impacts (e.g. Western Sydney community level extreme heat plan)

## Communicate the electrification process end-to-end

- Develop communications that reflect the electrification process as a whole, helping consumers understand the full scope of what is involved and the place of individual steps within the journey, rather than framing it as a series of discrete, disconnected decisions
- Concentrate foundational, deeply reliable information resources for those in the early stages of the electrification journey, including addressing common misconceptions

## Recommendations for decision-making tools

Consumers value resources that enable them to tailor information to their own needs and circumstances. Interactive planning tools can offer this support.

## Strengthen credibility and completeness

- Support independent, non-commercial information sources and tools to overcome sectoral distrust
- Foreground upfront costs and available subsidies early in the user journey
- Include lifecycle calculations, long term cost of ownership, end of life options for disposal
- Provide clear information about when switchboard and wiring upgrades are (and aren't) required in relation to different appliance upgrades, individually and in combination
- Consider temporal factors in the user's life, including potential major renovations, anticipated length of tenure, age of existing appliances and major life events, and contextualise information and advice accordingly

## Make tools usable and accessible

- Design decision-making tools to enable engagement with different levels of understanding and at multiple touchpoints through all stages of the electrification journey. Tools should allow initial engagement with minimal cognitive effort, provide increasing accuracy and detail with repeated use, support iterative decision-making and enable consumers to develop their understanding as far as they want to
- Design tools for different user cohorts with multiple use cases: planning whole of home electrification; taking advantage of end of appliance life; identifying the next iterative step to take to maximise benefit from solar and battery
- Ensure tool design caters for consumers with different cognitive styles by providing and soliciting information in different forms, e.g. combining visual and text descriptions of appliances, technologies, etc.
- Carry out comprehensive user testing with a diverse cohort of consumers to avoid misunderstandings or potential confusion in text and images
- Minimise the amount of information consumers have to provide; where it is necessary and there is unavoidable complexity, collect data in different ways and triangulate to reduce errors
- Assess the impact on information provision of erroneous consumer inputs vs approximations and assumptions; focus only on critical information

## Broader policy recommendations

As well as appropriate information to inform decision making, consumer electrification can be supported through availability of subsidies and rebates, suitable standards and regulations and training.

### Policy approach

- To build consumer support for electrification and the transition, it will be necessary to improve policy and regulatory coherence through a system level approach where appliance upgrade and electrification policy aligns with broader, coherent infrastructural strategies. More generally, addressing the contradictions of increasing fossil fuel extraction for export, building data centres that massively increase demand while asking householders to be more efficient in their energy use, is necessary for building consumer support for electrification and the transition

- As the intended uses and financial returns of technologies like solar PV, battery storage, electric vehicles, and other energy efficiency upgrades are often interdependent and 'stackable', coordinating incentives across these and other technologies, rather than applying them in isolation, will help to promote electrification, while more siloed approaches risk locking in piecemeal change
- To minimise the various complications associated with electrification, provide specific support for more comprehensive whole-of-house or small business electrification efforts to maximise bang for buck while disruptions occur – particularly for small businesses where interruptions to normal operations can be costly

## Training

- Develop industry readiness through training of installers, including developing skillsets across multiple appliances and technologies and broader understanding of electrification
- Develop training, resources and incentives for installers to provide accurate information to consumers about appliance costs and benefits, operation and maintenance needs

## Standards

- A broad co-ordinated development of the regulatory environment is required to ensure that electrification is embedded structurally, e.g., through building standards, appliance standards and development approval processes
- Improve energy service level protections for renters in general, and support high-quality upgrades for the rental stock, including through minimum rental standards processes occurring at state level

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## CEEM

The UNSW [Collaboration on Energy and Environmental Markets \(CEEM\)](#) undertakes interdisciplinary research across engineering, social science, business, economics and law into energy and environmental markets to support the energy transition.

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The views expressed do not necessarily reflect the views of Energy Consumers Australia.

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Designed by Chris Andrew Design

## Notes

Throughout the report, participants are referred to by pseudonyms and by participant cohort: C1 'engaged households', C2 'less engaged households', C3 'small businesses' and C4 'industry specialists'. For more details, see Section 6.2. Unless otherwise stated, all participant quotes are from interviews.

This report was written by people. No generative AI was used in its production or for the underlying research.

### **The following abbreviations are used in the report:**

**EV** – Electric Vehicle

**PV** – Photovoltaic, often used to mean photovoltaic or solar panel or system

**MEEH** – My Efficient Electric Home

# Contents

|                                                                  |           |  |  |
|------------------------------------------------------------------|-----------|--|--|
| <b>Executive Summary</b>                                         | <b>2</b>  |  |  |
| <b>Contents</b>                                                  | <b>12</b> |  |  |
| <b>1 Introduction</b>                                            | <b>13</b> |  |  |
| <b>2 Background</b>                                              | <b>15</b> |  |  |
| 2.1 Context is everything                                        | 15        |  |  |
| 2.2 The role of information                                      | 16        |  |  |
| 2.3 The customer electrification journey                         | 17        |  |  |
| <b>3 Findings</b>                                                | <b>19</b> |  |  |
| 3.1 Understandings of electrification                            | 19        |  |  |
| 3.1.1 How do consumers encounter the concept of electrification  | 20        |  |  |
| 3.1.2 Reasons for electrification                                | 21        |  |  |
| 3.1.3 Advantages of electrification                              | 23        |  |  |
| 3.1.4 Disadvantages of electrification                           | 24        |  |  |
| 3.1.5 Common misconceptions about electrification                | 27        |  |  |
| 3.2 Sources of Information                                       | 29        |  |  |
| 3.2.1 Where households go for information                        | 29        |  |  |
| 3.2.2 Where businesses go for information                        | 33        |  |  |
| 3.2.3 Industry specialist views                                  | 35        |  |  |
| 3.3 Types of Information                                         | 39        |  |  |
| 3.3.1 Consumer views on types of information                     | 39        |  |  |
| 3.3.2 Industry specialist views                                  | 44        |  |  |
| 3.4 What consumers can tell us about their electrification needs | 45        |  |  |
| 3.4.1 Hot water                                                  | 46        |  |  |
| 3.4.2 Space heating and cooling                                  | 50        |  |  |
| 3.4.3 Electric vehicle charging                                  | 53        |  |  |
| 3.4.4 Induction cooktops                                         | 54        |  |  |
| 3.5 Life course, timing, and information needs                   | 55        |  |  |
| 3.5.1 Major life events and triggers                             | 56        |  |  |
| 3.5.2 Everyday triggers                                          | 58        |  |  |
| 3.6 Information, timing, and the electrification journey         | 60        |  |  |
| 3.6.1 Reflections on the electrification journey                 | 60        |  |  |
| 3.6.2 When users look to different sources of information        | 63        |  |  |
| 3.6.3 When different types of information are useful             | 65        |  |  |
| 3.6.4 The impact of subsidies                                    | 67        |  |  |
| <b>4 Insights</b>                                                | <b>68</b> |  |  |
| 4.1 Consumer understandings of electrification                   | 68        |  |  |
| 4.2 Consumer Information needs                                   | 70        |  |  |
| 4.3 Information from Consumers                                   | 71        |  |  |
| 4.4 Information from Consumers                                   | 74        |  |  |
| <b>5 Recommendations</b>                                         | <b>76</b> |  |  |
| 5.1 Recommendations to support electrify                         | 76        |  |  |
| 5.1.1 Diversify messaging and media                              | 76        |  |  |
| 5.1.2 Embed information campaigns in wider contexts              | 77        |  |  |
| 5.1.3 Acknowledge concerns and challenges                        | 77        |  |  |
| 5.1.4 Communicate the electrification process end-to-end         | 77        |  |  |
| 5.2 Recommendations for decision-making tools                    | 78        |  |  |
| 5.2.1 Strengthen credibility and completeness                    | 78        |  |  |
| 5.2.2 Make tools usable and accessible                           | 79        |  |  |
| 5.3 Broader policy recommendations                               | 80        |  |  |
| 5.2.1 Policy approach                                            | 80        |  |  |
| 5.2.2 Training                                                   | 80        |  |  |
| 5.2.3 Standards                                                  | 80        |  |  |
| <b>6 Methods</b>                                                 | <b>81</b> |  |  |
| 6.1 Surveys                                                      | 81        |  |  |
| 6.2 Interviews                                                   | 82        |  |  |
| 6.3 Focus groups                                                 | 82        |  |  |
| 6.4 Participants and recruitment                                 | 84        |  |  |
| <b>7 References</b>                                              | <b>86</b> |  |  |



# Introduction

Transitioning household and small business heating, hot water, cooking and mobility from fossil fuel gas to electricity is necessary to achieve Australia's 2050 net zero emissions targets, as widely recognised by industry, policy makers and households. Electrification also offers a pathway to empower consumers through both greater affordability and improved access to emerging consumer energy products and services. However, household and small business consumers face significant complexity in navigating the electrification process and there is growing consensus among consumer advocacy, industry and government agencies that highlights the need for consumers to have access to information to support decision making about electrification options.

This report aims to improve understanding of the role of information in empowering household and small business consumers to take action on electrification, by answering 3 groups of research questions:

- What do household and small businesses consumers already know about electrification? How do households and businesses understand their electrification options, needs and constraints? How do consumers prioritise electrification of different appliances? And what timescales are consumers thinking about when they plan for electrification?
- What information (types, sources, formats) do consumers ultimately require for making electrification decisions? What are their relevant questions in thinking about electrification?
- What information is needed from consumers to support their decision-making capacities? What information are they able to articulate and comfortable to share about their needs plans (and with whom)?

Central to trying to understand consumers' information needs is consideration of the heterogeneity of both households and small

businesses. More generally, while information is important to the electrification process, whether and how people process that information into actionable knowledge depends on the social and material context and on how and when they receive the information.

Specifically, the research underpinning this report confirmed four hypotheses:

- Energy consumers have varying levels of understanding of the energy system and potential electrification options;
- Conventional energy and electricity expertise is not always accessible or translatable to “non-expert” energy consumers;
- Energy consumers’ understanding and information needs develop and change through the user journey;
- Both energy information and user experience must be responsive to consumers’ specific needs to support effective decision-making.

Even with these expectations, the diversity of household electrification experiences we encountered was surprising, from a meticulously planned whole-of-house electrification completed by eight carefully co-ordinated tradespeople in a day, to a 10-year iterative learning process that started with a plan to replace coal-generated electrical appliances with ‘lower emissions’ gas and ended with a fully electric house.

This report presents findings collected through 26 semi-structured interviews, 3 focus groups and 389 survey responses, describing the experiences of a diverse range of household and small business consumers and electrification professionals. Some of these participants have completed their electrification journeys, some are just starting out, and others are unlikely to electrify anytime soon. Together, they shed some light on the many challenges of the electrification process and the different types of information that can help consumers make decisions about electrification.

We found that, while some of the perceived technical challenges of electrification are exaggerated or misunderstood, there is no one-size fits all process for electrifying Australia’s residential (or small business) buildings stock. Nor is there a simple answer to what information will enable consumers to electrify.

The project participants speak for themselves in Section 3 of the report where our detailed findings are described. In Section 4, the findings are distilled into why and how consumers electrify; what they already understand about the electrification process; what information is useful to them, and how, when and by whom it is best delivered; and what they are able to tell us about their existing appliances and future electrification needs. Section 5 sets out recommendations in three categories: to support for consumer awareness of electrification opportunities and benefits; for development of credible and decision-making tools to provide consumers with tailored information; and towards holistic electrification policy.



# Background

This section draws on an extensive literature review on the role of information in electrification decision making. Key insights from that document are presented here to provide context for the research findings described below.

## 2.1 Context is everything

Electrification takes place within a broader context of existing infrastructure, environment and personal and relational considerations, which can aid or constrain the ease and attractiveness of electrification opportunities. Building type, age, historic and contemporary planning schemes, and existing services and appliances can all influence the type of information required to support consumer electrification. Examples include the capacity of the electricity connection to supply new electric appliances [1], the presence of gas connections and appliances for cooking and water and space heating (mostly concentrated in south-eastern states [2]).

Electrification actions also need to be understood within a broader context of home improvements which fall into three broad categories: major renovation, home improvements (piecemeal upgrades), and emergency replacements [3]. Energy-related renovation *“is usually not implemented in isolation, as a one-off renovation, but often follows or is guided by other renovations.”* [4]

The social context for electrification includes individual characteristics like gender, income, and core values, as well as key life events and social relationships. Life course and major milestones are important because

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<sup>1</sup> The full literature review is available here:  
[https://www.ceem.unsw.edu.au/sites/default/files/documents/Information\\_for\\_Consumer\\_Electrification\\_Literature\\_Review.pdf](https://www.ceem.unsw.edu.au/sites/default/files/documents/Information_for_Consumer_Electrification_Literature_Review.pdf)

they can act as triggers that shape the timing of electrification and other energy retrofits [5,6,7,8]. Research consistently finds that financial, environmental, and health and safety considerations are key priorities, while comfort-related issues are also important [9,10]. Demographics, including home ownership status, income level, and gender also influence electrification and home energy retrofit [11,12]. Tenure adds particular complications, with rental conditions and short anticipated residency commonly acting as barriers to uptake for household renters [13] while centralised services and challenges of strata decision-making impede apartment electrification in apartments and many small businesses [14].

Energy consumers are frequently framed as rational actors in the energy system, responding only to financial incentives, but many researchers attribute the underperformance of energy retrofit policies to this dominant framing. There is a need for more nuanced understanding of what households and businesses value, who they trust, and how they make decisions in the context of relationships with friends, family, advisors, tradespeople and others [6].

## 2.2 The role of information

Knowledge or its absence plays an important role in electrification decision making. Actionable knowledge requires information, but is not equal to it [15]; people create knowledge by processing relevant information within the contexts described above. There is evidence that people navigating electrification are faced with too much (rather than too little) information, which can reduce their understanding and confidence, [16], and ultimately become an impediment to engagement and action [17].

It is therefore important that “...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.” [18]. Equally important is that irrelevant, incomprehensible or poorly timed or delivered information is avoided.

- **Purpose and timing:** The appropriate content, form, and source of information depends on the needs of the recipient(s) and its intended purpose, which shifts according to the stage of the customer journey.
- **(Appropriately) tailored information:** Households and businesses want general information about products and ways to reduce costs (40% and 35%, respectively more than additional tailored “recommendations for products to narrow choices and suggest actions based on my household details” (22% and 24% respectively) [10]; tailored information must be *appropriate*, by engaged communities like the Facebook group My Efficient Electric Home where people seek highly personalised, context-specific guidance [18].
- **Financial metrics:** Cost and savings information are key drivers of uptake, with rebate and subsidy information the single most sought-after category (48% of respondents in a national survey) [16]. However, comprehensive installation costs are often difficult to determine

upfront, and the willingness to weigh upfront costs against future savings varies by individual circumstances [16,11].

- **Emissions:** Most Australians want to reduce their carbon footprint but many don't know how (67% vs. 43% [10]), with awareness of the benefits skewed towards solar and EVs over other retrofits like heat pumps or insulation [16].
- **Process:** Households commonly lack information about suppliers, installers, and the actual process of electrification (i.e. what to do, and in what order) [19].
- **Trusted sources:** Trust strongly shapes how information is received. Local councils are generally well-trusted, while energy retailers and other levels of government attract more scepticism [18,10]; suppliers' marketing materials risk being dismissed as spam.
- **Form:** Effective delivery depends on matching the format of information to its purpose. Simple, low-effort messaging suits early engagement with electrification, while more detailed information is needed later in the process, as are comparison and interactive tools, which can link tailored guidance to rebate eligibility, installer referrals, and other concrete advice [17].

## 2.3 The customer electrification journey

The concept of the "electrification customer journey" describes a step-by-step process through which fossil-fuelled appliances and services are replaced with electric alternatives. In one customer journey framework [20], six touch points – Sensitise, Advice, Tender, Install, Evaluate, Inspire – present opportunities for an intermediary or service provider to engage with the customer, including by providing information to inform decision-making. The purpose of the information provided at each touch point is dependent on the stage of the journey.

- **Sensitising:** alerting households to the benefits (financial, environments, comfort etc.) of retrofits.
- **Advice:** information tailored to individual preferences, building characteristics, and energy needs, informing decisions about the type of retrofit.
- **Tender:** supporting households navigating the tender process and seeking to support their evaluation of quotes through transparency and comparison tools.
- **Installation:** information focused on operation and maintenance of appliances.
- **Evaluate:** assisting households to evaluate their retrofit by comparing predicted costs and benefits with actual outcomes.
- **Inspire:** using households' experiences post-installation to inspire others to undertake energy retrofits.

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<sup>2</sup> For our fieldwork we combined the 'Evaluate' and 'Inspire' stages into 'Ongoing evaluation', while other stages were framed using more lay-friendly language (e.g. 'Sensitising' was translated into 'Awareness').

A slightly condensed version of this framework (see Figure 2) has been used in this research to explore what different types and sources of information are useful to households and businesses in different stages as they move through the electrification. Although this consumer journey concept risks oversimplification, it reflects terminology and thinking already commonplace in the energy sector, resonates with consumers and enables understanding people's information needs within broader contexts.



**Figure 2** Stages of a typical electrification customer journey, adapted from [20]

# Findings

## 3.1 Understandings of electrification

The range of understandings of the concept of electrification encountered through this project suggests that the concept of electrification is one that is still in the process of being embedded. Among interview participants, those who had encountered the concept typically had understandings coalescing around the ideas of moving away from fossil fuels, “...electrification means trying to remove fossil fuels from the electricity generation” (Margaret C1) and towards either renewables sources of energy generation, “I suppose, like, the change away from, like, using gas appliances to, you know, more renewable forms of energy, like solar and electric cars and batteries and that sort of thing.” (Gary C2), or electrified appliances and services:

*“What I think it means is making a home fully electric so that you’re not using any gas in the home. That’s what I guess it means, as in you’re putting all the appliances on electricity, so you’re not using gas in the home.” (Kary C2)*

These quotes reflect the intuitive way that many participants understood the concept, suggesting their understanding linked to how it made sense within their own context.

Some interviewees also explained that while they as individuals were familiar with the term, due to engagement in environmental issues, they thought it unlikely that others in their household, such as partners or children, would be familiar with the concept.

A number of participants had very little familiarity with the concept. Unsurprisingly, these were more commonly – although not exclusively – members of the C2 ‘less engaged’ cohort, illustrated by the exchange below:

*“Interviewer: So, first of all, have you heard that term before, electrification? Interviewee: No, I haven’t. Interviewer: Would you have any idea what it meant? Interviewee: Not a clue.” (Steven C2)*

However, those in the C1 ‘engaged households’ cohort also expressed uncertainty: *“I can imagine what it would mean, but – yeah, I’ve never heard it used in a sentence or anything.” (Bridget C1)*

A similar dynamic was also evident in survey responses, with just under 85% of respondents accurately describing electrification and remaining responses suggesting that they either didn’t know or were unsure what electrification meant, or understood it as describing that a house was wired to receive electricity, or otherwise linking it to the process of installing solar and batteries.

One industry specialist discussed how the idea of electrification is still a relatively new concept, even to environmentally motivated specialists:

*“My interest in electrification started in about 2008 when I moved into the house that I live in [...] I initially thought that switching to gas appliances was a great idea because it was better than using coal-fired electricity, right, which was a very common idea at the time [...] eventually, I realised that that was a mistake, and so I started electrifying instead.” (Joel C4)*

### 3.1.1. How do consumers encounter the concept of electrification

Consumers encounter the concept of electrification in a range of places. Some interview participants first encountered the term in the media, *“I do read newspapers a lot and I watch the news. I’ve certainly read about it in newspapers and seen it in the news as well.” (Kary C2)*; on social media such as groups on the theme of home energy efficiency; when researching home retrofits; via family and friends; and through government initiatives or communications:

*“[The] ACT gov... they put out a lot of electrification content on there. They send emails to businesses and stuff... I mean you hear about it for households as well. It’s like just general politician chat about electrification.” (Max C3)*

Advertising, whitegoods retailers and big box hardware stores were also cited as common initial sources of information on electrification.



<sup>3</sup> Throughout the report, research participants are referred to by pseudonyms and participant cohort: C1 ‘engaged households’, C2 ‘less engaged households’, C3 ‘small businesses’ and C4 ‘industry specialists’. See Section 6.2 for details.

Notably, interview participants often described encountering the concept of electrification from multiple sources, suggesting that rather than a first significant experience, an accumulation of encounters with electrification may have been more relevant to their developing understanding of the subject: *"It's definitely in the media and also, sort of, in discussion with friends, because we have friends who have switched over to electric cars or sort of hybrid cars."* (Sofia C3)

Participants also pointed to or used language linked to non-government advocacy efforts (such as Saul Griffiths and the Electrify Everything movement, Tim Forcey and the My Efficient Electric Home Facebook group, and similar) as raising their awareness about the concept of electrification. For example:

*"I am a pretty faithful consumer of anything that comes across the ABC News website and there's been a couple of long reads or deep dives with... [Saul Griffith] who has done a lot of writing and thinking on Australia going fully electric."* (Mark C1)

It was also interesting to observe how local and state policy geographies seemed to shape some participants' understanding. Some interviewees in ACT and Victoria were notably aware of electrification and similar energy retrofit concepts through links to government policies or political discourse in these jurisdictions. Less was said about policies in other states, or at the federal level, about electrification per se, although a number of participants were aware of rebates and similar funding support available through in jurisdictions without linking them explicitly to electrification. Although some local governments are mobilising to support their constituents to electrify (notably, many are oversubscribed), councils were not mentioned as a point of first encounter by participants in this study.

### 3.1.2. Reasons for electrification

Participants gave a variety of reasons for why they thought electrification of homes and small businesses was occurring in Australia. By and large, most linked electrification with broader environmental sustainability efforts, such as installing and making use of rooftop solar systems, as well as broader efforts to decarbonise Australia's energy systems (mitigating and adapting to climate change, meeting international climate commitments, and addressing customer preferences for greener products). As seen in Figure 3, maximising use of rooftop solar was the highest ranked factor influencing respondents' electrification decisions, with almost 75.6% of respondents ranking it among the top five factors. Similarly, more than 40% of respondents ranked options that provide the biggest carbon emissions reductions in their top five considerations when making electrification decisions, with over 10% ranking biggest reductions in emissions as the number one factor.

In both interviews and survey data, participants typically offered additional reasons alongside environmental considerations, highlighting that electrification reaches into different aspects of everyday life. These

additional reasons often related to financial drivers. As noted above, maximising use of rooftop solar featured strongly (encompassing both environmental and financial values) in survey results. Other highly ranked factors related to financial considerations, including biggest bills savings, lowest upfront cost and largest government subsidy. These also emerged in interviews, with participants discussing their interest in opportunities to lower operating costs, sell self-generated electricity, and access government rebates and other support. Interview participants also described market momentum towards electrification. This included the availability of electrical appliances and related products alongside embedded generation technologies, the intuitive advantage of reducing energy infrastructure such as reducing the need to build and maintain gas as well electricity supply systems, as well as the appeal of greater self-sufficiency by insulating both Australia and individual consumers from energy price shocks:

*"I think a lot of people would have a sense that they want to do their part for the environment. They would like to use less fossil fuel and have a lower carbon footprint. But I think the economics have to be in place, whether that's through Australian government subsidies or whether it's just through batteries and solar panels getting cheaper for reasons in other countries, all that has to be in place before people are able to put that goodwill to use. I think most of my neighbours would have a want to be on solar and battery, but if it means spending more overall on their bills, they wouldn't go for it." (Mark C1)*

*"I'm open to [electrification], but it's not a priority for me unless it's, I want to see more money in my pocket. I think that would sum it up in a nutshell." (Charlotte C2)*

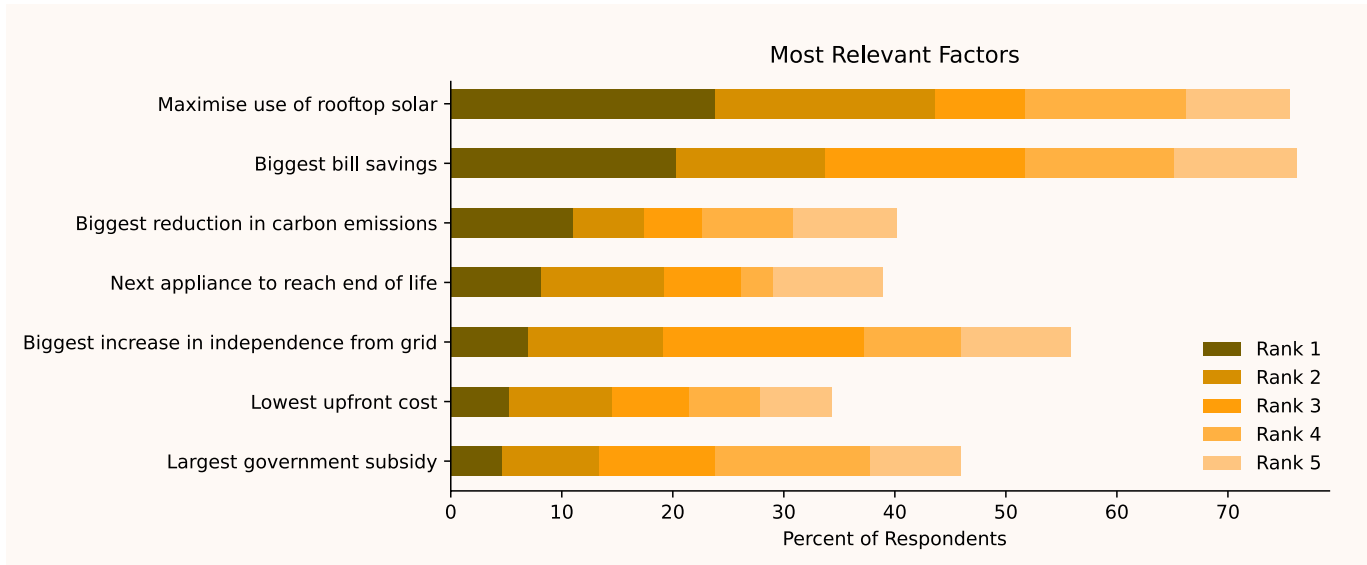
The appeal of self-sufficiency was also evident in survey results, with over 55% of respondents indicating that the "biggest increase in independence from grid" factored into their electrification decisions.

A small number of interviewees expressed some concern about lack of coherence within approaches to electrification and to the energy transition more broadly. Some expressed their wariness of electricity retailers (particularly those who also provide retail gas offerings) and the energy sector at large, questioning their motivations when offering electrification support. Some, while supportive of electrification in general, questioned the seeming technology-specific focus of financial support options, pushing them towards particular changes (seen for example in rebates for household batteries and similar). This theme emerged when participants reflected on how their electrification trajectory had been influenced by opportunistic access to rebates, whereas in hindsight they could have pursued more impactful options first, for example, upgrading to more efficient air conditioning, or improving dwelling thermal performance prior to installing a home battery. These participants would like to see support for more structural changes, such as improving energy performance of the building stock or appliances, as well as guidance to assist households and businesses pursue the most impactful options. One less supportive participant

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<sup>4</sup> E.g. <https://app.zapcat.com.au/innerwest/>

noted the contradiction between Australia’s drive for electrification while continuing to export fossil fuels. This issue surfaced at different moments throughout the research, indicating that as householders and small businesses make sense of the electrification concept, they expect it to fit coherently with wider government policy.



**Figure 3:** Significance of different factors in electrification decisions (C1 n=186)

### 3.1.3. Advantages of electrification

Participants offered a wide range of potential benefits of electrification. As noted in section 3.1.2, environmental benefits featured as a key advantage: *“I just know it’d be more eco-friendly. That’s the only thing I really would say.”* (Hannah C2)

Participants linked these benefits to reduced greenhouse gas emissions or reduced need to mine fossil fuels, as well as the ability to make use of Australia’s renewable energy resources. Financial benefits were also frequently raised, with participants noting financial savings that come from the removal of gas supply charges, cheaper cost of EV charging compared to purchasing fuel for ICE vehicles. As above, environmental and financial advantages were often linked:

*“...they’re using less fossil fuels, less emissions and sort of investing for the future. So, even if it’s something that costs more now... they’re going to get savings in the long term and will be better for the future of climate change and so on.”* (Gary C2)

Participants also noted the financial benefits opened up through electrification of appliances coupled with rooftop solar and batteries, enabling use of lower-cost on-site renewable energy and avoiding purchase of gas or electricity, including under higher prices expected in future.

Participants raised improved health and safety outcomes from the removal of gas appliances, eliminating the risk of gas leaks or exposure to fumes during use. Safety of children was noted as a particularly important aspect of shifting to induction cooking:

*"So, one of my friends was – she's renting a house and her stove is induction. And she's told me that it's very safe for the kids, 'My kids, turn it on by themselves and they can cook something'. And I was like, 'Oh really?' Because we never allow our children to go near to the gas stove when we are cooking. So that was very new to me. And I'm very much concerned about my kids' safety. So I was like, 'Oh, that's good.' And then she moved to another house, which is like gas stove. So, she said, 'I'm going to buy an induction top, a portable one.'" (Sana C3)*

Improved convenience was also seen as an advantage of electrification, with participants noting that induction cooktop and cookware are easier to clean, EVs could be charged at home (and hybrids require fewer visits to petrol stations) and that the consumer would only have to manage one energy bill. Some participants saw inherent value in the improved energy efficiency of electric appliances. One participant noted that electrical appliance and vehicles were aesthetically pleasing.

These themes were largely consistent across participant cohorts, although as might be expected, small business participants viewed electrification from within their own business context, introducing additional advantages. Some noted that removal of gas had the advantage of reducing their insurance premiums. They also noted that removing gas and/or switching to efficient electric appliances improved the working environment. For example, one participant who has electrified their café-restaurant kitchen:

*"In a commercial kitchen, especially, there are heaps of benefits [to electrification]. It's way nicer environment to be at. It's also way safer as well. You can be boiling a pot, really boiling it... take it off, and it's not even hot, the plate. It's incredible. It's way easier to clean. There are no fumes." (Max C3)*

### 3.1.4. Disadvantages of electrification

When reflecting on electrification, participants also raised a range of potential disadvantages. Some perceived disadvantages were linked to financial and practical issues relating to physically removing existing fossil fuel appliances and installing new electric appliances. Others concerned development of new social practices needed to access energy services (as also seen in literature on home retrofits), high upfront costs, aesthetic or logistical challenges of installing new appliances, and unfamiliarity with new technologies.

Other perceived disadvantages of electrification revolved around three general themes: environmental sustainability, qualitative performance of electric appliances, and risks resulting from relying on a single energy source. Some participants questioned the environmental consequences of replacing functional appliances with new, electric alternatives: *"To me, that seems pretty bad for the environment to just get rid of a good appliance that works to replace it with a new one. That seems silly."* (Kary C2Y)

In a similar vein, participants also asked questions about longer term end of life considerations, such as how batteries and similar appliances



### Matthew's story

Mathew has already helped to electrify one home, installing a large solar array and battery for his elderly father. However, as a renter the same path is closed to Mathew. Bigger upgrades, like replacing an underperforming air conditioner or gas hot water system, are simply out of reach. But even modest energy efficiency measures, like draughtproofing doors and windows, or changing blinds to better block summer sun, also prove difficult due to limited funds and landlord negotiations. Mathew's experiences highlight the challenges facing the roughly one third of Australians who rent their home when seeking to undertake both minor and major energy efficiency upgrades at home [21].

would be recycled or disposed of. Relatedly, occasionally participants from C2 and C3 'less engaged' household and small business cohorts also questioned the timing of electrification, for example, asking what comes after electrification (e.g. will electric appliances become superseded as they have seen with CDs and similar products), and whether Australia is pursuing a transition to electrification in advance of price and technology maturation.

Several participants opined that a change to electric appliances should not result in lower qualitative performance, compared with fossil fuelled appliances or services: "...with gas, it's generally instantaneous, whereas with electricity, it takes time to heat it up over course of time." (Brendan C1). This was a particularly a concern for participants with existing fossil-based appliances, particularly long-term users, or those who have had prior negative experiences with electric appliances, such as poor-quality resistive coil or ceramic electric cooktops (common amongst renters). Although, as illustrated in the following quote, there are certainly opportunities to overcome these concerns:

*"...like many people, I've been in rental accommodation where it's got a really old electric cooktop that's not very good. And then I heard from a few friends who had the newer electric induction cooktops, and they said, oh, they're actually much better than you expect, and they're completely different to an old-style electric cooktop. And I wouldn't have known that unless friends had actually made that recommendation." (Kary C2)*

This issue of negative perceptions of electric appliances raises wider issues about the potential for uneven outcomes from electrification, particularly for renters who are already exposed to poor quality or aging electrical appliances that underperform. As an example, a participant shared that the water heater at her family's previous rental accommodation did not provide sufficient hot water to enable warm showers. Through discussions with a plumber sent to conduct an annual safety inspection of the system, she learned that it was unlikely that the tank could maintain heat due to its age. The family had had to resort to topping up the bath using a kettle.

Relatedly, homeowners shared their caution, based on earlier experiences of energy efficiency programs resulting in poorly located and installed appliances:

*"We had solar hot water put on for a while, but the people who installed the solar hot water ripped us off... They arrived on the day. They put the solar panels on the south side of the roof because it was closest to where the... [hot water tank] was. I came home, 'Why would you put them on the south side? You know, this is not going to be efficient... I tried to call them about three or four times. They were impossible to get. Eventually, you give up and you end up with a crap system... And so, we just went, oh bugger it, we'll just go to gas. So, it was kind of, you know, we tried to move in the direction of electrification [sic]. And because, in some respects, a poor provider, we kind of got burnt. And so that was at that point we then converted to gas." (Russell C3)*

Concerns about qualitative differences also linked to participants' homemaking practices. Gas cooking in particular was noted as a socially and culturally encoded practice:

*"I really don't wanna give up my gas cooktop... I'm half Indian by background. I imagine there's a lot of people who... [have] an Asian background and they like cooking on gas cooktops. 'Cause my partner and I, we do cook stir fries a bit with a wok, and I definitely would do that on the gas cooktop." (Kary C2)*

and one that was familiar and comfortable: *"The only thing that I wouldn't want to change is the stove, but I think that's just me being stuck in my ways. I like cooking over fire." (Yuki C2)*

One electrification advisor described how their clients' attitudes to gas cooking contradicted cultural stereotypes:

*"This is so bad, but a lot of white people are like, 'Oh, I just like cooking on gas.' Sorry, I don't know a better way to say that. There's something in the gas that they like. [...] People of Asian heritage come to us wanting to switch their cooktop over and they're like, 'We can just get a wok induction pan, it's fine.'" (Antonella C4)*

The third disadvantage participants raised was the potential downside of moving to a single energy source. This was particularly important among participants in regional areas, such as communities with a history of electricity outages:

*"...we used to live up in the hills, in the Adelaide Hills, and we'd always have blackouts, so having gas then was helpful because we didn't have a generator or anything. So, when everyone's electricity went off, we were the ones that could cook everyone dinner." (Tracey C1)*

At this time of interview, this participant was pursuing home electrification, notably following a move to the Adelaide plain, where such black outs were thought to be less of a problem.

However, this issue was also raised by participants in areas that had not necessarily experienced frequent or long-lasting blackouts. For some participants, they attributed this to their previous experience with both gas appliances and supply as both familiar and reliable: *"I know gas works. I know it's a reliable system. We haven't run out of gas in the state yet... I've had gas hot water all my life." (Graham C2)*

Others noted that if they pursued electrification, they might retain a gas barbeque or camping stove, to ensure access to cooking in the event of an electricity outage. Others noted the importance of off-grid functionality if installing solar and batteries, at least to cover a minimum set of loads. These concerns were also raised about potential impacts of electricity outages, particularly as some participants noted correlation between recent outages and extreme temperatures. Concerns about impacts of power outages were not only attributed to electrification. For example, one small business operator with only electricity supply, explained that they had previously had to close their business for the duration of an electricity outage, but this would have been required even

if they had fossil based appliances as their digitised payment system could only run with an operating electricity supply.

A few participants raised concerns about the equity impacts of electrification from a usability standpoint, noting that older or less technology-savvy people may find it difficult to use electric appliances, observing that these new devices often incorporated new or unfamiliar technologies or interfaces. This issue of accessibility of digitised devices and touch screen interfaces has also surfaced in recent media.

Concerns about data privacy were also raised, with a few participants commenting on the possibility that new electric appliances may provide companies with increased opportunities for surveillance activities in the home or business.

### 3.1.5. Common misconceptions about electrification

Some participants, particularly those from the C4 'industry specialist' cohort, described a number of common misconceptions, either about specific electrical appliances or about electrification in general.

A widespread misconception is that heat pumps don't work, particularly in colder climate zones. This applies to hot water systems, *"one of the things that's really pervasive in Canberra, too, is the idea that heat pump hot water systems don't work here [...] there are still plumbers that will believe this"* (Joel C4), and to air-conditioning for space heating, *"there's usually just like a blanket, 'You can't do it,' and then there's no other solution. It's like it just won't fit, or this won't work, or whatever it is, where there are other solutions."* (Antonella C4). This was variously attributed to outdated information relating to earlier versions of the technology and to the physical experience of air-conditioning:

*"Well, it's because the split system gives off no radiant heat. [...] That's the real reason why they think it doesn't work as well. I mean, I had friends that'd say, 'Oh, they're just useless; they just blow warm air.' I'm like, 'Yeah, but it does warm up the room eventually, right?'"* (Joel C4)

The EV space is particularly prone to misinformation, with one specialist telling us *"overcoming misinformation is every day."* (Lawrence C4). One common misconception is that EV charging fires are commonplace, whereas *"we could get to a point where a fire person might only see one or two in their career"* (Joel C4). Another is the need for fast charging:

*"There's also another big misconception problem with the fact that people think they need really fast charging in their parking space, and so they all run around and then they get a quote to put seven-kilowatt EV charging in each parking space [in an apartment building] and realise it's going to massively overload the connection to the grid. So, one of the things we're trying to do is just convince people that actually, in most cases, a 10-amp power point will do the job."* (Joel C4)

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<sup>5</sup> <https://www.abc.net.au/listen/programs/am/product-design-failing-vision-impaired/106623776>

One participant attributed this to deliberate misinformation:

*"I think the trolling around electric vehicles has gotten worse – sort of COVID, post COVID – and as vehicles and as EV sales have gone up, I think the more of a threat it is to vested interests. [...] Yeah, the house electrification stuff is becoming a bit more – I don't think that's as politicised." (Rebecca C4)*

Several of the participants talked about exaggerated perceptions of technical challenges and wiring requirements for household electrification, *"in a lot of cases, people are making this much harder than it needs to be"* (Joel C4). The need for switchboard upgrades is relatively common, particularly in older buildings:

*"Most of the switchboards, they are 20, 30 years old. So upfront, we are, we expected that there would be a high demand for switchboard upgrades. I don't have the exact stats for you, but I probably would estimate maybe I'd say about 80% of the installs we're doing requires switchboard upgrades [...because] either there's no available space on the switchboard or it's replacing fuses with circuit breakers, upgrading circuit breaker size." (Romaine C4)*

However, upgrades to higher capacity or multiple phase grid connections are often not required. In particular, common misconceptions include that induction cooktops require 3-phase or high current connections; that heat pump hot water systems need their own circuit in the switchboard, while *"some aren't even a kilowatt. They typically sit around 0.8 of a kilowatt, so you can just plug them into a general GPO"* (Antonella C4); and that EV chargers require upgrades.

*"I think there's just a lot of fear around what an electric home is and how much power it draws, but the appliances are so efficient that your air conditioning is not going to draw much. Your hot water draws literally close to nothing, and the induction cooktop you don't have on every moment of the day, and it also doesn't have a big power surge when you turn it on." (Antonella C4)*

Similarly for EVs, connection and phase upgrades may be safely avoidable, provided the charger has its own circuit and RCBO (residual current circuit breaker with overcurrent protection) in the switchboard, and charging is arranged to avoid times of peak household load *"Our requirements for electrical upgrades, generally, are limited to find a space in the existing switchboard, put in 1 RCBO for one dedicated circuit and run from there, and then education for the customer about when they should be using this equipment."* (Lawrence C4)

All these misconceptions lead to overestimation of the costs of electrification. Relatedly, gas may be incorrectly perceived as cheap relative to electricity, due to not accounting for the efficiency of electric appliances and therefore that lower running costs may offset higher installation costs.



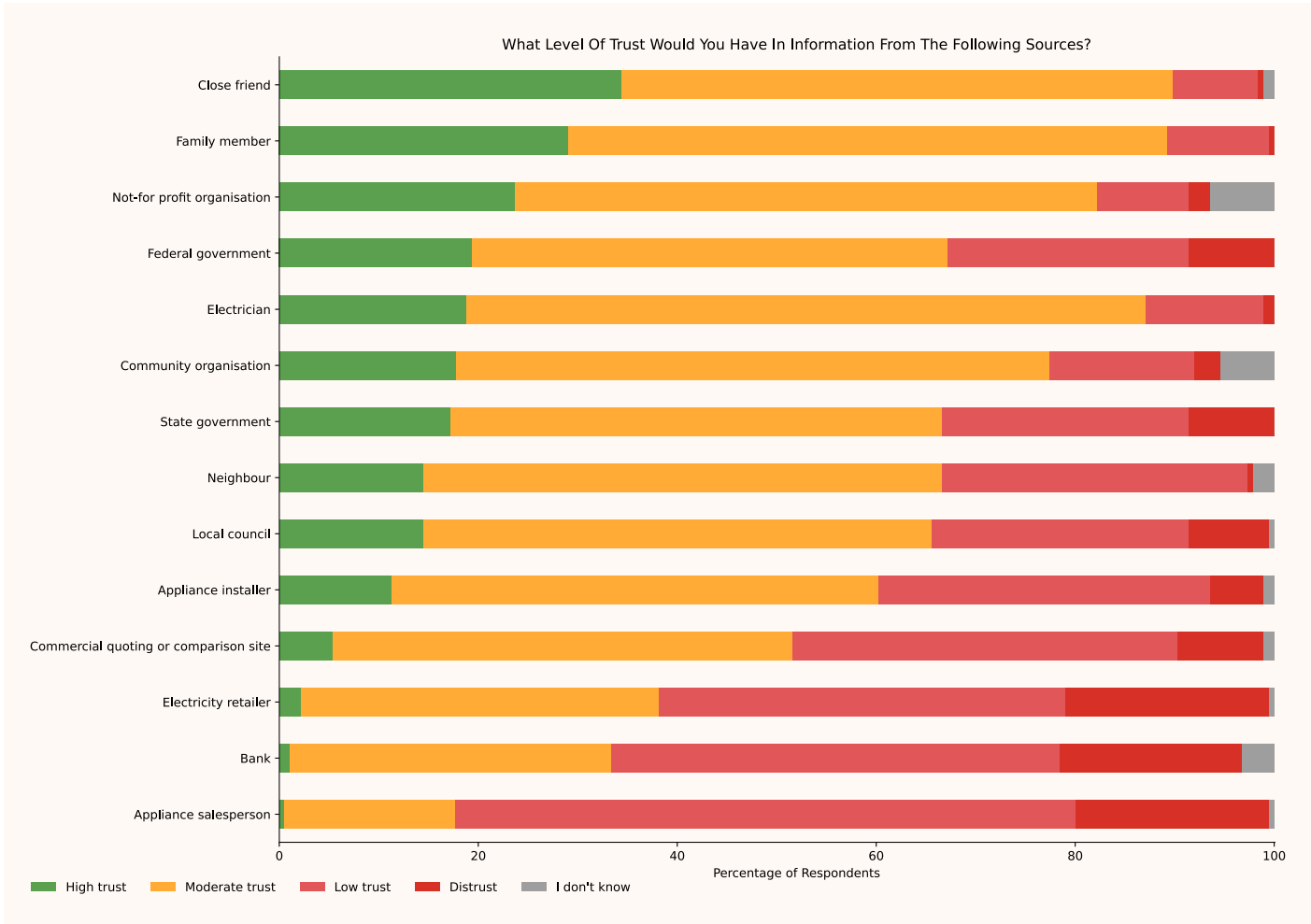
## 3.2 Sources of Information

This section considers the sources of information participants reported they had used or may use when electrifying; in other words *where* people go for information. Pertinent to this subject are issues of trust and usefulness.

### 3.2.1. Where households go for information

As illustrated in Figure 4, the source of information has important implications for its perceived trustworthiness. Participants have high or moderate levels of trust in information sourced from close personal contacts, such as friends or family members (89% of respondents), and from electricians (87% of respondents). Trust in appliance installers and comparison sites is rather more ambivalent, although 60% and 51% of respondents reported high or moderate trust respectively. Electricity retailers, banks and appliance salespeople appear to be the least trustworthy sources, according to C1 respondents, with only 38%, 33% and 18% respectively reporting high or moderate trust and 20%, 18% and 19% responding that they distrust these sources. As might be expected in a study within the historically political contentious area of energy, trust in governments was mixed. Supplementing these quantitative findings with qualitative data provides insights into the reasons for these trust levels.

**Figure 4:** Level of trust in different information sources (C1 n=186)



Among C1 'engaged' interview participants who had undertaken some form of electrification – from installing solar panels, through to fully electrifying their home or small business – personal contacts (e.g. family, friends, and colleagues) and tradespeople or suppliers appeared to be the most common sources of information: *"...knowing people in energy, asking them what they think or what they've got in their house, or getting them to check a quote. So, doing it that way, people that actually do this for a job"* (Tracey C1)

Other useful sources of information included: social media and online forums (including the Facebook group My Efficient Electric Home, Reddit threads, and Whirlpool Forums), comparison websites like Solar Quotes, and government websites (Solar Victoria, ACT Government's Climate Choices website).

However, as might be expected, in practice, participants explained that they typically drew on multiple sources of information in combination, rather than relying on any single source:

*"I got a referral from my mum with an electrician they have used before in the area. And he basically said that the Mitsubishi was the best brand. It wasn't the cheapest and it wasn't the dearest. It was mid-range price. And also, he said out of all of the brands that he's dealt with, this one has the least amount of maintenance."* (Bridget C1)

Regarding trust in and usefulness of different information sources C1 'engaged household' participants varied in their specific preferences but shared a general tendency to favour sources perceived as independent, including recognised experts such as industry professionals, academics, and community organisations:

*"I would much rather watch a video that's like a 20 or 30-minute presentation by an industry group or academics rather than an influencer who I'm not really sure where their backing comes from."* (Mark C1)

Participants also expressed a strong preference for personal accounts from ordinary people who, unlike potentially more knowledgeable tradespeople or salespeople, were perceived by participants as not having a stake in a particular outcome, and therefore, more independent and trustworthy.

*"Is [the information] current, who's writing it, are they reputable, who's the author and what's their position? So, that's pretty much how I read everything with that lens... that's the CRAAP test. Some of them you're reading, you just go, 'Okay, no, that doesn't work for me, or your position is pushing me in a direction because that works for you, not for me.'" (Eleanor C1)*

Conversely, where sources were perceived as potentially benefiting from electrification, such as energy retailers, builders, and salespeople, participants expressed caution: *"I mean, obviously, the energy companies will tell you to put on as much as you can... And then you've got way more than you need."* (Margaret C1)

Nonetheless, some participants felt the advice of such people or organisations could be relied upon if corroborated by other sources:

*"I was a little untrusting of retailers, so I was keen to do as much of that as possible myself. And then, at worst, have a sole retailer come to me with the same answer." (Nathaniel C1)*

One participant (Eleanor C1) described drawing on a layered combination of sources, each serving a distinct purpose. ACT government materials provided a useful starting point for exploring electrification, while a trusted brother with technical expertise helped filter out "noise" by directing her toward credible, independent analysis. Crucially, this personal connection was valued precisely because the participant's brother was "not trying to sell something," which gave the participant confidence to scrutinise commercial advice before accepting it.

C2 'less engaged' households appeared to gravitate towards different sources of information than C1 participants. In part this might be attributable to the fact that C1 'engaged' participants had electrified their homes to some degree, while C2 'less engaged' participants generally had not. Nonetheless, there were also many similarities, including in terms of people's preference for independent sources, whatever their variety. Some participants explained council newsletters and government websites as potential sources of electrification information, though also expressed a preference for the option to speak directly with someone to gather more information: *"I'd go on the [council] website first to see if they have a section there... and to have a contact person for it and take it from there." (Michael C2)*

Other C2 participants expressed doubt about the accessibility and functionality of government materials:

*"I did not know that they would supply that information. But if they're anything like myGov and my ID, they're so hard to understand, to follow. So, yeah, you'd probably go, 'I've had enough. Don't worry about it. I'll go somewhere else.'" (Steven C2)*

Comparison websites such as Solar Quotes, Compare the Market and Finder were viewed as particularly valuable sources of information by some, allowing consumers to do prior research before engaging with salespeople, *"I'll have a look at it but I do my homework. I rely on myself doing the homework. And I go to a place called Solar Quotes [to do that]." (Steven C2)*, as were review websites, particularly where bot and sponsored content could be filtered out:

*"I appreciate it when they remove sponsored reviews and bots as well, all the bot reviews. So the first thing that comes to my head is Finder, or Compare the Market, which I know are insurance and bank ones. They're helpful because they compare the different products you can filter to your specific needs. There are heaps of things you can compare, so it's not just one niche product or topic." (Megan C2)*

Review sites were seen as useful and trustworthy as they provided insights into how the product or service played out during operation:

*"I think just like googling Google reviews or Facebook reviews, just seeing comments from other people is most beneficial to me... I just know it's a real person who's used that service before, so I trust that more than an article that might be sponsored or their own website."* (Yuki C2)

However, participants noted a degree of engagement is required:

*"I pick and choose what I use social media for advice on. I find sometimes it can be really helpful, especially in forums with people who actually take the time to review things and value the honest feedback. I'm sure you're aware: social media, there's a lot of junk on there, so just have to pick and choose."* (Megan C2)

Relatedly, some participants mentioned that AI could also be used to compare quotes, assist with verifying the legitimacy of businesses (thus helping people to avoid scams):

*"I'm a big believer in taking screenshots and asking AI if they are scammers or not because Facebook is bloody full of scammers. That's the first thing I did [after being contacted by a home battery installer], to make sure it's a legitimate company."* (Mathew C2)

This same participant also used AI to translate energy jargon into accessible language, a strategy he had put to use to resolve an issue with his father's home batteries: *"I put it all in AI. AI explained it better than anyone could."* (Mathew C2)

As with C1 'engaged' participants, personal contacts were also a valuable way for people to access relevant and trustworthy expertise or experiences:

*"I think that one of the things which, you know, even if people don't realise it as much as they like to admit, family and friends and word-of-mouth recommendations can have a large impact on their decisions... if one of my close friends had an electric car and I was constantly a passenger in it, and seeing them with it, that would probably play a big part in my opinions about me eventually purchasing one, I suppose."* (Gary C2)

Participants also shared that this type of recommendation from personal contacts allowed them to avoid the burden associated with independently researching what is, for many, an abstract and complex topic:

*"It's a bit like doing the Home and Contents Insurance, you know, like it's just so mind boggling... like you start doing your own research and then it just gets way too much going on in your head... and then it's like, 'Right, where's our mate? He needs to help me, guide me. Help, mate.' You know?"* (Hannah C2)

Finally, as with C1 'engaged' participants, C2 'less engaged' households in our interview sample recognised the value of tradespeople and suppliers as sources of expertise, although not in isolation:

*"I go on the internet and do my homework and then, when they tell me the battery they're gonna use, I go online, source that battery, and read up on it, read the specs, see what it does. Yeah, that's how I did. I don't rush into things. I do my homework." (Steven C2)*



### 3.2.2. Where businesses go for information

Similar to C1 participants who already had some experience with energy efficiency and renewable energy retrofits, C3 small business participants typically noted their ability to draw on prior experience when seeking out information to inform decisions about their business, including about relating to energy systems. This experience may have been gained through participants' management of their business premises fit out, for example. For some, this included upgrading power supply from single to three phase, as well as equipment procurement, including of bespoke equipment. Some had also developed experience of the energy sector through seeking out better electricity price offerings. Many of these participants felt relatively confident about their ability to manage electrification as the processes fell within their existing skillset used to run a small business:

*"I mean, in business, you're fairly used to dealing with upfront costs, right? Like, every time you buy a new piece of machinery, there's a big upfront cost, but in the hope that it makes you money or saves you time or something. So, yeah, I think when you run a business, those things aren't so onerous as they would be for a person not running a business." (Sofia C3)*

However, while participants felt they might have the skills and experience to manage an electrification process for their business, electrification was not necessarily an opportunity that sat front of mind unless otherwise prompted:

*"I think really that the key thing for me is, you know, it's the competition for eyeballs, isn't it? Really, it's the competition to get to the top to get this decision to the top of my to do list. That's the major hurdle for me." (Russell C3)*

Participants reiterated that the scale of effort required to electrify had to be fitted in around other business operations:

*"Yeah, so many hidden tasks, and when you run a small business, there is really not much time in the day to – there's a lot of work that needs to happen on the back end with like bookkeeping and all that kind of thing. Then throwing in something fairly big, like putting solar panels on, and you're dealing with all of these people, I think, would be too difficult. Especially, if it wasn't your own premises. If it was my own premises then yes, because there's such a big incentive to do it." (Sofia C3)*



### Max's story

Max's café-restaurant illustrates an important dynamic common to small business electrification. The first is a reliance on trusted expertise. Max's head chef was inexperienced with, and so initially wary of, induction cooktops. However, her opinion changed during a chance conversation with a respected colleague, a chef at a high-end restaurant, who spoke to the quality, reduced fumes, and lower kitchen temperatures that induction could offer. Relatedly, Max had a low tolerance for disruption during the kitchen renovation because any pause in food service would mean lost income. That the electrician understood and worked around this constraint was, in Max's account, as critical to the project's success as the technical work itself. Both moments point to how professional networks are central in the decision-making work that small businesses often lack the time, knowledge, or capital to undertake themselves, thereby underscoring the value of investing in these networks as a driver for electrification.

Participants explained that therefore, they would likely rely on information available through personal and professional networks, offering them a shortcut to trusted products or installers or processes, or to initiate the process. These contacts may offer the first prompt to consider a particular option. For example, one participant was prompted to consider installing solar when a member of their social soccer team posted about a positive experience with an installer on their team WhatsApp group. Others explained that family or migrant community networks were an important way of learning about new products and offerings: *"Like we are very close, 15 families or group, and everyone now have it."* (Sana C3)

Sometimes this information was shared more incidentally, for example, one participant explained that they were working to electrify their café-restaurant, but due to the reluctance of their head chef, had decided to stick with gas cook tops until an incidental conversation between the head chef and a contact who provided a positive review of the technology: *"That was enough.... She was just like 'Okay, let's give it a go.'"* (Max C3)

Participants often noted that they would look to governments as a trusted source of information about electrification. For some, this was a theoretical source that they had not yet drawn on but expected to be available:

*"I think I'd be able to find them fairly easily. I thought that there was some kind of government set up, kind of, websites. Maybe I'm wrong. I assume they generally have a website for a lot of these things."* (Sofia C3)

However, not all participants had clarity on which level of government they should seek out: *"Oh, there you go. I'm struggling to associate energy production. It's a state government thing, isn't it? Is energy attached to state government?"* (Russell C3)

Some pointed to federal government, due to awareness of earlier rebate programs, while ruling out local councils, many of which have mobilised information resources to support electrification among their constituencies. Some were a bit sceptical of governments' capacity to provide actionable resources, with some expecting that government might favour cheaper brands, rather than quality:

*"When it came to the hot water transition, I think there was probably a government-type website that explained how there were initiatives, financial initiatives, to switch from gas to electric hot water systems. I soon realised that I didn't like any of those just because they were just based purely on cost and not actually on performance and longevity."* (Casey C3)

Other thought that government websites might prioritise completeness, rather than usability:

*"I'd probably be looking for some sort of government-sanctioned website response to that rather than – I'd probably dig through a couple*

*of the commercial ones again because of that difficulty, clunkiness with many of the government websites versus the how clear and easy it is to navigate. So, I probably do a mix of both of those, but there was something else there as well.” (Russell C3)*

Participants expected that they would hear about electrification-type news or resources from government or council mailouts or newsletters. This approach had been key to one participant who enrolled in a government support program as a result.

As seen among C2 ‘less engaged’ household participants, online reviews were also identified by small business participants as an important source of information, drawing on both customer-generated and expert reviews, including through Google reviews, Trustpilot, product listings themselves, and Canstar. Participants noted that reviews provided a way to validate claims made by brands themselves, and took care to read between the lines and check multiple sources:

*“I also know that if something is not going right, people avoid to give the reviews or if there’s something like extraordinary good, then they give reviews mostly. So, I just don’t go by with like, there are only bad reviews. I still give it a go if I like something, because I know that people who like it, they are like me not posting much reviews, only if something goes wrong. So, yeah, I do that as well, but I always check multiple sites. Like, first, I try to see the brand’s website, brand reviews, and then if it’s not satisfactory, only bad comments, but then I go to Facebook page of that brand.” (Sana C3)*

Tradespeople and suppliers were also important, particularly as the business moved towards equipment selection, sourcing quotes, understanding technical constraints and weighing up options: *“We had to talk to a sparky. That was making sure that we actually had enough usage.” (Max C3)*

### 3.2.3. Industry specialist views

Industry specialists interviewed recognized the complexity of electrification decision making for consumers, and the need to minimise the number of people and organisations they need to interact with, as a means to simplify the process.

*“Complexity for the consumer can be reduced if there is a single point of contact, whether a tradesperson who can install multiple appliances, or an expert co-ordinator who can collect all the necessary info and pass it on to a range of trades. We’re not yet there. The installer network to support electrification, we believe, is still not at that stage of maturity. We’re having difficulty finding installers that can work on multiple appliances, say hot water, plus air conditioner, those common devices. It has to be two separate ones, which means two separate visits, two separate discussions, and meet-ups with customers.” (Romaine C4)*

Joel (C4) acts as an advisor to consumers, helping them navigate their electrification journey:

*"Mostly [people talk to me] at the beginning [of the electrification process], which kind of suggests to me that they were just kind of, you know, confused or paralysed by the whole thing and needed some help." (Joel C4)*

Antonella goes a step further, providing a 'one stop shop' to manage the whole process:

*"Our goal is to make home electrification as easy for homeowners as we possibly can ... not only quoting and understanding the customer home, but things like trade coordination, trade selection, rebate management, and all that tricky stuff. We have a really simple three-step process that we follow pretty rigorously. And our goal is to make that process as easy as possible." (Antonella C4)*

Consumers using these services are prepared to pay extra to reduce the cognitive load and uncertainty, and so are not representative of all consumers. They also have diverse levels of interest in understanding or controlling the detail of the process:

*"We have quite a few customer types. Some are just happy for us to handle everything and almost like don't care, and others that are super involved and they're like, 'No, I want this specific thing,' and have questions about everything, and then there's a bunch of people that sit in between that." (Antonella C4)*

Participants described the central role of tradespeople as a trusted source of information for many consumers as well as a potential source of misinformation or confusion:

*"I just think it doesn't help, right, when you start exploring this area and you're going to start talking to different trades, and you start getting different messages, like, that's a recipe for paralysis right there, right?" (Joel C4)*

This can become a barrier to electrification:

*"It really does feel like people trust the trades in their home. So if a trade has said to them, 'Oh, no, you won't be able to do this for this reason,' or, 'It's cheaper to just replace like for like', and the myth is about heat pumps or whatever it is, is not real, those sorts of things will stop people from doing it." (Antonella C4)*

Interviewees attributed this to a range of factors, including disinterest in learning new skills, reliance on outdated information, or desire for certainty:

*"I suppose what I'm saying is that all business people, regardless if they're builders or otherwise, are seeking certainty, and often certainty means doing what you know. So, most will, if they've installed a certain type of heater or heat pump hot water system in the past, then that's what they'll go with." (Robert C4)*



Tradespeople are often relied on to size (or provide advice on sizing) appliances, but may not have the necessary expertise and so, in turn, rely on manufacturers:

*“The plumbing companies are very good at installing all this equipment, but they’re not so great at sizing it. So, what they tend to do is they tend to call up the suppliers of the gear they’re buying, say, Mitsubishi or someone like that, and they’ll give them a description of the building. And Mitsubishi sizes the system for them.” (Joel C4)*

The lack of appropriately skilled tradespeople was described by participants as a factor in the slow pace of electrification, exacerbated by the increased demand for home batteries driven by the Cheaper Home Batteries Program, which diverted electricians from other – more complex and potentially less lucrative – electrification tasks. However, in some jurisdictions, requirements for new homes to be all-electric are contributing to developing industry readiness which will also benefit retrofits:

*“We have new suburbs which are all-electric and, you know, have been for a couple of years now. The trades, whether they like it or not, are getting used to installing all this gear, right? So, it’s kind of, you know, forced capacity building, that they’re learning how to install heat pumps and stuff, and they can see that all these houses work, and presumably the opposition to it falls a bit [...] And it builds up the supply chains and all that sort of stuff as well.” (Joel C4)*

The importance of trust was discussed by many of our C4 participants, and particularly the importance of individual relationships in building trust throughout the electrification process:

*“I think a lot of that [trust] sits in that initial home visit, and also the ongoing communication, and touch points that we have along the line. [...] The 2 people that do the home visits, ... we effectively don’t let anyone else do them, unless they’re a qualified person who knows what they’re talking about.” (Antonella C4)*

Independence engenders trust: *“There’s a little bit of scepticism about what trades are telling people, because they have a vested interest. And so, that was the other thing I provided because I was independent, right? I wasn’t pushing any particular product.” (Joel C4)*

Participants emphasised the importance of trusted relationships between different actors in the electrification process and how this can build consumer trust: *“It was pretty clear that the electrician that I was working with was so good and we had a good rapport with each other, [so] everyone was happy.” (Joel C4)*

*“So sometimes you’ve got eight people on site. Sometimes it gets a bit busy and it’s tricky to work, but at the same time, we’re trying to get all our trades to consistently work together so that their communication increases and so that they know each other, so they can ask each other for help and schedule the day properly. That’s just got more efficient as time goes on.” (Antonella C4)*

This reliance on personal relationships with a trusted individual presents a challenge to scaling a one shop stop and may act as an impediment to widespread electrification:

*“The thing that’s really frustrating us is that there’s a lot of money in the industry at the moment, talking about technology, and scale, and how that looks, and what that is, and what AI can do, but fundamentally, you’re going into people’s homes, homes that they built over years that they really care about, that they spent a lot of money on, that they want to grow old in, and so you need to be a person at this stage to do that work for them.” (Antonella C4)*

Participants also discussed trust – or lack of it – in relation to online sources of information. Online reviews – such as Google Reviews and Product Reviews – are commonly used by consumers, and are important to installers and sellers to the extent that some offer incentives for good reviews, potentially undermining the reliability of this information source: *“They give a good Google Review or refer a friend kind of thing, and they get \$100 back [...] that’s definitely wrong [but] It’s a marketing strategy that businesses will use” (Cole C4).*

While recognising the value of digital communities like the My Efficient Electric Home Facebook group, *“MEEH was really useful to me when I was doing my own house”,* one online influencer considered Facebook to be generally a less reliable source of information than other social media platforms: *“Facebook is boomer men who just want to troll me, or they’re usually holding a fish or an Australian flag, or it’ll be a picture of some ICE vehicle as their profile picture”(Rebecca C4).* Antonella expressed concerns about commercial information websites linked to banks or electricity retailers who *“are quote aggregators, but claim to be home electrification experts”* diverting consumers from more independent information sources.

The specialist participants emphasised the value to consumers of their own lived experience, for example through EV test drives or induction cooking demonstrations, and of *“talking to friends who have done it” (Antonella C4).* Some also talked about the importance of visibility, how seeing EVs, EV chargers, solar, batteries and heat pumps in a street helps normalise the technologies and identifies the owners as a potential source of information. *“It’s like keeping up with the Joneses, [...] it’s when your neighbours get it [...] One person gets one and every – you know, almost every week, there’s a new car.” (Rebecca C4)*

*“I think a big part of that seems to be social proof, like a lot of customers want to see that other people have done it before and it works for them. I mean, the site that I’m at now, there’s one that we already installed six doors down in the same street. So, this one is happening in part, because this person saw their neighbour had one, asked their neighbour, their neighbour said, ‘Yes, great, you should totally get one of these.’” (Lawrence C4)*

A trusted community (whether local as in the Electrify 2515 project or online like MEEH) can generate an environment for shared learning, not just about *whether* to electrify but also about some of the detail of *how* to electrify:

*"[People] tend to trust the local community [...] so people are telling us they trust their neighbours more and learn from that experience. So their neighbours telling them, 'I could have gone for a bigger tank for the heat pump,' or, 'I could have gone bigger solar,' or, 'I could have done this and that,' and they learn from that, so that builds trust within the community."* (Romaine C4)

Some households are also keen to develop the social nature of their infrastructure: *"we're deploying equipment that will be visible in people's front yards, considerations of how is this going to work in the streetscape? How am I going to get along with my neighbours? Can I share this infrastructure with my neighbour? If I install one, can my neighbour, three doors up, use it? And the answer is, of course, yes"* (Lawrence C4)



### 3.3 Types of Information

This section considers the types of information that participants had or imagined would be accessible to them during the process of electrifying their home or business.

#### 3.3.1. Consumer views on types of information

C1 'engaged household' participants with prior experience of home energy upgrades, described the type of information that they had encountered during these earlier experiences, the types of information they would expect in future efforts and how useful these would be. This cohort were often motivated by environmental considerations, but did not necessarily see metrics for environmental performance, such as carbon emissions, as a key information. Perhaps, in this regard, they

were already convinced and so were more interested in the next layer of considerations. For example, participants described their interest in understanding the long-term issues of ownership, such as long-term costs and savings, including hidden costs, such as maintenance requirements for different technologies, and protections offered by product or installation warranties:

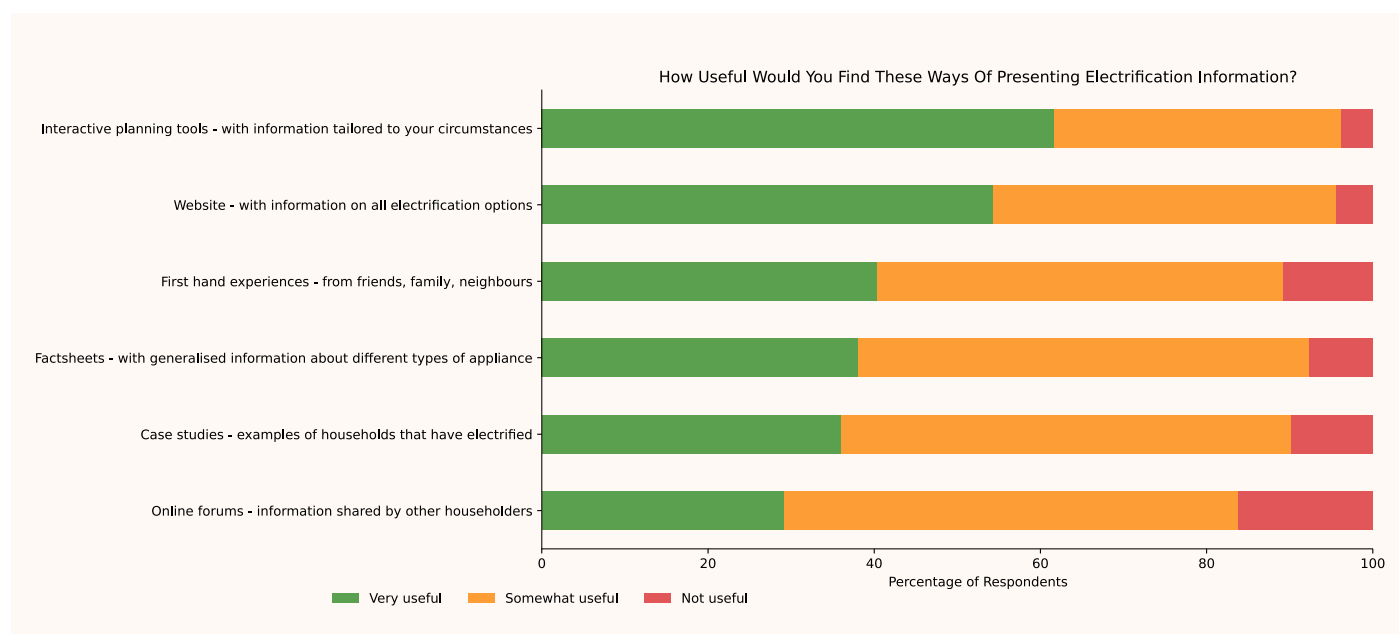
*“The one thing that I’d like to see more of is more information on reliability and serviceability for things like heat pumps and hot water heaters, because somebody can give you like a four or a six-year warranty on a big system, but if someone has to come out a bunch of times and replace things in those four years, it doesn’t matter that it’s under the warranty because you still have the experience of it breaking and being out of service.” (Mark C1)*

A key theme that emerged both in interviews and in survey responses was the importance of contextualising information to individual circumstances. Interactive planning tools emerged as a means for accessing and making sense of electrification information to aid decision making. 97% of survey respondents indicated that that such tools would be either very or somewhat useful (see Figure 5). Interview participants elaborated, explaining that interactive planning tools would be helpful for developing their understanding of relevant options and sizing for different appliances. They noted that for these to be useful and trustworthy, they should be independent of energy retailers or installers (as mentioned in section 3.2; also see Figure 4) and that they could cater to different level of detail and complexity, depending on the user’s preference and stage of the process. This sentiment was also echoed by participants from ‘less engaged’ cohorts:

*“That would be helpful, wouldn’t it, is to have, you know, two levels of calculator. One level is the simple that just gives you a rough sort of, you know, I reckon this is your calculation sort of thing. That’s really all I’m after.” (Russell C3)*

In the absence of sufficiently detailed and usable interactive planning tools, some interview participants had built their own spreadsheet tools to allow them to compare different options based on their own circumstances.

Some participants expressed that they did not want to be required to dig through and interpret their energy bills, although others suggested that some degree of integration with energy bills and energy consumption would likely offer valuable insights for comparing different options: *“Here’s our current usage for the last number of months. Here’s our gas bill. Here’s our electricity bill. And if we converted this to solar with a battery, here’s how long it would take to turn back. If we converted to solar without a battery, here’s how long it would take. You know, kind of those options being able to switch those things in and out would be helpful.” (Russell C3)*



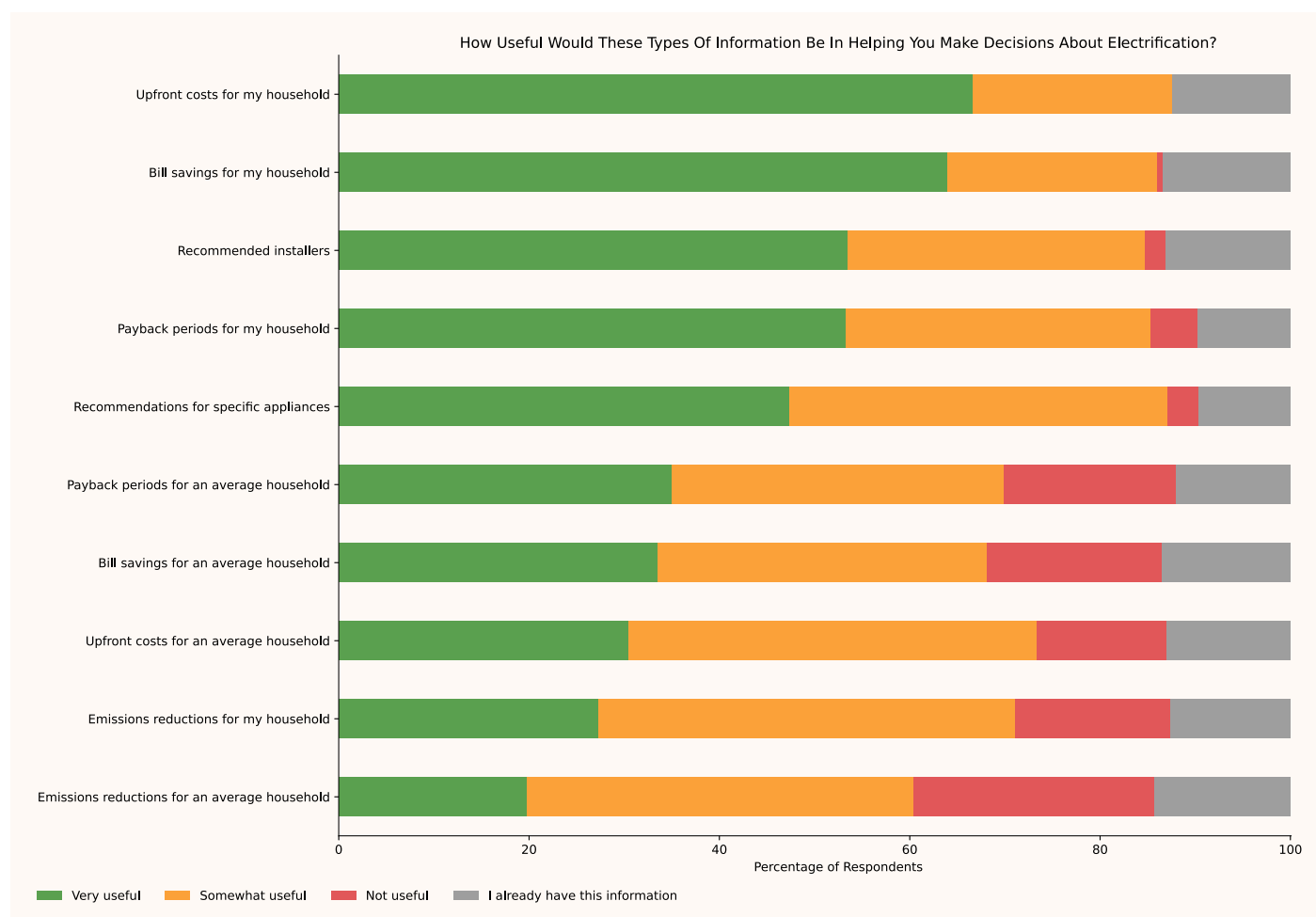
**Figure 5:** Preferences for different media for presenting information (C1 n=186)

Regionally located participants highlighted the importance of geographically specific information, particularly in the absence of personal professional networks. One regional participant described their ideal website portal for geographically relevant information, with clear pathways to either telephone or in person support:

*"It would have to be a web page. You'd have lots of pull-down tabs – for [regional town 1] area, [regional town 2] area, [regional town 3] area. In an ideal world, pull down the tab, click on [relevant regional town], 'Okay, we can help you.' And then like break it all down. This is who you could ring to talk. This is who you could ring to get out to your house to have a look. And every FAQ question that you could possibly think of under the sun should be put on this website, because there's always questions and answers and even a Contact Us or Email Us or Check with Us Now." (Danielle C3)*

Websites of this nature were also rated by C1 survey participants as useful, with 95% of C1 survey respondents indicating that they would find websites with information on electrification options as very or somewhat useful, as shown in Figure 5.

An advantage participants raised about such websites and independent interactive tools was that it might help equip users to engage more meaningfully with tradespeople and salespeople, rather than relying on their goodwill and expertise (and willingness to allocate time to discussing different options). Some participants reflected on experiences where they had been given incorrect information by installers, e.g. that heat pump hot water did not work in their climate zone (this individual subsequently found out that many in their neighbourhood already had this technology installed and working effectively). This highlights the importance of connecting with a trustworthy and knowledgeable installer, when undertaking electrification. This point is also evident in the C1 survey results where 85% of respondents indicated that they would find installer recommendations very or somewhat useful (see Figure 6).



**Figure 6:** Usefulness of different types of information (C1 n=186)

Relatedly, some participants thought interactive or other contextualising comparison tools might help in prioritising what electrification action to take and in what order. As one person explained: *"I like those checklists a bit or where you have different options and then you think what is applicable or not. So, you could start with insulation, you could start with an aircon, you could start with a battery. Don't just start at the back. Maybe you don't need a battery."* (Margaret C1)

This participant reflected on the structure of both the industry and policy approach, set up to deploy particular technologies, rather than to provide a holistic solution, tailored to individual circumstances, to have the biggest impact. While these tools and checklists were valued by participants to counter sales tactics or installer preferences, participants also valued the expertise offered by the industry, particularly well-reasoned advice or recommendations provided by installers, that individuals could use to make up their own mind. In person validation by installers was also seen by participants as an important step towards getting the correct solution.

C2 and C3 'less engaged' participants were similarly interested in interactive planning tools, some noting that they had found online calculators helpful for other decisions (e.g. for mortgages). This group, with less experience in the energy space, expressed a wider set of information needs. Participants explained that financial metrics were important, such as prices of appliances, installation costs, other ownership costs over time (including future refurbishment costs), and (for homeowners) the value of the upgrade to their property price. Note



### Charlotte's story

Charlotte lives in a standalone house on the fringes of a major city that she and her partner have recently purchased. They live with her 12-year old daughter, and Charlotte and her partner are expecting a new baby in the next few months. The family are energy-conscious but electrification is not a term that they have come across. They are investigating rooftop solar, which is an option now that they are homeowners. This is primarily a financial decision as both Charlotte and her partner have experience of financial hardship and are determined to set their family up well financially. Decisions about other energy appliances are also viewed in this light, and Charlotte has questions about the performance and longevity of electrified appliances. These questions are shaped by her earlier experiences of poorly performing appliances when renting. Both Charlotte and her partner have jobs where working from home arrangements are not feasible. This means that any work requiring tradespeople or installers to visit their home will likely require them to take leave from work. In general, Charlotte is not opposed to moving to electric appliances, as long as they could be relied upon to provide the same level of service (or better) she is used to. For this reason, she is hesitant about electric cooktops, as much of her cooking requires precise temperature control.

that although these elements featured less prominently in C1 interviews, C1 survey responses suggest that those already 'engaged' similarly find a range of financial metrics helpful for their electrification decisions, as seen in Figure 6. C2 and C3 participants noted that this range of metrics would help determine whether they could afford to proceed or not. Amongst these cohorts, price was also noted as a proxy for quality, along with brand.

Similarly, participants explained their interest in understanding how electrification would shape their everyday experiences. Interactive planning tools could be useful here in painting a vision of what electrification might look like. However, some participants noted the importance of hands-on exposure to using new electric appliances and technologies:

*"You know, if I like if one of my close friends had an electric car and I was constantly a passenger in it, and seeing them with it, that would probably play a big part in my opinions about me eventually purchasing one." (Gary C2)*

This experiential information was more relevant than specific technical details of how appliances work. However, participants did note that if they were to proceed with electrification, they would need to have access to some level of technical detail, to integrate new appliances into their lives:

*"I don't even know how gas or electric hot water gas works, whether it just heats up as soon as you switch the tap on type of thing? The gas fires into it and starts heating? I've got no idea." (Hannah C2)*

This technical detail was seen as key to ensuring that the technologies could be relied upon during operation, and for knowing who to contact if any performance issues were to emerge.

Finally, the split incentive between landlord and tenant remains a key issue shaping small business engagement with electrification. Casey's experience of electrifying his manufacturing business operating in rented premises provides an illustrative example:

*"And really, I was only interested in longevity – because there were no incentives there for small business that I could at least see... it's not our property and the landlord, in typical old school fashion, couldn't be less interested whether we stayed with gas or electricity. And that was our cost. Whereas, with some of our other landlords, that would have been happily absorbed as their cost. So, we bought a reasonably cheap solution for the warehouse because, you know, maybe in five years, we won't be there...[the factory is] leased on a long-term basis. The previous landlord – there's a new one now – but the previous landlord was happy for [installation of rooftop solar] to happen but wasn't willing to contribute anything." (Casey C3)*

These realities of small business operations sharpen the need for clear information about the economics of electrification and how it fits within lease and tenure arrangements (a point raised elsewhere in relation to households [11].

### 3.3.2. Industry specialist views

Industry specialist participants had varied views on the amount and type of information needed by consumers, likely related to the priorities and motivations of their different client cohorts. For some, the overriding need is to understand the financial outcomes, based on installation costs, bill savings and, importantly, available subsidies:

*“So it’s cost and benefit, basically. They wanted to know how much it would cost them. They wanted to know how much subsidies available, so they would know how much they’ll be out of pocket, and they wanted to know the benefits of basically ROI information for them, like what’s the return on investment for me.” (Romaine C4)*

For other consumers, largely driven by environmental concerns, detailed financial outcomes and bill savings are less important: *“We actually don’t [provide detailed cost-benefit analysis] and we made a really conscious decision at the beginning not to do that. We thought that it was too much information and if people were coming to us, they already knew why they were doing what they were doing” (Antonella C4)*. However, Antonella speculated that this may change as electrification becomes more mainstream.

Some consumers are happy to defer appliance choices to consultants or tradespeople, as long as they are assured it will provide the same service as their existing appliance.

*“If I was able to do a like-for-like replacement, they were happy, right? Like, they obviously didn’t want any reduction in quality of service, but as long as the replacement appliances did what their current appliances did, they would be happy.” (Josh C4)*

Others prefer to compare appliance options based on factors such as brand, warranty and price, but may need reassurance about specification.

*“They’ll trust the expert on that and that’s why you get someone like us to come in and do the work. People do ask about heat pump size all the time, which is really strange to me. You don’t ask about air conditioner but you do ask about hot water, usually because they’re scared of running out.” (Antonella C4)*

Conversely, some consumers prefer to be more involved in the detail.

*“We say that people who have the information and care that much should just do it on their own, because they care and they do the research, understand what they’re getting, get 25 quotes, make a long hard decision on it, and do it all themselves. I guess the one-stop shops are probably not the best solution for them.” (Antonella C4)*

Information on life expectancy and warranties helps consumers choose between appliances but also builds trust in the technologies.

*“Providing just clear information to customers on life expectancy and warranties for the products really helps them make a decision. If you’ve*

*got something like, you know, that's a good quality heat pump from a good brand with a 10-year or a 15-year warranty, that provides a lot of insurance, against scepticism from the clients." (Cole C4)*



### Antonella's story

Antonella runs a 'one stop shop' service for household electrification. Her clients are predisposed to transition to an all-electric home, often for environmental reasons, and prepared to pay a bit more for simplified decision-making and a streamlined process. The information needed to plan a household electrification is collected by Antonella or one of a small group of experienced assessors through a home visit, conducted either in person or virtually using a phone or tablet. To allow for householders' diverse knowledge, the assessor finds as much of the detailed information they need to specify appliances as possible from direct observation or measurement of the home, and relies on the householder only to tell them what existing gas appliances they have. Wary of overwhelming clients with too much information, Antonella has also reduced the detail provided to clients, now focusing only on what they plan to install and how, with a video call Q and A session to fill in any gaps. In-person home visits use more time and resources, but provide an opportunity to build a personal relationship with the client and, consequently, are more likely than virtual visits to lead to a successful full home electrification, which is typically carried out by 6-8 trades people in a single day.

The need to keep information clear and simple, to avoid consumers being overwhelmed, was discussed by several participants, but is not a straightforward task given the complexity of the electrification process. One electrification professional described how their process had developed over time from providing consumers with a lot of information and asking them for a lot of detail about their needs, to a much more streamlined approach: *"We've literally pulled back a lot of data and a lot of information that's just not needed. We think there's a really fine balance between over communication and under communication"* (Antonella C4). The appropriate balance varies, not only between different consumer cohorts, but between different appliances and stages of the electrification process.

## 3.4 What consumers can tell us about their electrification needs

To understand the options available for electrification of a household or small business requires knowledge of the building and existing wiring arrangements, the existing gas and electric appliances and the consumer's needs and preferences for electric appliances. To estimate future electricity consumption and bills, additional information such as temperature preferences, hot water usage profiles and driving habits, is needed to understand how appliances will be used. While there is a case that appliance specification should be independent of these behavioural factors, to allow for future occupancy changes, understanding of the costs and benefits of different options can be important to inform decision making.

While professional advice and expertise is needed to determine appliance specifications, electrical connections, etc., consumers' understanding of their own needs can inform this process and, importantly, empower consumers to assess their options, compare quotes and make informed decisions. Of course, consumers have diverse levels of understanding of their own existing appliances and of their electrification needs, and also different appetites and competencies for engaging with the detail of the process.

'Expert' perceptions of consumer understanding vary, partly depending on the particular cohort of consumers they engage with, and this informs their approach to collecting information. Relying on consumers to provide detailed information about their appliances and electrical installations can overwhelm them and may mean incorrect information is collected. For a full household electrification, an in-person expert assessment of the home, scoping all existing appliances, room sizes, electrical wiring, etc., helps streamline the scoping and installation process but requires experienced people.

Some participants reflected on how little they knew about their existing appliances and electrical infrastructure when first starting energy retrofits:

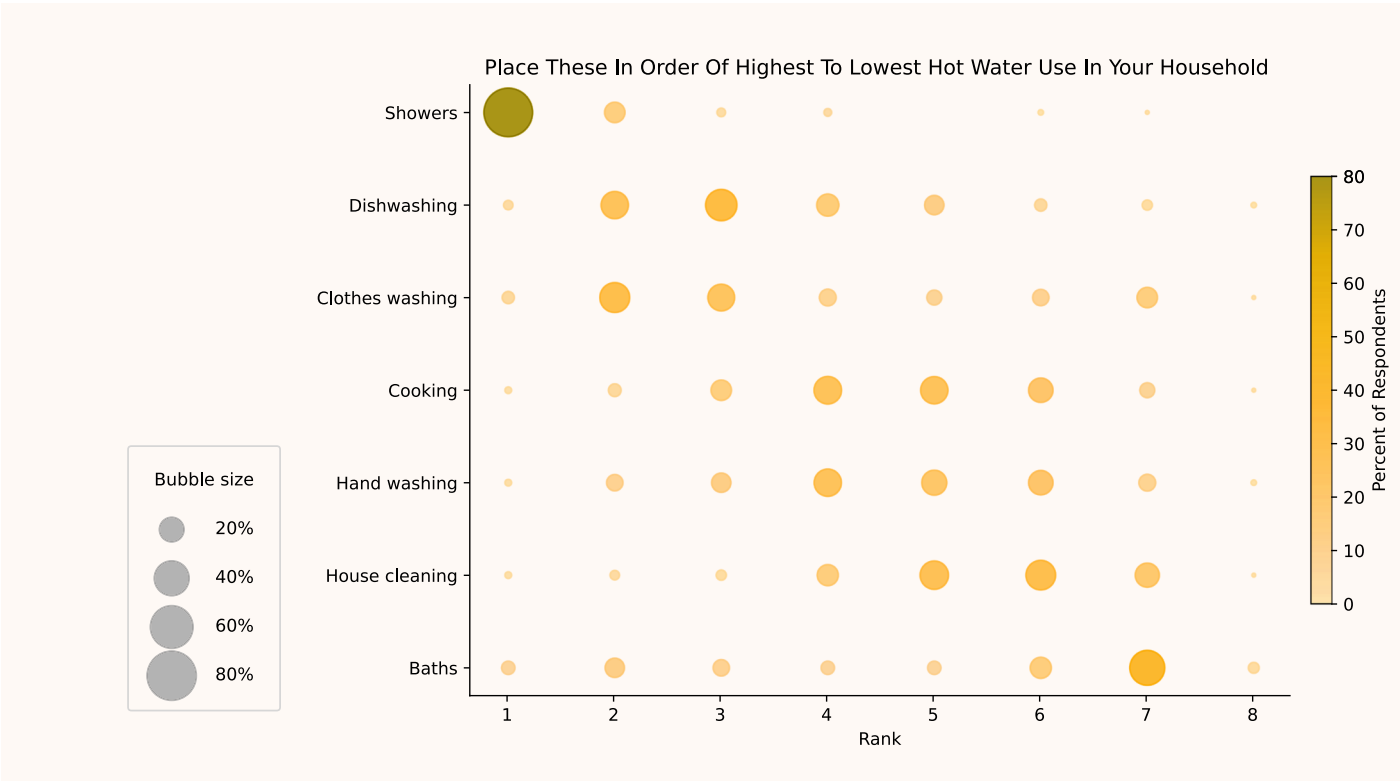
*“You kind of hear about it and think – oh, I should maybe do that, but where do I start and what is specific – it’s like people say, ‘Oh, you’re on three-phase power.’ I don’t know – am I? And how would I know? I could look in my electric box, but is that gonna tell me? The things that you don’t actually know about your own property that people ask you when you’re looking into things, like we’re looking into the EV charger that connects to our inverters, I gotta ask all these – I end up having to take a photo of our electricity box for them.” (Eleanor C1)*

3.4.1. Hot water

The optimum size of a residential hot water system depends on the amount of hot water being used in a day, which in turn depends on the household occupancy, the appliances and services utilising hot water, climate zone and social and cultural factors that drive behaviour.

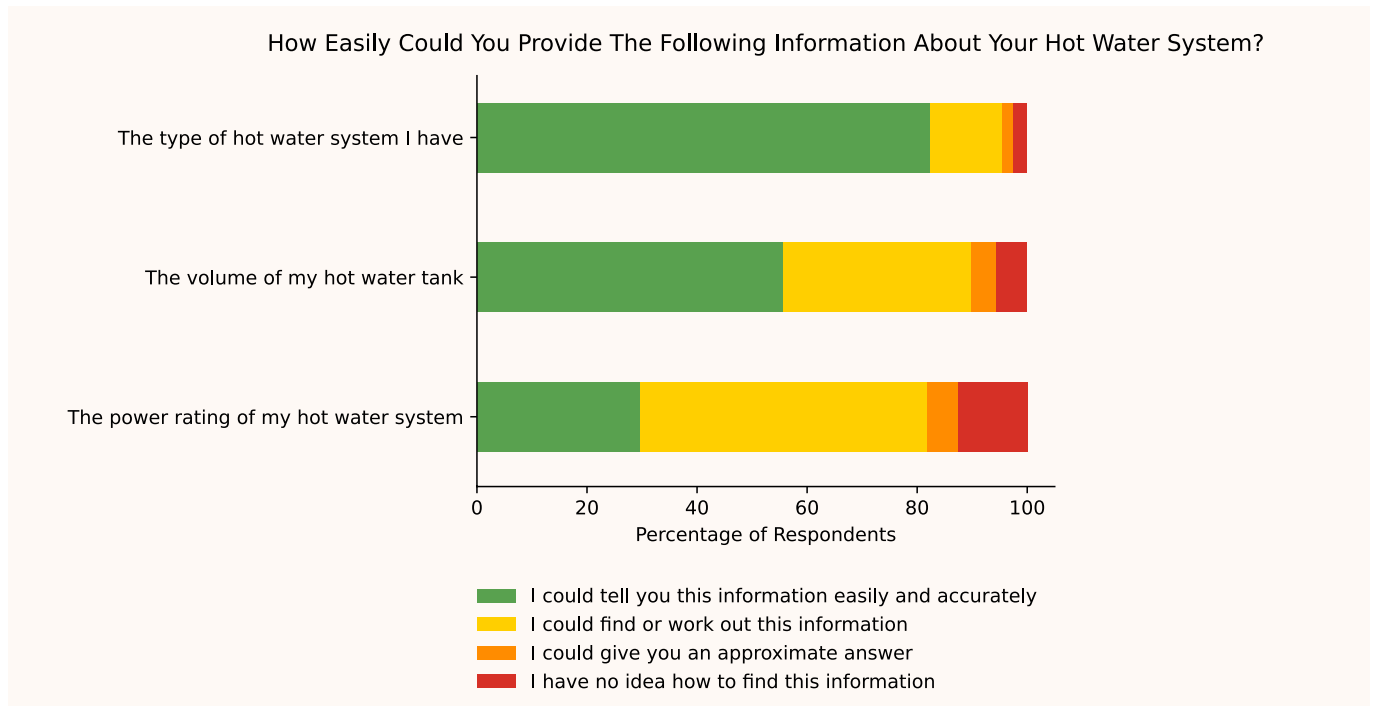
80% of survey respondents correctly identified that showers typically account for the largest proportion of their hot water use (Figure 7), and so are likely think about showers when they describe the times they use most hot water. Dishwashing and clothes-washing were ranked second. However, many washing machines and dishwashers use only cold water inputs and internal heaters, so this likely distorts perceptions of when hot water (from a hot water system) is being used.

**Figure 7:** Household perceptions of significant hot water uses (C1 n=203)



### 3.4.1.1 Hot water system type

Most respondents could identify the type of their existing hot water system from a list (Figure 8), although 2% of this 'engaged household' cohort had no idea.



**Figure 8:** Ease of providing information about hot water systems (C1 n=203)

Focus group participants were divided on whether choosing the hot water system type from a list was easier or harder than choosing from a set of images, with some confused by the terminology ('gas instantaneous', etc.) and others finding the images to be confusingly similar. In interviews, it wasn't uncommon that participants did not have a detailed understanding of their hot water system unless they had reason to investigate, such as replacing a broken system or switching to electric. For some, the hot water system is a 'hidden' appliance that they haven't given much thought to. *"I think it's in one of the cupboards. I would have to check. I haven't looked at it. I'm not tall enough to see it."* (Megan C2). Others were unsure whether their hot water was gas or electric: *"I saw there was a tank in the backyard. I thought hot water actually only came with gas, but it's got some electrical wires to it, so maybe it is electric."* (Charlotte C2). By contrast, Steven C2 knew the exact product name: *"It's gas – it's that Rinnai. Yeah, the Rinnai 26."*

### 3.4.1.2 Hot water system size

Less than a third of survey respondents could easily provide the power rating of their existing hot water system, but over 80% had some idea where to find the information (Figure 8). Over half of this 'engaged household' cohort said they knew the volume of their water tank, and 90% that they knew where to find it. However, both 'engaged' and 'less engaged' household participants in focus groups found it difficult to provide the tank size; one knew where to find it on the tank itself *"on your hands and knees"* (Mathew C2), while another thought they could find it from their bill (Steven C2).

Some interview participants described using proxies, such as tank height or number and timing of showers, for sizing either their existing system or future requirements: *"It's just a bit less. It comes up to about here [indicating height of tank compared to participant's height]"* (Michael C2) or:

*"it would be as tall as me. It's this big brown metal cylinder. It's got a couple of pipes around, but then there were a couple of electrical wires coming out of it. I've never seen that before. I know at our previous house, it was definitely a gas tank. I haven't seen one with wires before. ... [name of spouse] and I both have shower in the evening, and Olivia has one in the morning, so we split it up."* (Charlotte C2)

Other participants were happy to take advice from tradespeople about appropriate sizing for hot water systems, *"Well, I just told them how many people in the house and what we're using at the moment, and I didn't tell them water litres, but – And then they said this is a sort of standard for that size house."* (Tracy C1)

While hot water use is largely driven by the number of occupants in household, sizing a system on this basis can be problematic if there is a change of occupants so sizing by building characteristics may be more appropriate:

*"We typically size off number of bedrooms. One reason is that if you were to ever onsell the house and you catered for the people living in the house – we all know there's usually two people living in a five-bedroom house or four-bedroom house when all their kids have left. If we put in 160-litre tank in a four-bedroom house, it's just not sustainable. Someone is going to have to come back and pull that out. So we size for bedrooms [...] We typically size anywhere between 250 and 270 litres for up to a three-bedroom house. Anything above three bedrooms will size 300 to 320 litres."* (Antonella C4)

This 'expert' participant advised erring on the side of oversizing systems to avoid the possibility of running out of hot water, particularly as smaller systems may not be cheaper. *"Interestingly, the cost between different sizes of heat pumps is it's nothing. This is so ridiculous, but the smallest heat pumps – so the 160 litres – are the most expensive"* (Antonella C4). This approach was echoed by Steven C2: *"I'd say maybe a 300. I wouldn't go – I'd probably buy a bigger one than a smaller one, just to be on the safe side. That was for five people."* However, another expert interviewee noted that the tendency to oversize systems in apartment buildings, ignoring the diversity of different water draw profiles across residents, could lead to high costs and become a barrier to electrification.

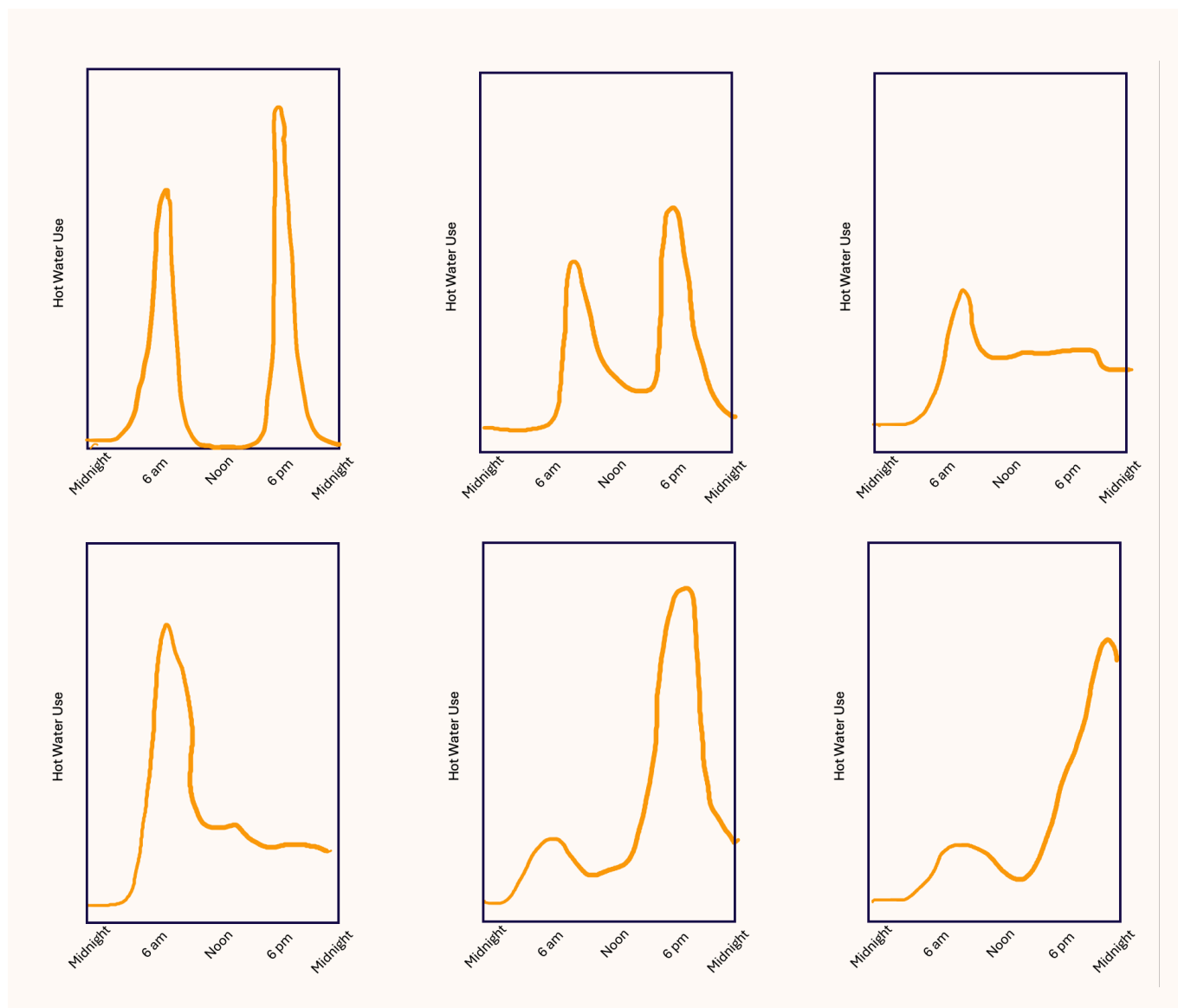
*"Everybody, in fact, uses very conservative estimates for hot water use per apartment. [...] and, you know, okay, admittedly the building occupancy could change, but on the surface, this building is using half the hot water that the rules of thumb say they should be. And so, you know, there's an argument to say, well, actually, maybe they should take a bit of a risk on having a smaller system than the rule of thumb would say, with a slightly higher risk of running out of hot water, and then they get to save \$20,000 bucks."* (Joel C4)



### 3.4.1.3 Hot water usage pattern

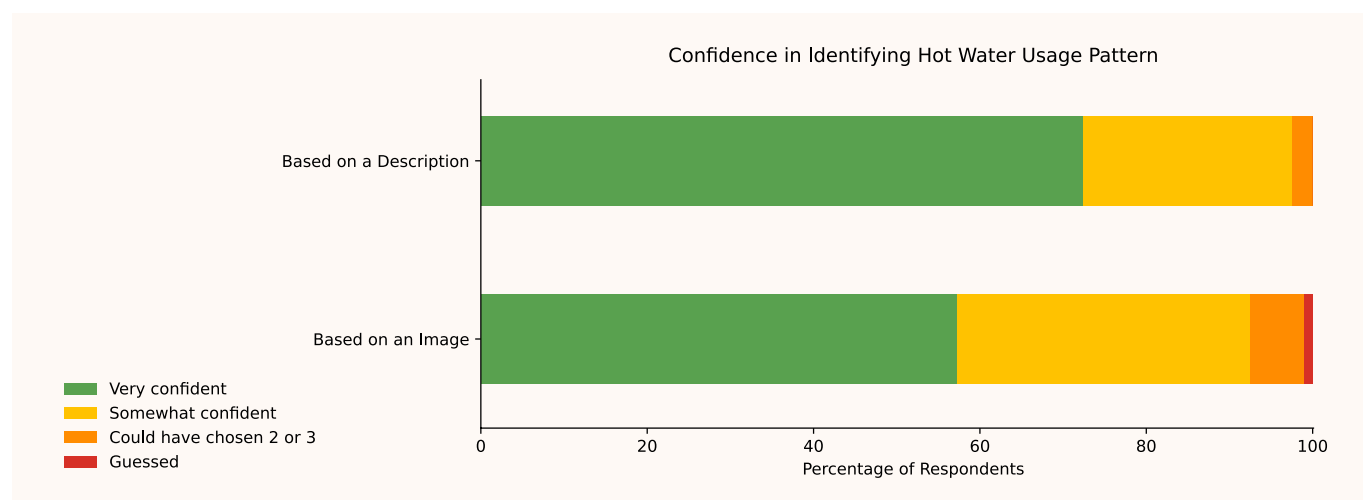
The operating cost of a gas or electric hot water system depends on the size of the system, the amount of hot water being used, and also on when it is being used.

Survey respondents were asked to identify their daily hot water usage profile from a set of six typical diurnal hot water usage profiles (Figure 9, [22]) and, separately, from a list of 6 descriptions of when they use hot water ('only use it in the morning and evening'; 'mostly in the morning and evening, but some during the day'; evenly throughout the day'; 'mostly in the morning', 'mostly in the evening'; 'mostly late at night').



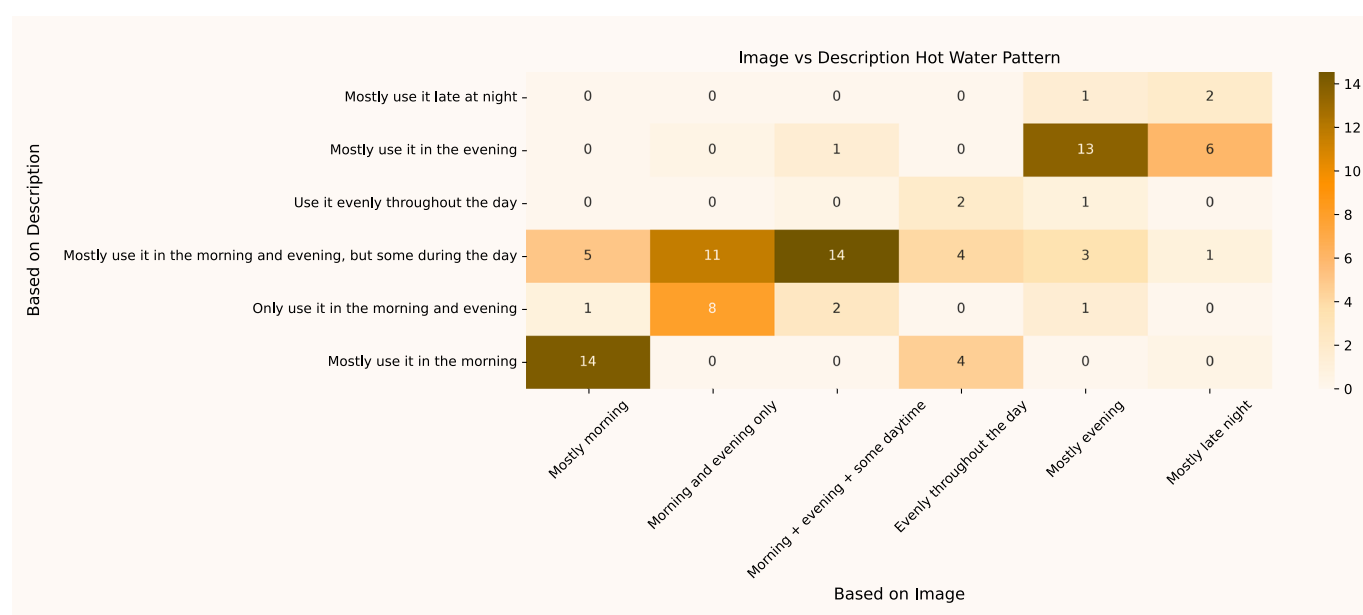
**Figure 9:** Six typical diurnal water usage profile [22]

Over 90% of respondents were very or somewhat confident they could identify their household profile, with, on average, greater difficulty choosing from the images than from the descriptions (Figure 10). However, there were significant discrepancies between their responses, with 41% selecting different profiles from the images than from the descriptions (Figure 11), suggesting that, in general, participants overestimated the accuracy of their responses.



**Figure 10:** Perceived ease of providing information about diurnal hot water usage profile (C1 n=203)

Focus group participants varied in their preferences. Tracy C1 found the graphs “easier for a visual person”, while Mathew C2 thought them “perhaps less intuitive than writing” and wondered “when and where do you see a graph of your hot water use”, and Steven C2 thought the graphs “about the same as the written description”. Margaret C1 noted discrepancies between some of the charts and their descriptions. This suggests the need for both visual and textual descriptions, and highlights the importance of rigorous user-testing of design and wording.



**Figure 11:** Household perceptions of diurnal hot water usage profiles, based on identification of chart or description; numbers indicate percentage of respondents that fall into that cell (C1 n=203)

## 3.4.2. Space heating and cooling

### 3.4.2.1 Heating and cooling types

Some participants were unsure of heating type: “Again, there’s a button on the wall that says heat. This one looks more modern because it’s got a screen on it, whereas the other one didn’t have a screen. I don’t know. I’m not sure if it’s gas or electric.” (Charlotte C2)

The terminology of “ducted systems”, “split systems” and “reverse cycle” is not universally understood, and some respondents were unclear about

what type of air-conditioning system they had. *"What are they called? They're not ducted. What are they called? I can't even think of the top of my head."* (Hannah C2)

Others described other ways of maintaining comfort not always involving consumption of energy or fuels:

*"There's gas, gas heating, that I don't know of. But generally, if there's any heating that's used at home, the people generally just wear extra clothing instead or have extra blankets. Heating, I don't know about that. Yeah, I don't know about that in general, about heating."* (Brendan C1)

### 3.4.2.2 Aircon sizing

As with other appliances, consumers have diverse capacities and interest in specifying their heating and cooling needs:

*"Some would probably know, would tell the installer, 'I want this kilowatt size air-con, I want this size tank for my heat pump,' and some would just say, 'What suits me?' Ask me the question, like how many occupants in the house, what's the size of the rooms, all those type things. Those who doesn't have that technical knowledge, they probably would just rely on the installers to tell them what is the right size for them, which is very important."* (Romaine C4)

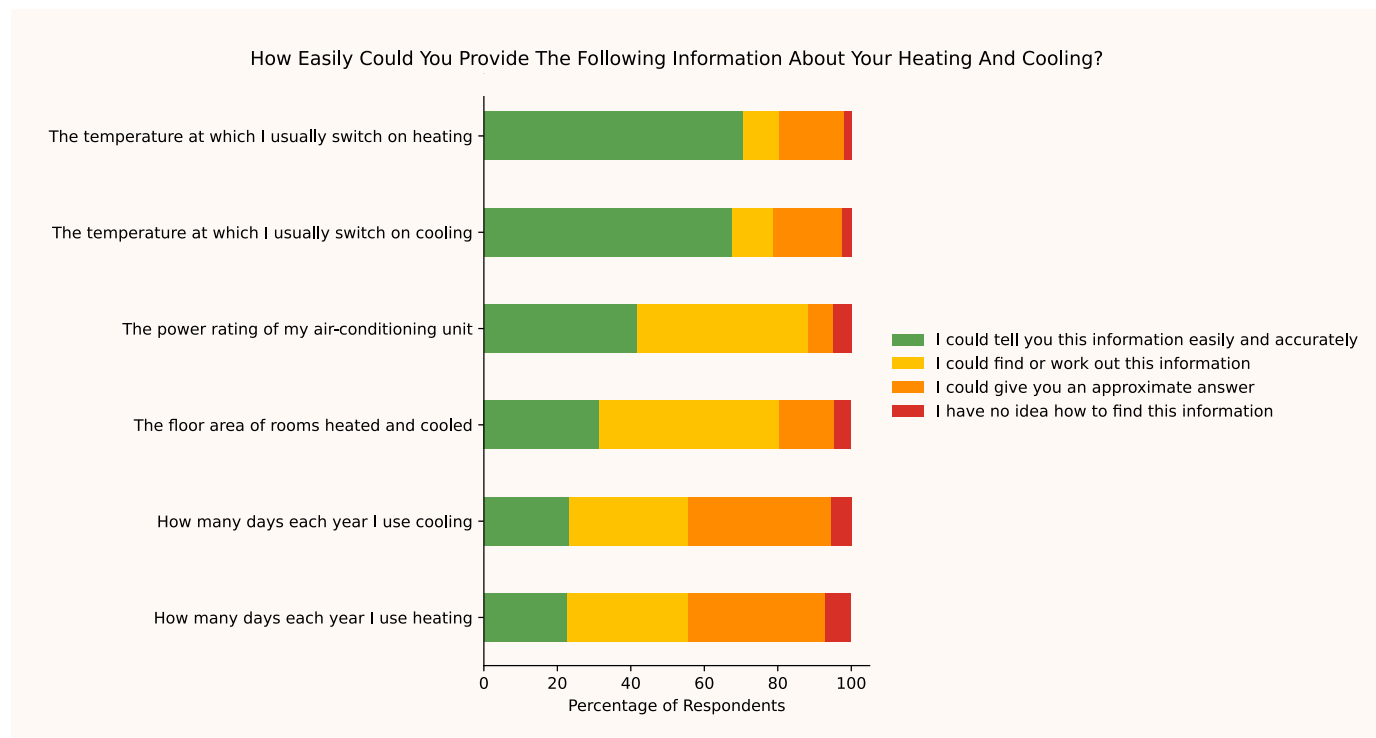
Air-conditioning systems are typically sized for the building rather than the occupants, based on the climate zone and volume of air to be heated or cooled, which, in turn, depends on the number of rooms to be conditioned, the floor area and ceiling height. However, other building characteristics are also important:

*"Volume is a big one, so we go based on the room volume. Ranges are relatively broad for different size rooms. They say it's an exact science but it's not really. A jump from a 2.5 kilowatt to a 3.5 kilowatt can be a difference of two to six metres in a room, from a floor area perspective. It also depends on things like what type of room it is, how many people in the house. If it's a kitchen, you'll typically put a bigger split system than in a bedroom just because there's more heat load in that space. Direction makes a difference as well. So, if there are lots of single-glazed windows facing west, then you'd probably put a bigger split system in there for whatever reason."* (Antonella C4)

However, this electrification advisor also emphasised the importance of householders' perceptions of heating and cooling needs:

*"They've lived in their house, they know what they need, and we're always open to listening. So if a customer came to us and said, 'I don't want a split system in this room because I don't use it,' or, 'It doesn't really get hot or cold,' we're not going to go, 'Oh, but you should install a split system anyway.' We'll always listen to their needs."* (Antonella C4)

Only 80% of 'engaged household' survey respondents thought they could provide the floor area of rooms to be heated or cooled in their house, either easily or with some working out, though another 16% thought they could give an approximate answer (Figure 12).



**Figure 12:** Ease of providing information about heating and cooling (C1 n=203)

Those with existing air-conditioning, thought it easier, on average, to provide the power rating of the system than the floor area of rooms, although it was not clear if they could provide input or output power, as the question was ambiguous. "You've got, like, different kilowatts of consumption of electricity and different kilowatts of output of heat, for example. So, there's often a mix-up in that sense if you're a lay person." (Cole C4).

Some interviewees described their systems in terms of physical dimensions or in terms of the space being heated or cooled:

*"It's like the sort of – we're in a two-bedroom apartment and it's high on the ceiling. It's almost like a standard size of what you'd expect for an air conditioner. Hang on, I'll just show you the size. Yeah, I don't know how many kilowatts it is. The width of it's probably about 1.2 metres and it's kind of like – what I'd say is it's a very standard size for what you see in an apartment."* (Kary C2)

Others could find their air-conditioning spec by looking at the units or their product sheets, sometimes with some deductive investigation:

*"I can go look. So, there's one, which I think is a 7 [kW] ... we've put a third split system into the nursery ... The nameplate for that one doesn't specifically give cooling capacity, but the model number has 35 in it, so I think it's also a three-and-a-half kilowatt system."* (Mark C1)

### 3.4.2.3. Aircon usage patterns

As well as system size, the cost of operating air-conditioning also depends on system efficiency and on household occupancy, behaviour and preferences. Nearly 80% of survey respondents could provide their temperature set points, either easily or with some working out, and only 2% had no idea how to find the information (Figure 12). However, one focus group participant (Kary C2) thought temperature was not relevant and described using air-conditioning “just to take edge off (by feel rather than by temperature)”.

Respondents found it harder to say with any accuracy how many days a year they used heating or cooling (Figure 12) which could be a significant factor in estimating operating costs.

### 3.4.3. Electric vehicle charging

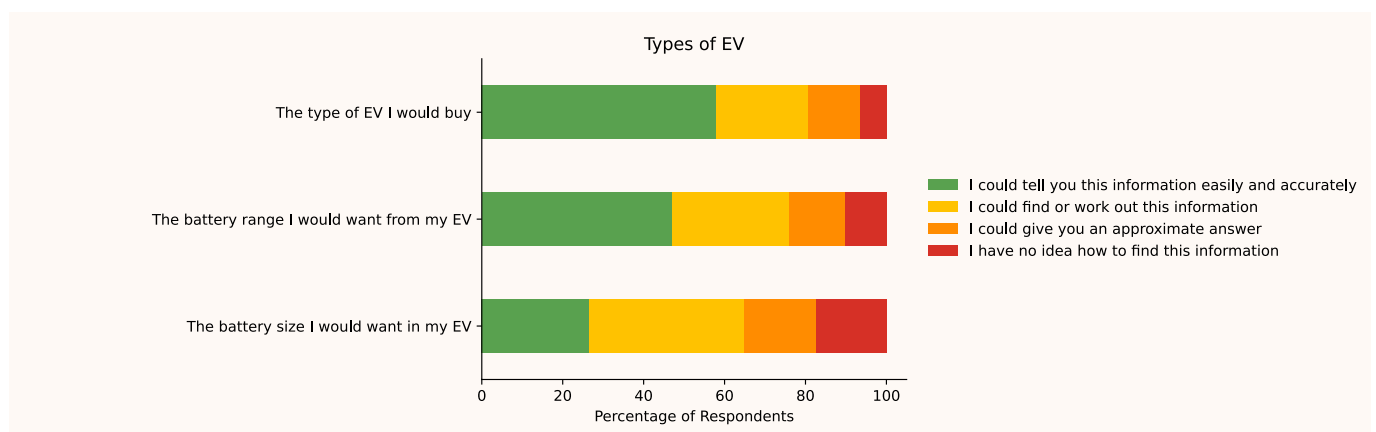
The type of EV charger needed by a household depends on the battery capacity of the EV and the anticipated driving and charging patterns. It may also be constrained by the existing wiring installation.

Only 25% of the C1 participants surveyed said they would be easily able to say what battery size they would look for if they were buying an EV (Figure 13), even though a third of this cohort had bought an EV in the past 5 years and 28% planned to buy one in the next 5 years. However, 46% of survey respondents could easily specify the driving range they would want, and 90% could give an approximate range.

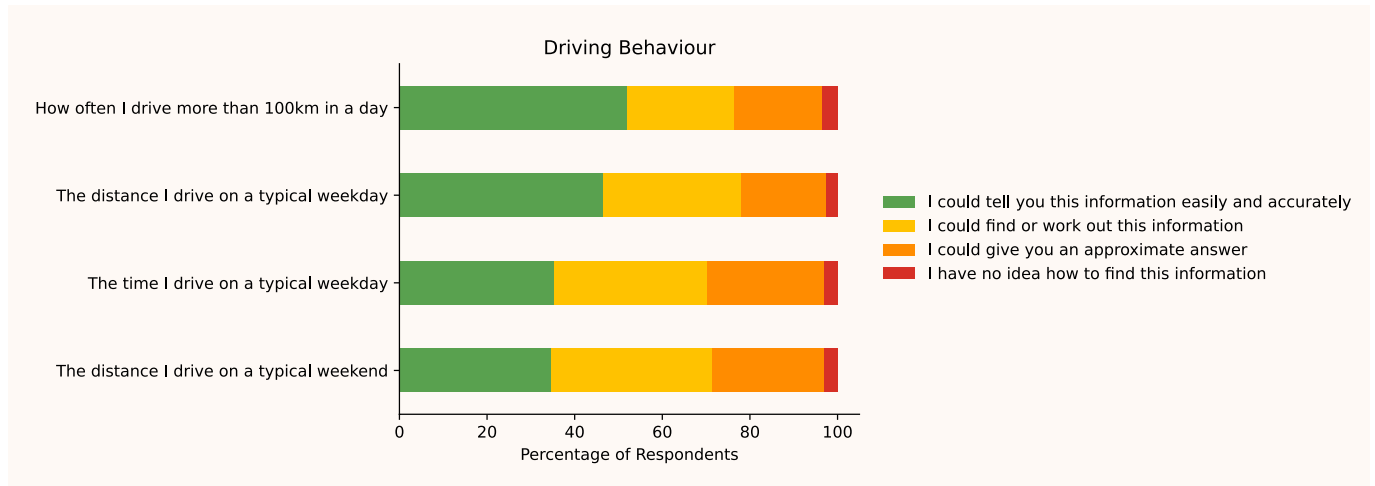
In focus groups, participants described various approaches to sizing an EV: Tracy C1 and Megan C2 “would want to not have to charge too regularly”, Steven C2 found a larger battery size appealing for a once-a-year road trip, but recognised the need to balance cost and range, while Margaret C1 noted that a larger battery would mean a larger and heavier vehicle. Identifying the type of EV from a list (hatch, sedan, small SUV, medium SUV, large SUV) was easier.

**Figure 13:** Perceived ease of providing information about EV preferences ‘if you were planning to buy an electric vehicle’ (C1 n=203)

Participants raised a range of other factors that would influence their choice of EV, including brand, safety rating, cyber security, country of manufacture, servicing needs and availability, resale value and physical dimensions.



Survey respondents found it easier to describe their driving habits with only 3% having no idea how to provide this information (Figure 14). Typical driving time was found easier to describe than driving distance though one participant (Tracy C1) noted that “Time doesn’t necessarily equate with distance, same trip takes different amounts of time.” Weekday habits were easier to describe than weekends because, as Margaret C1 observed, “every weekend is different”.



**Figure 14:** Perceived ease of providing information about driving habits (C1 n=203)

Industry specialists talked about the adequacy of low power EV chargers for many consumers, based on driving habits: “I mean, people have generally got a fair idea how far they drive. [...] Any number short of about 30,000 [kilometres], a 10-amp plug into a power point charger in an urban environment will be enough. The sort of houses we’re selling to, these are homeowners in inner city suburbs. They’re not Uber drivers. They’re people who generally don’t drive a hell of a lot. And when they’re doing long distances, they’re a long way from home. They’re using public fast charges anyway.” (Lawrence C4)

### 3.4.4. Induction cooktops

Cooktops are the last appliance to be electrified for many households. This is partly due to doubts about the effectiveness or controllability of induction cooktops (as discussed in Section 3.1.4), but the low energy consumption compared to hot water or space heating and cooling, means this aligns with emissions reduction and financial logics.

The technical information needed to specify an induction cooktop is less complex than for other appliances, primarily physical dimensions and details of the switchboard. However, compared to hot water systems or air-conditioning, households have stronger personal preferences:

*“Of all the appliances that customers wanna replace, cooktop is where they make a longer time to decide. The way we interpret this, because it’s in the kitchen. It’s very visible. They take time to decide on what type of cooktop would suit the kitchen. Maybe not much on the functionality, because the functionality is pretty much the same across the different cooktops.” (Romaine C4)*



### Tracy's story

Tracy lives in the suburbs of a major city with her husband and their two teenage children. They are currently undertaking a major renovation, in which they plan to electrify their house, replacing instant gas hot water with heat pump and the gas cooker with induction. They plan to install a battery and solar once the home renovation is complete and may purchase an EV to replace one of their vehicles, although this decision has been deferred as their eldest child is currently learning to drive, and due to uncertainty around the timing of their solar purchase. Tracy cares a lot about her family's impact on the environment and electrification is part of this commitment. However, the outcomes also need to deliver comfort and performance. She has hired a builder to deliver the renovation, but they have limited knowledge of energy performance and when Tracy asks energy-related question, they refer her to the energy performance report. She does not have a technical background in energy but through work connections is able to draw on expertise of those working in the energy sector. She remains heavily involved in the renovation process, meeting with suppliers and installers to understand product and design decisions and how they will affect her home once the renovation is complete.

Most participants could tell us easily whether their existing cooktop was gas or electric, but there was slightly less certainty for ovens. Charlotte C2 deduced her oven type based on contextual clues: *"I haven't used the oven in this house yet, but because it's connected to the stove, so I guess it would be gas as well."* There was also some uncertainty of the difference between induction and resistive electric cooktops, with one participant discussing contextual clues to identify their appliance:

*Interviewer: Do you know what type of cook stove you have?*

*Interviewee: An electric one.*

*Interviewer: Is it four burners or two burners?*

*Interviewee: Yeah, four burners.*

*Interviewer: Is it induction, or is it ceramic, or resistive?*

*Interviewee: It's glass.*

*Interviewer: Do they get really hot?*

*Interviewee: Yeah. (Megan C2)*

Small business C3 participants described different needs for specific types of heat/temperature control for commercial cooking. One preferred induction for frying, citing precise temperature control, but gas for cooking large quantities of rice:

*"You know, the stirring is very continuously and the water has to evaporate at the right time. Otherwise, it becomes mushy or mashy. So, yeah, that's why. ... or maybe because I'm used to only that" (Sana C3)*

Sana also noted the limited options available in commercial induction appliances: *"I think there is not much research going around for induction cooktop for catering different communities like Asians or Indian, Pakistani, it's mostly for Western people and their cooking."*

## 3.5 Life course, timing, and information needs

The role of one's life course – including the broader circumstances of everyday life, as well as major life events – on the electrification process was a salient theme discussed by research participants. Triggers for electrification during the life course can be separated into two broad categories based on their scale and character. Major life events are significant, often anticipated life events that reshape priorities and financial circumstances in a single, identifiable shift – such as the birth of a child, retirement, or receiving an inheritance. Everyday triggers, conversely, are smaller, more incidental occurrences including appliance breakdowns, general renovations, and rebate deadlines that prompt action in the moment, often cumulatively, without necessarily representing a broader or major life transition. These categories are not mutually exclusive, but rather a way of helping to understand how the process of electrification is influenced by the natural course of people's lives.

### 3.5.1. Major life events and triggers

Participants explained how a range of different major life events and milestones shaped their electrification journeys (see Figure 15). During interviews the most discussed major event influencing electrification was a renovation. Several C1 participants explained how their home electrification occurred as part of a wider project:

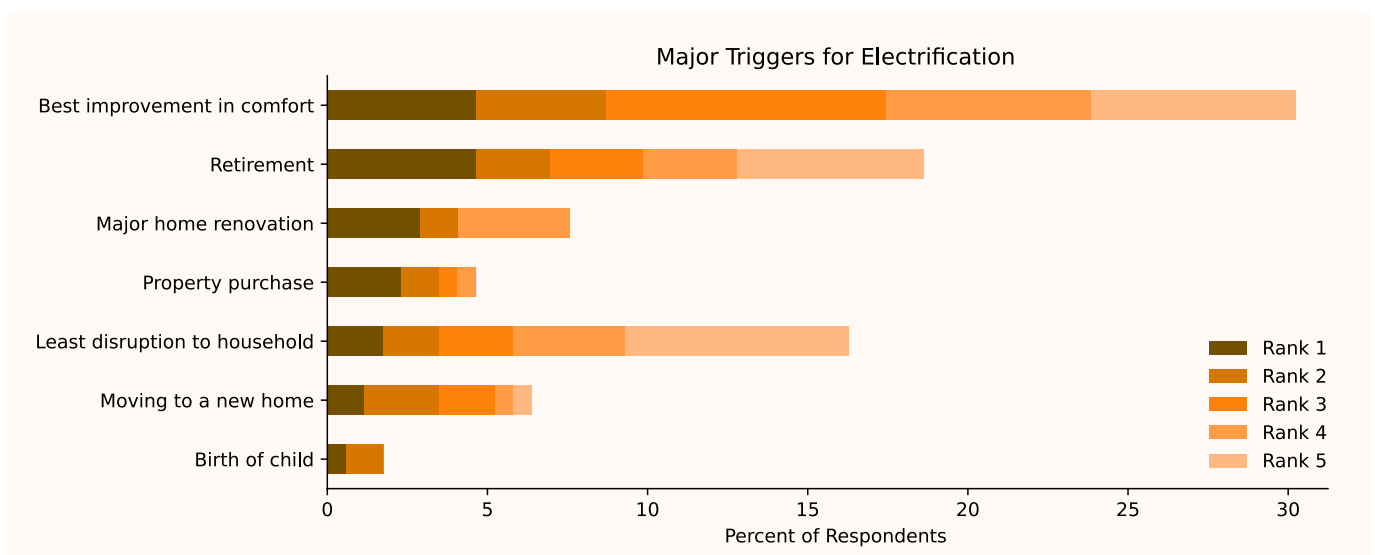
*"We do love the induction cooktop... We've only [installed] it after the flood event when we had to renovate the kitchen... so I used the opportunity by not having the insurance just patch bits and pieces, but rather decided how I want to renovate, you know. So this was a forced renovation, but we made the best out of it." (Edward C1)*

This sentiment is supported by the survey results, where major home renovations were the third most common major trigger for electrification. There also appeared to be a similar connection between renovations and electrification among some small business participants. Two interviewees running hospitality businesses explained that, because of the financial impacts of any disruptions, there was an incentive to ensure any renovations – electrification included – were done at one time, and as quickly as possible. The owner of a cafe and restaurant in Canberra recounted how the electrification of their kitchen was undertaken overnight to minimise any potential loss of business. The owner explained how the installer recognised the importance of a quick renovation:

*"[The sparkie was] just like 'Man, if I have to work all night, I'll work all night. You won't lose a day.' We just got lucky that the people working understood the parameters of the project." (Max C3).*

This perspective was shared by Sofia C3, also a cafe owner, who explained that: *"The time when you would be [electrifying] is if you are really like refitting the shop... When you're doing it, you want to do everything at once."* Although the small business context clearly differs from that of households, an important relationship between renovation and electrification appears to exist there as well.

**Figure 15:** Significance of life events in electrification decisions (C1 n=186)





### Mark's story

Mark and his wife began their home electrification process by installing solar panels, a home battery, and two split system air conditioners, with plans to install induction cooking, a heat pump hot water system, and purchase an EV in the near-future. Alongside the federal government's Cheaper Home Batteries scheme, several factors shaped the timing of these electrification decisions: "we finally own the home ourselves, so we do have the ability to have this level of control, and then secondly, we recognise that we hadn't started a family right then and because kids are expensive, you can spend money on other things before the kid is in the picture. So, it was a good time [to electrify]." Meanwhile the split system air conditioners were installed to ensure comfortable, healthy indoor temperatures for their newborn. Mark's experience reflects the finding that while macro-level influences like market forces and government rebates undoubtedly shape when and how people electrify, personal factors like major life events – such as purchasing a home or having a child – also importantly influence home electrification.

Aside from improving comfort (something that may also connect with ageing bodies and health), retirement was cited as the most important major event for home electrification. Retirement was also cited by a number of research participants as influencing the timing of home electrification, as people prepared to age-in-place with more comfortable and healthier spaces by minimising unanticipated home maintenance, cushioning future bill shocks, and more generally "trying to design a future proof home" (Nathaniel C1). Most commonly, such future proofing involved activities like installing reverse cycle air conditioners, solar panels, and home batteries. As one of our expert interviewees recognised: "they're about to retire [so] they start digging into their incomes to do this, because they want low running costs in retirement." (Joel C4). Relatedly, the birth of a child prompted some participants to electrify services like space heating and cooling and hot water so that the home was well-prepared for the changing needs of a small child.

Major life events might also occur together, as exemplified by Nathaniel C1 undertaking a major home renovation ahead of retirement, or Bridget C1 discussing how an inheritance brought forward the timing of a planned renovation, which also included upgrading the kitchen stove to an induction cooktop:

*"...my husband had an unfortunate incident where his uncle passed away... we'd always planned on doing the bathroom renovation within the first five years. We were going to save up really hard for five years, get it replaced. And then because of the inheritance that we were gifted, we did it within two years of living in the house." (Bridget C1)*

The role of these life events in prompting electrification maps closely with findings from other research noted above [e.g., 6]. The connection between major life events or milestones and electrification could also act as a constraint on change, however. For example, participants described needing to save up sufficient money to make large purchases or undertake complicated processes like a renovation. As Mark C1 explained "we have not gotten very far with plans to get on an electric cooktop, an electric stove because we're trying to decide if we want to alter the whole kitchen." Similarly, rather than a single major milestone or everyday event, participants discussed how competing and changing priorities could also result in electrification remaining important but also never quite reaching the top of the to-do list: "That's one of the things that's probably number 247 on the list of things to do. So [electrification] doesn't – it never quite makes it to number one." (Russell C3).

As with major life events and milestones, participants also described how a range of everyday events and occurrences triggered electrification. Perhaps the clearest example was the failure of an existing appliance, which sometimes prompted people to install an electric replacement:

*"Years ago, I think I had trouble with the hot water out the back... it broke and when it came time to replace it, I think I swapped it to electric." (Michael C2).*

### 3.5.2. Everyday triggers

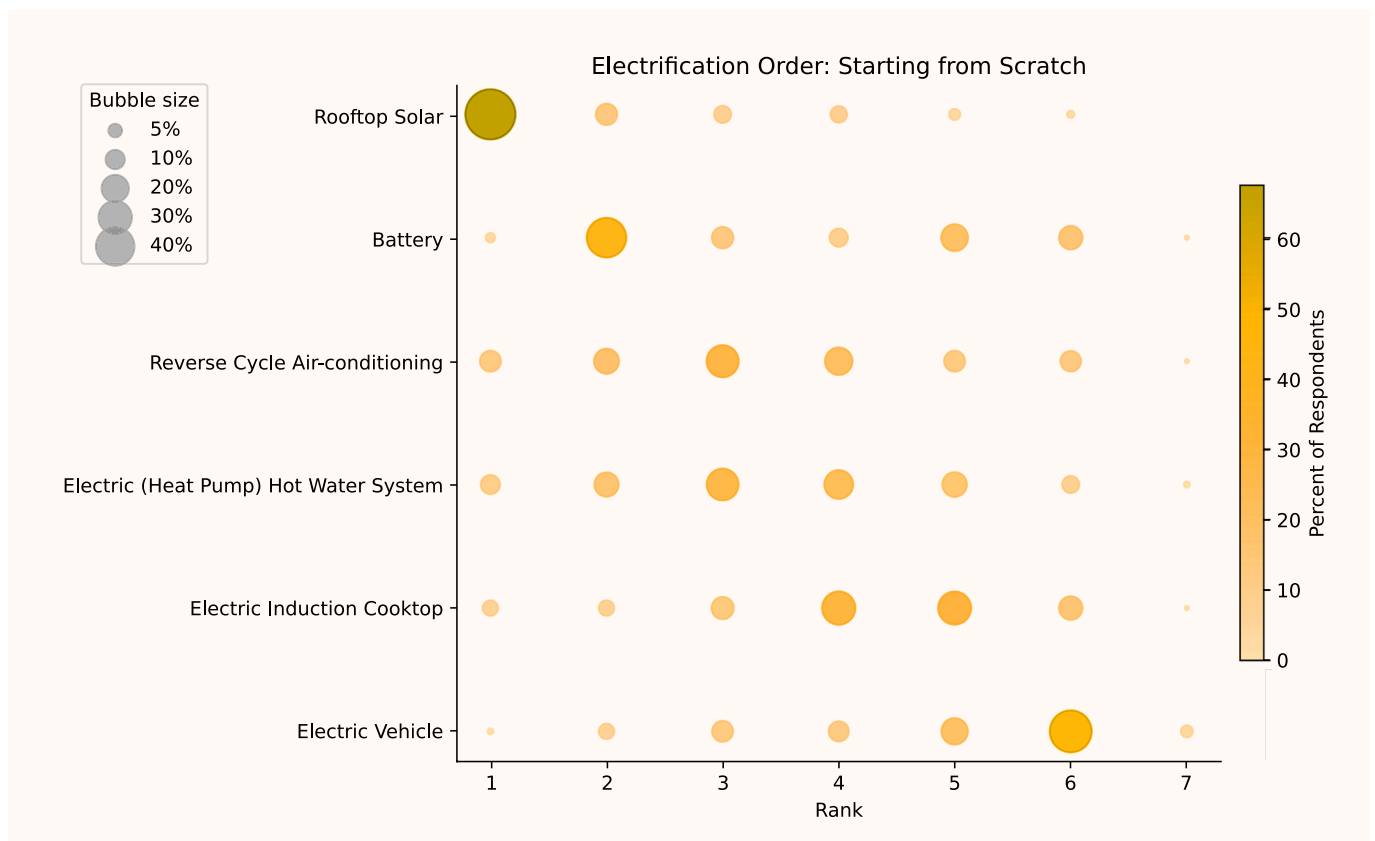
For a number of participants, installing solar PV served as the first step and as a catalyst for further electrification (a finding strongly reflected through the survey, see Figure 16). Nathaniel C1 noted that: “...my full EV Hyundai came after we installed the panels and batteries, when we saw the huge excess we were exporting to the grid.” This experience was also commented on by industry experts: “The customers who have solar tends to be more receptive to having a battery and eventually EV than the customers that doesn’t have solar yet.” (Romaine C4)

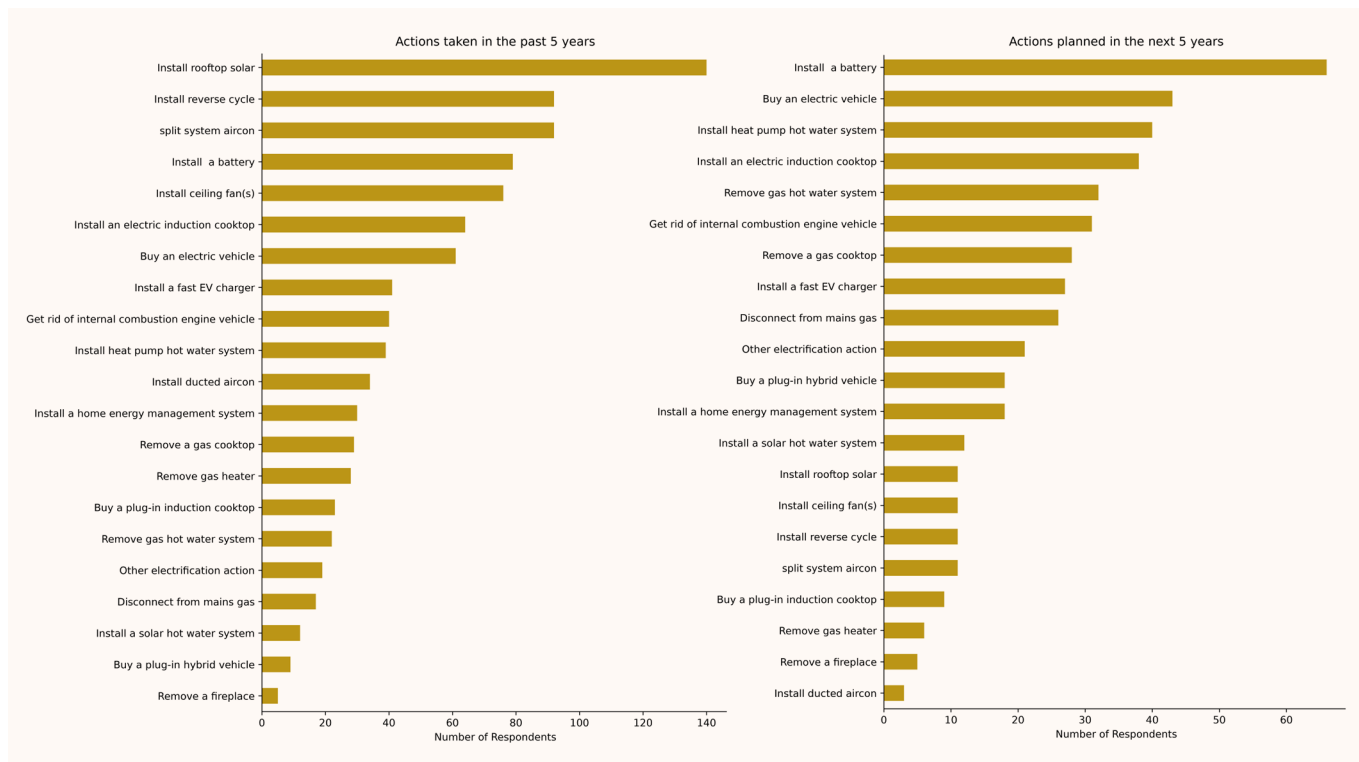
Joel C4 gave a possible explanation for why installing solar PV might serve as a catalyst for wider electrification:

*“The explosion in PV installation has meant that, and also with the falling feed-in tariffs, meant that people were on the hunt for new electric loads that they could use to meet, you know, serve up with their PV instead of exporting it to the grid.” (Joel C4).*

Relatedly, rebates and subsidies – particularly the federal government’s cheaper home batteries scheme – were shaping when and how people electrified. The survey results appear to support these findings, with most respondents seeing battery installation as the second step in an electrification journey (see Figure 16), and 43% of them planning to install one in the next 5 years, higher than any other appliance (Figure 18: Most common actions planned in the next 5 years (C1 n=186)). This contrasts with the past actions of this same cohort, who were more likely to have installed air-con in the past 5 years than a battery (as evident in Figure 17).

**Figure 16:** Perceived ideal order of electrification if starting from scratch (C1, n=203)





**Figure 17:** Most common actions taken in the past 5 years (C1 n=186)

**Figure 18:** Most common actions planned in the next 5 years (C1 n=186)

One expert interviewee working for a home electrification business suspected that home batteries would prompt people to think about further electrification steps to make best use of their energy storage. Householders also recounted how changing rebate offers influenced the timing of electrification decisions. Discussing declining federal government rebates for home batteries, Nathaniel C1 explained: “We need to, at least, take advantage of those rebates because who knows what may happen then after June first.”

For many, electrification was understood as the outcome of a gradual, piecemeal process: financial constraints, developing technologies (particularly regarding EVs), changing rebate availability, the complexity of understanding and organising electrification, and other competing daily demands cumulatively shaped – both positively and negatively – how one approached electrification.

*“Little things might make it more achievable for you. It might be a sale or a discount or a promotion, a government incentive or a rebate. It may be, you know, an extra conversation with family or friends. All these little things add up... it’s like the sum of all these things. And then when it gets to it, you know, one of these things might just be the thing that tips you over the edge.” (Gary C2).*

For both households and small businesses, electrification rarely followed a single, decisive trigger, but instead emerged through an array of often accumulating factors, including both major and minor life events. This is consistent with academic literature [e.g., 3, 4] which highlights the considerable diversity in how and why people undertake (energy)

renovations, including over varying scales and timeframes. These triggers could precipitate or accelerate electrification by connecting it with other necessary or planned work, or by prompting households to look for ways to better use their solar energy and home batteries; but equally, these triggers could constrain or delay electrification amid competing financial and time pressures. Whatever the case, the examples in this section clearly demonstrate how electrification is deeply connected with the course of people's lives. Consequently, information needs to be seen as only one factor shaping electrification decisions, and attention paid to the specific times when such information is likely to have the most impact.

## 3.6 Information, timing, and the electrification journey

The time required to electrify a home or small business can vary considerably. Some households electrify completely in a few weeks, while, at the other end of the spectrum, one C4 participant we spoke with reported that it had taken him ten years to remove all the gas appliances in his home. Nonetheless, there seems to be a trend towards completing electrification more quickly. This is evident from the example of a small business electrifying their kitchen overnight (as discussed by Max C3 on page 56), as well as in the work of one C4 participant's electrification business where the aim was to have the entire installation completed in a single day.

### 3.6.1. Reflections on the electrification journey

A key theme explored in the research concerned when information was needed during the electrification process: specifically, appropriate timing of different types and sources of information people. The insights below were generated through surveys, as well as a Miro board activity and accompanying discussion conducted during the focus groups (as described in Section 6.3). Participants were presented with two hypothetical scenarios in which they were electrifying their home or small business with and without the support of generous government rebates, alongside a timeline of a typical electrification journey (shown in Figure 19) based on that developed by de Wilde and Spaargaren [20].



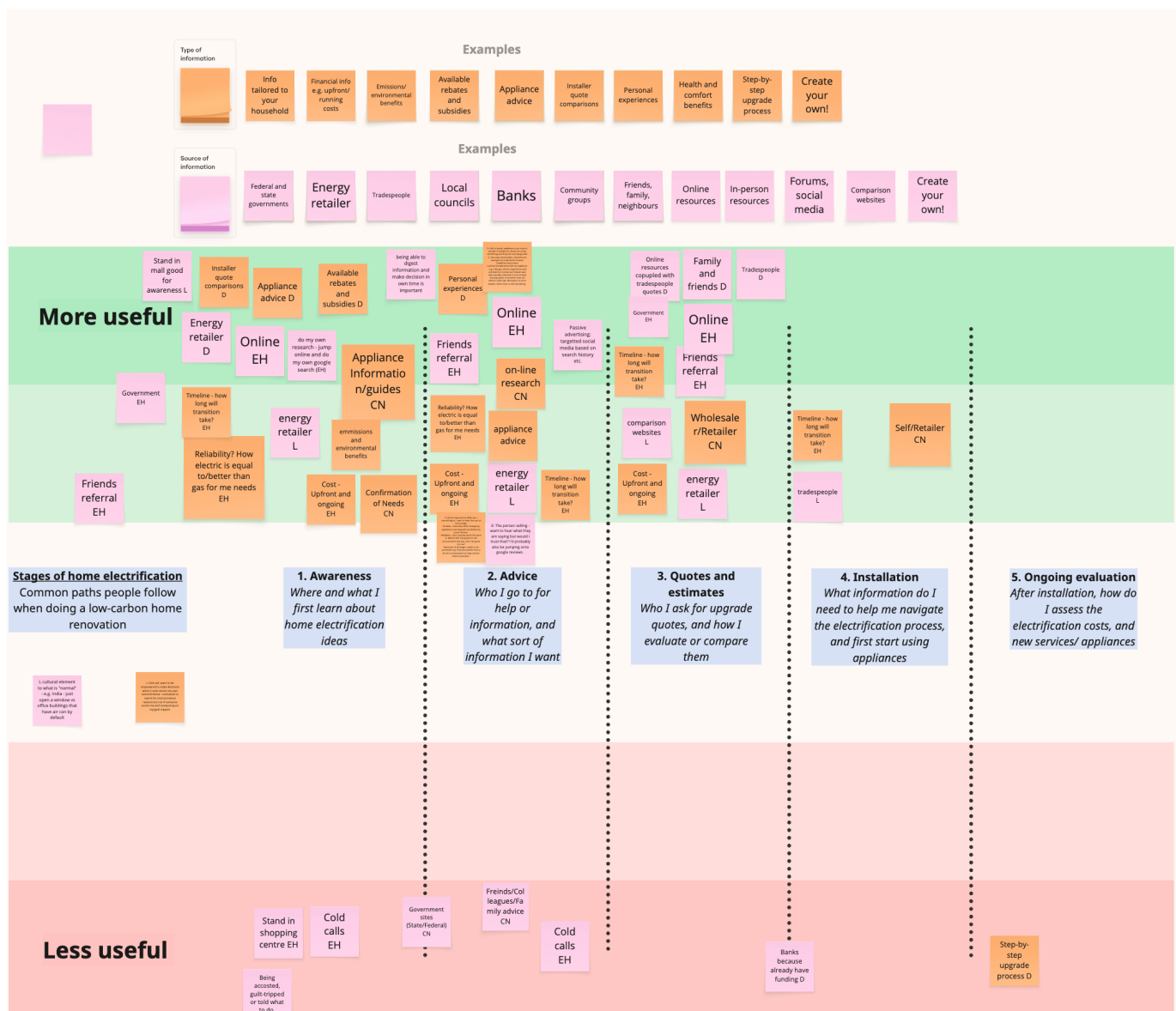


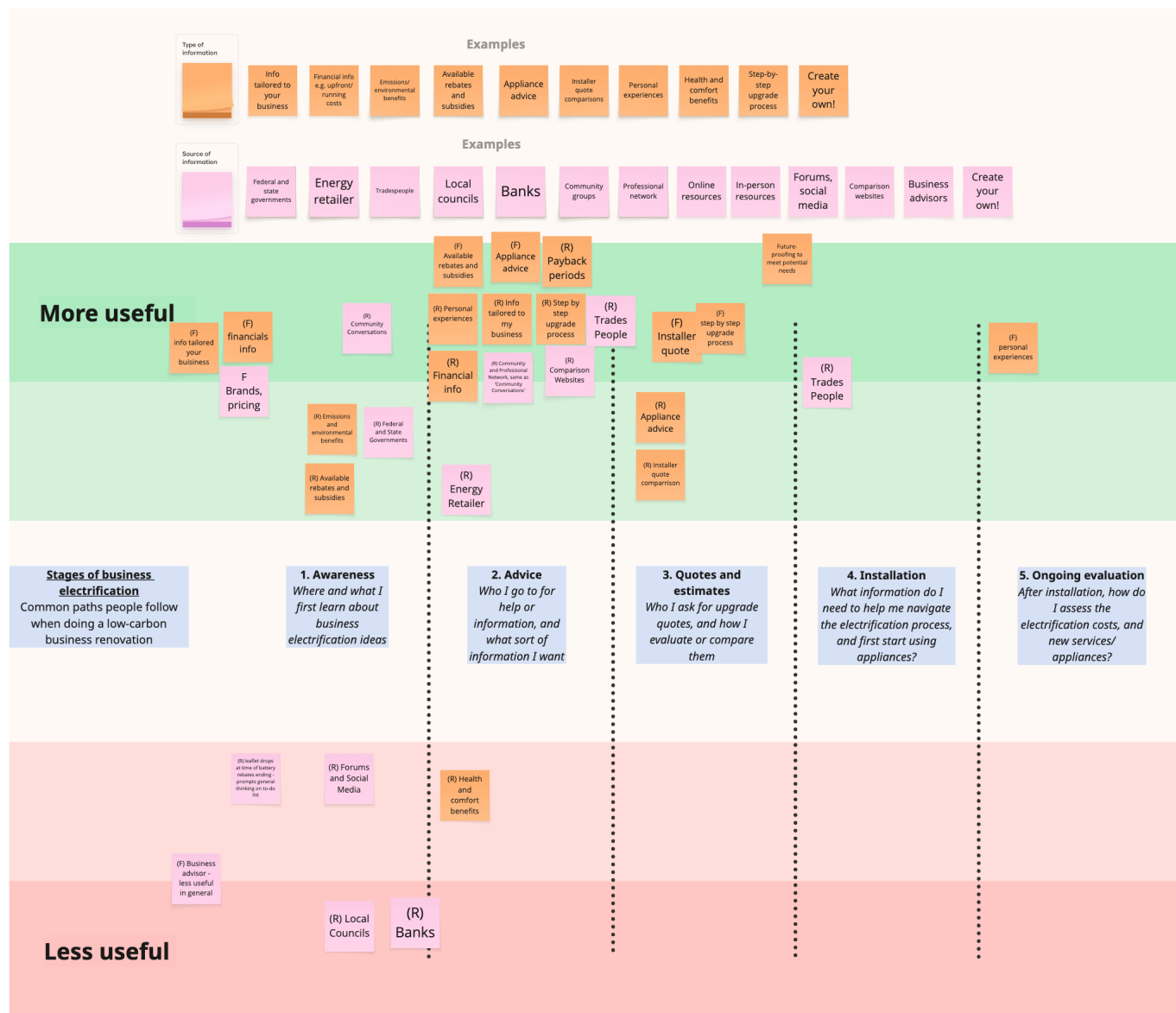
**Figure 19** Stages of a typical electrification customer journey [20]

Focus group participants also offered feedback on the electrification journey framework itself. The five stages of the journey were generally seen as realistic by those participants with experience of electrification: Nathaniel C1 was typical in saying that during his household's home renovation and electrification journey "these 5 steps make sense and we have followed these."

Nonetheless, several broader observations emerged regarding the process of electrification. First, the pace at which participants moved through the stages varied considerably, with more time generally spent in the earlier stages (1-3) than in later ones. Some of these delays were not within participants' control: for example, one participant (Mathew C2) described how it took two and a half months simply to have a distribution network service provider approve and switch on a home battery at his father's property following installation. Second, participants did not always progress through the stages in a strictly linear fashion, at times moving backward and forward between them – a pattern with implications for their information needs at different points in the journey. Finally, participants suggested that the boundaries between stages were not necessarily always sharply defined. For example, 'quotes and estimates' (stage 4) and 'installation' (stage 5) often occurred in close succession, or even concurrently, alongside on-site tradespeople; similarly, 'awareness' (stage 1) and 'advice' (stage 2) sometimes unfolded together as participants developed their understandings of electrification.

**Figure 20:** Focus group activity exploring the usefulness of information types and sources during the electrification journey among households (C1 and C2).





**Figure 21:** Focus group activity with small businesses (C3).

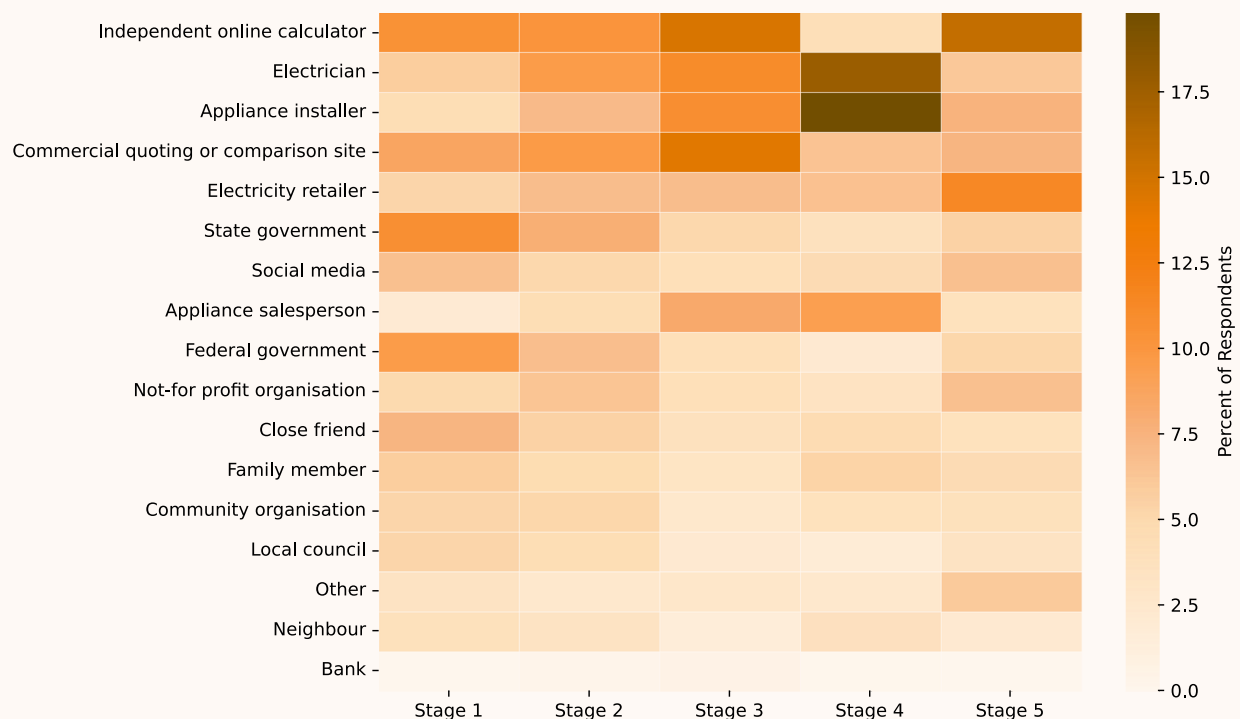
### 3.6.2. When users look to different sources of information

As shown in the survey results (Figure 22) and focus group activities (for an example, see Figure 21), information needs were heavily concentrated in the earlier phases of the electrification journey, particularly during the 'Advice' stage (2), with consumers utilising multiple information sources as they move from general understanding to more specific and decision-relevant information.

As the journey progressed from 'Quotes and estimates' (3) to 'Installation' (4), the range of distinct information sources narrowed considerably, likely reflecting participants' growing reliance on tradespeople as trusted and relevant sources.

Finally, 'Ongoing evaluation' (5) emerged as the thinnest stage in terms of information needs; nonetheless, participants noted the value of living with new technologies during this phase, as well as the role of tools such as apps, energy monitors or bills from their energy retailer in helping them better understand and evaluate the changes they had made (as illustrated clearly in Figure 23 below).

Where Respondents Find Electrification Information Across Stages of Home Electrification



**Figure 22:** Information sources at different stages of electrification journey (C1 n=203)

Evidence from the focus groups shows that household participants tended to favour personal sources and types of information, such as the experiences of, or referrals from, family and friends. Small business owners similarly valued personal experiences, including those from their professional networks; however, in contrast to the household participants, they appeared more willing to also engage professionals and experts, such as tradespeople, installers, and energy retailers. The reason for this wasn't explicitly explained during the focus group, but may reflect the fact that business owners regularly engage other businesses and experts for advice or services, and so are consequently more comfortable with this process, or have already developed networks of reliable professionals on whom they can consistently draw on, as suggested by Russell C3: "I'd be trying to find out who's a trades person. Do I know a sparkie who does this [electrification] stuff? I do. Riley, he does this stuff. Right... Next time I see him [I'd say:] 'Riley, I was talking to Tim the other day and he was saying -' and then I'd be listening to his opinion." (Russell C3).

For all cohorts, the role of tradespeople, installers and similar experts became more important as the electrification journey progresses – especially (and unsurprisingly) during the 'Quotes and estimates' and 'Installation' phases – but were not usually the starting point for either awareness or advice.

In terms of usefulness, unsolicited advice was generally rated as less useful, except insofar as it could build peoples' awareness of a technology, rebate, or issue, which participants might then choose to follow up in their own time.

*"I think I've had a couple of mailbox drops with, you know, when rebates were coming to a changing point. And also, I think I've had some unsolicited emails... [they go] straight in the bin... But it's not entirely unuseful... because what it does is it prods my thinking to go, 'Oh, yeah, yeah, yeah, I probably should do something about that, shouldn't I'?" (Russell C3).*

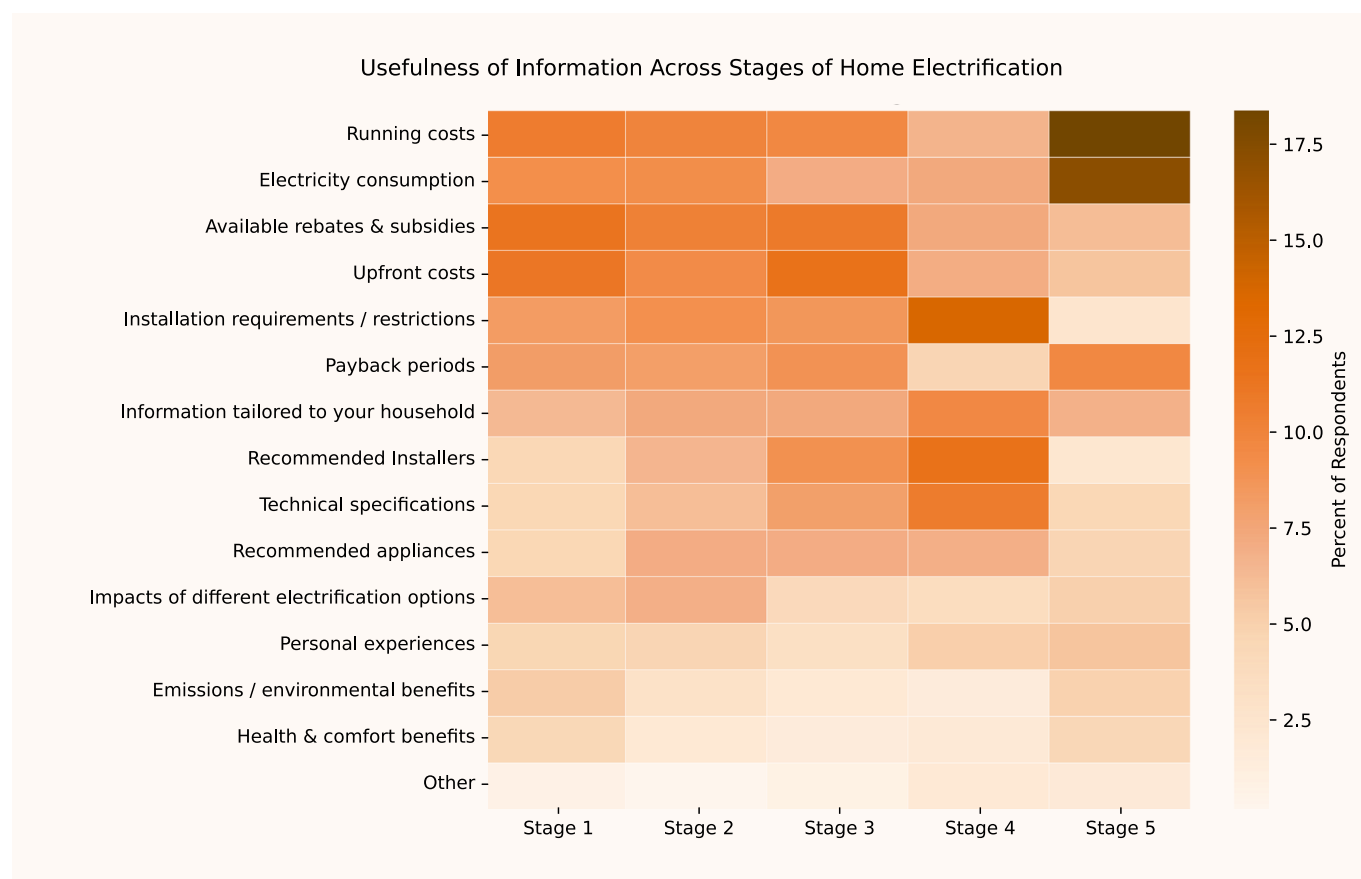
A householder explained that:

*"...as long as it's, yeah, on my terms... I probably respond well if there's something, you know, like ads on social media where it says government rebate. Like, that'll grab my attention, but no one's accosting me to say 'Hey, action now.' Like, I can choose when I want to do it." (Charlotte C2).*

More broadly, in discussing less useful information sources, participants across each focus group raised concerns regarding trust (e.g. unsolicited advice, possible scams), information overload (one participant in a focus group, Sana C3, described online resources as less useful because you "become bamboozled", citing the example of receiving four different quotes for batteries), and uncertainty regarding the perceived relevance of expertise (e.g. questioning the appropriateness of banks or local councils as sources of information on energy technologies). Notably, the same source might also be rated as both more and less useful depending on the context, as illustrated by the above point about unsolicited calls or advice, or by divergent views on the use of AI: some participants found it useful for identifying potentially fraudulent businesses, while others approached AI with caution: "So, even internet or ChatGPT, whatever you want to call them, I don't think they're always going to be 100% correct. So, you've got to do diligent homework" (Steven C2).

### 3.6.3. When different types of information are useful

Echoing research findings elsewhere [17], early in the electrification process (Stage 1, Awareness), information needs are simple, with more detailed information wanted as consumers move into the advice stage (2). These early stages of the electrification journey are characterised by active information seeking, as participants work to translate general awareness into the specific knowledge required to support decision making. The types of information during the middle period of the journey remain somewhat consistent, particularly in relation to financial information. As also reflected in the literature, all cohorts expressed strong interest in financial information. Small business participants, however, were more narrowly focused on financial framings of electrification, prioritising a quick assessment of the viability of any prospective changes. Household participants, by contrast, tended to combine financial information with a broader range of information types and sources, particularly during the awareness stage. In this respect, households appeared to engage in a slower, more exploratory, and lower-commitment electrification process than the small business participants. Several factors may account for this difference, including divergent financial contexts (e.g. access to capital, risk tolerance, and



**Figure 23:** Types of information at different stages of electrification journey (C1 n=203)

the actual purpose of electrification), differing approaches to managing competing priorities (e.g. a home oriented around the differing needs of individuals, versus a business oriented around profitability), and the distinct aims or values shaping each context (e.g. values-oriented versus profit-driven approaches). For example, in one focus group the point was made that, in a household, electricity is a large cost and so anything to reduce that would be helpful; however, in a business where there are many outgoings, but also scope to increase revenue, activities that improved productivity would be prioritised:

*"... [it's] a big cost for replacing my gas stove to my electricity, electric stove [so] I would definitely leave it as it is. But if it's increasing my work capacity, like I'm getting kneading machine, or I'm needing this kind of machinery which helps my business, might reduce my time, I would buy that, I'm more inclined towards that." (Sana C3).*

Financial information was consistently rated as the more useful type of information across all cohorts and focus groups, as well as in the survey (Figure 23). However, during the focus group discussion subtle variations emerged in when and how such information was considered useful by different groups. Households tended to seek financial information on an ongoing basis, whereas small business participants' financial information needs were more closely clustered around the 'Advice' (1) stage. This difference may be because, as one small business owner reflected when comparing decision making for his business and his home:

*"I suspect the difference would be that things financially tend to be scrutinised more tightly at home... it's tougher to get to the decision*

*at home to electrify, because, you know, because of the limited funds. I'd probably be quicker to get to the decision if I ran a business out of my own office. I'd probably be quicker to make the decision, go, 'Yeah, yeah, this is a good thing, let's do it.'*" (Russell C3).

### 3.6.4 The impact of subsidies

Turning to the differences observed between the two hypothetical electrification scenarios explored in focus groups (higher and lower rebates), several notable shifts emerged in participants' information needs and decision-making rationale.

As expected, when the generous government rebates available in scenario one were reduced in scenario two, participants expressed heightened interest in financial information, which was rated as more useful and more important earlier in the electrification journey. Alongside this increased financial scrutiny, the rationale for electrifying was also questioned in a way that was less prevalent under the higher-rebate scenario. As one participant explained during the focus group discussion:

*"I would think about electrification when the existing appliance is at the end of its life. And then if I am replacing that appliance and going from gas to electric, that's probably when I'd look at whatever government rebates are available at that time. But I don't want to throw out a gas appliance that works well now."* (Kary C2).

Another participant summarised this sentiment, saying: *"...if something's not broken, why fix it?"* (Charlotte C2).

Some participants further suggested that with reduced rebates, the electrification process would likely take longer, as more time would be needed to find and weigh up information. This was reflected in one sticky note, which stated: *"Available rebates and subsidies more important than before"* (Michael C2), and in another writing *"More time spent in the awareness stage because there's lots of confusing information"* (Kary C2). Additional doubts, such as concerns about the environmental impact of replacing functioning gas appliances, were also raised in scenario two, underscoring the extent to which financial considerations shape how other dimensions of electrification are evaluated, with resulting effects on peoples' information needs. A key finding from this scenario comparison is that as rebates or other similar forms of financial support diminish, the conversation for both households and small businesses shifts from questions about how to claim incentives and undertake electrification, to more fundamental questions about whether electrifying is justified at all.



# Insights

In this section we discuss how the research findings address the three sets of research questions outlined in Section 1. These examine how and why consumers electrify (Section 4.1), consumer understandings (4.2), the information (types, sources, formats) that consumers require when making electrification decisions, as well as the questions that they have when thinking about electrification (4.3) and, finally (4.4), what information industry professionals need from consumers to support their decision-making capacities and what consumers are able to articulate and comfortable to share.

## 4.1 Why and how consumers electrify

- **Consumers typically decide to electrify for a combination of reasons**

Our research shows that electrification is **rarely triggered by a single event**, but rather is **the outcome of an accumulation of factors**. These include macro forces and trends like energy prices, government rebates, geopolitical factors, as well as personal values, individual circumstances and life events.

- **Household electrification journeys are diverse**

While some households are able to fully electrify in a day, we encountered others who had taken 10 years.

**Major life events**, such as preparing for retirement or a major home renovation, can create specific windows of opportunity for holistic approaches to electrification in a relatively short time period. However, for many consumers, the process is more **iterative**, with electrification of each appliance considered separately and driven by different triggers – perhaps installing air-conditioning in response

to high temperature weather events; replacing a gas water heater at end of life with a hot water heat pump; or responding to government subsidies or market opportunities.

- **Small businesses are focused on minimising operational disruptions**

Although disruptions to daily routines can be a challenge for household electrification, for small businesses, any prolonged disruption can have severe financial impacts. This suggests the need for information and expertise that can speed up both decision-making and the actual installation of electrified appliances and services in business premises.

- **Home batteries are joining solar as a common catalyst for electrification**

Our research clearly supports the idea that **solar PV can act as a powerful catalyst** for electrification. Amongst house owners who are able to install solar, it is commonly seen as the first step in the electrification process, with other appliances installed subsequently in order to make better use of the solar generation.

With strong (though shifting) federal government rebates for home batteries, energy storage is beginning to play a similar role, with **batteries now commonly seen as the second step in electrification**, and providing additional motivation for households to increase electrical loads (particularly during non-solar periods) such as induction cooktops and EV charging.

- **Induction cooktops and EVs are commonly considered the final step**

Electrification technologies need to match, if not exceed, the standards of their fossil-fuelled equivalents. Replacing gas hot water systems with heat pumps, and gas heating with reverse cycle air-conditioning are the more straightforward upgrades, with technical requirements relatively standardised and closely related to characteristics of existing appliances, and so these are prioritised by many consumers. Requirements for transport and cooking are more closely connected to personal circumstances, needs and preferences, and so electric vehicles and induction cooktops are often the last household electrification upgrades.

- **Incentives can shift both the pace and sequence of electrification**

Government subsidies and other financial support appear to shift both the pace and sequence of electrification for both households and small businesses. For example, the Cheaper Home Batteries programme may be (temporarily) slowing electrification as consumers prioritise batteries over other appliances and electricians – increasingly busy installing batteries which can be simpler, quicker and more lucrative than other upgrades – are less available for other home electrification projects. This reinforces that, while undoubtedly important, information provision is only one part of a broader context in which consumers act.



## 4.2 Consumer understandings of electrification

- **The concept of electrification is relatively new**

There is wide variation in awareness and accurate understandings of electrification (Section 3.1). Many consumers – including those who have installed rooftop solar or started to electrify, and even some tradespeople – have not previously encountered the term ‘electrification’, though most can approximately guess its meaning. The term is most commonly encountered through public and media discussion of policy debates, financial rebates, and retrofit schemes, or while researching related topics such as home upgrades.

- **Misunderstandings are common and need to be addressed**

Misunderstandings of different aspects of electrification are common amongst consumers (See Section 3.1.5). These include thinking heat pumps are unsuitable for colder climates, that EVs always need fast chargers and that electrification requires three phase power or upgrades to the electricity supply. The efficiency of electrical appliances (particularly compared to gas appliances) is also poorly understood, leading many people to underestimate the potential bill savings of electrification.

The potential detrimental information role of tradespeople in this context – whether based on resistance to learning new skills or outdated experience of older technologies – adds nuance to the literature that points to installers as prime sources of information. The deliberate dissemination of misinformation by vested interests also plays a role

## 4.3 Consumer Information needs

- **Electrification is complex and the information can be overwhelming**

Beyond a broad awareness of electrification and home energy needs, people's understandings of their electrification options, needs, and constraints are rather complicated. As discussed through sections 3.2, 3.3, 3.5, and 3.6, the **sheer quantity of information available to consumers** is one significant constraint on electrification, as are their diverse circumstances changing needs, and varied financial and technical capacities. Consumers do not simply need more information; they need information that is trusted, timely and relevant to their circumstances. There are genuine challenges around identifying what information any particular consumer needs, and when, to guide electrification.

- **Consumers need guidance about the electrification process**

There is an evident desire for **simple and clear guidance** from **trusted parties** about how the electrification process works, what steps consumers need to take and in what order, and which appliances they should prioritise.

- **Information needs are highly diverse**

The **type of information, timing of delivery and level of detail** wanted clearly differs quite substantially between people. Some wish to engage in the detail of the electrification process themselves to minimise their costs or to remain in control of decisions, while others are more interested in handing often complex decision-making over to experts.

Notwithstanding the heterogeneity of households, **business electrification needs are even more diverse** and highly specific to the sector and to the particular business. The information needed in order to understand their electrification options can therefore be more complex.

- **Information needs evolve as consumers move through the electrification journey**

The consumer electrification journey framework (Awareness – Advice – Quotes & Estimates – Installation – Ongoing Evaluation) resonates with consumers (Figure 2). However, there may be different entry points or triggers for this journey, with blurring of the stages and iteration rather than a single, linear process.

The type of information and level of detail needed by consumers evolve as they move through this electrification journey, beginning with more general information and becoming specific to their circumstances.

At the start of the journey, consumers need information about electrification options and the associated value propositions, to build awareness and help them decide which options to explore further. Financial information (capital cost, available subsidies and potential long-term savings) are important feeders to this, alongside other considerations such as emissions savings.

Information needs are highest at the Advice stage, when more detail is typically needed to assess options, including tailored financial information, appliance functionality, details of available rebates and subsidies (including eligibility requirements), qualitative performance of specific products and options, and personal experiences of the process. This information can forearm consumers before they engage with sales reps, tradespeople and installers (who may not have the time to provide explanatory information about electrification) and to guard against inappropriate recommendations, hard selling or misinformation. More 'independent' information sources can help consumers navigate the quote, selection and installation stages, when tradespeople and installers have significant influence over the process.

- **Consumers place high trust in information from friends, family and personal contacts**

The sources, types and formats of information required by customers are heavily interrelated with feelings of trust and usefulness (see sections 3.2 and 3.3). Research participants repeatedly reflected on the processes they used to determine whether information is trustworthy, revealing key insights into what is required to provide appropriately tailored information. Primarily, **trustworthiness is ascertained through assessment of the source** of information. Personal contacts, such as neighbours, friends, family and social groups, are often the first port of call for information about electrification options, and are also used to sense check or validate other information accessed from websites, advertising or tradespeople, or simply to avoid having to wade through technical details.

A key question here is whether or not an individual has the requisite knowledge within their existing personal network, both to make electrification accessible (to move it to the top of the priority list) and to guide the process. Some participants were able to extend their access to such sources, by drawing on professional contacts with expertise in electrification; this is similar to the relationship-building process used by consumers to learn about decentralised energy technologies observed elsewhere [23].

- **Trust may extend to public personas**

The tendency of consumers to favour personal contacts also informs how some of them process publicly available information. For example, participants referred to public electrification advocates and authors by their first name – Saul (Griffiths from Electrify Everything]) or Finn (Peacock from SolarQuotes website) – while discussing their confidence in information from these sources. This suggests the value of parasocial relationships in supporting consumers to engage with electrification information. When engaging with social media and review sites, participants noted that they would assess the trustworthiness of such sources in terms of how much these sources appeared to be genuine reflections of the authors' experience.

- **The value of information depends on context**

The information needed by consumers is dependent on their specific social and material context, as well as on their initial level of understanding and their appetite and capability to engage with detailed technical or financial information. Consumers value information that can be readily contextualised to their individual circumstances. This shapes the type and format of information needs, both for consumers to learn about what they should be looking for and how to navigate the process, and in translating technical performance of specific technologies into everyday experiences.

- **Interactive tools are valued and trusted if seen as independent**

Many consumers see value in interactive planning tools to support electrification decision making. These are seen as trustworthy, if perceived as independent of industry and others who might stand to gain from electrification (reinforcing findings from elsewhere about customers' scepticism of retailers [18]). They are seen as useful for understanding the practical financial and environmental impacts of different appliance choices and how to prioritise different options, particularly if pursuing electrification in a piecemeal way. Such tools also have the potential to help consumers to take a more holistic and cost effective approach to electrification, for example, by combining multiple upgrades and reducing labour costs.

- **Interactive tools that enable engagement at different levels of detail can help users build knowledge in a scaffolded way**

In providing tailored information and supporting consumers as they navigate the electrification process, there is a tension between completeness, detail and accuracy on the one hand and usability and ease of comprehension on the other. As some research participants suggested, interactive tools should allow users to engage at different levels to access information with varying degrees of detail, according to their preferences. This approach may provide opportunities to build up consumers' knowledge and understanding in a scaffolded way, through iterative use of the tool or by accessing optional or supplementary information, accessible on demand.

- **Consumers need reassurance about qualitative performance and reliability of electric appliances**

A key question from consumers concerns the qualitative performance of new electric appliances, and whether these can deliver at least equivalent outcomes to the fossil fuel-based technologies they are familiar with. This is particularly relevant for stovetop electrification, as many participants noted that gas reliably provides the desired temperature and control, important for both taste of cooked food and the cooking experience, while, for some, use of gas is also connected to their cultural identity. This is not a surprising finding, given the poor electric cooking options that many people have experienced, particularly in rented accommodation, and aligns with findings elsewhere [e.g., 24, 25, 26, 27]. Lived experience and exposure to new electric technologies, including through personal networks, offer an important pathway for consumers to develop confidence in these new technologies.



## 4.4 Information from Consumers

- **The type and detail of information needed from consumers evolve through the electrification journey and depends on their specific aims**

As with the information needed *by* consumers, the information needed *from* consumers depends on their specific aims and increases in detail as they progress through their electrification journey. Asking consumers to provide too much information early in the process may be off-putting or overwhelming and can result in collection of inaccurate or incorrect data.

At the early 'Awareness' stage, consumers are looking for a high-level understanding of the electrification options that might be available to them. This can be provided on the basis of basic information about their existing appliances (e.g. gas vs electric).

As they move into the 'Advice' stage, providing some high-level information about their homes (such as type of dwelling, number of rooms & bedrooms, approximate floor area, etc.) enables approximate sizing of different appliances and, therefore, an estimate of the purchase costs. However, to fully understand installation costs, more detail may be required – including about the existing switchboard and wiring infrastructure. To estimate the likely operating costs and potential bill savings –and thereby make an informed comparison of the costs and benefits of different options – information about how appliances are likely to be used is needed. This might include household occupancy, hot water usage patterns, comfort preferences (such as temperature set points), typical driving habits, etc. While some consumers only need or want equivalence to their existing service provision, others are strongly interested in specific functional or aesthetic criteria, which will be overlaid on the quantitative data.

- **The information needed from consumers varies between appliances**

In broad terms, air-conditioning and hot water systems can be specified for the building (e.g., number and size of rooms) but their operating costs and benefits depend on the occupants. However, specifying EV charging infrastructure is somewhat dependent on driving patterns; and cooktops are perhaps most strongly tied to personal preferences.

- **Consumers are better able to provide information about how they use energy services than technical detail about the appliances themselves.**

Findings from Section 3.4 provide insight into the capacity for consumers to describe their existing energy technologies and needs. While there's a generally good, but mixed ability to describe the existing appliances in one's home or small business, participants speak with greater confidence and clarity about how they actually *use* these technologies. This reinforces an important point made in the social science energy literature at large that people are experts in their own lives. Consequently, exploring what people know about their home energy use through their own understandings – such as regarding hot water usage, heating and cooling needs, or driving habits – may prove more fruitful for those seeking to support electrification than asking about technical data alone.

- **Information collection can introduce errors**

Many research participants found it challenging to provide technical specification of either their existing or future appliances. However, interestingly, the focus groups and surveys revealed variety in participants' preferences for and levels of confidence in answering different types of questions or providing information in different formats, e.g. responding to visual prompts or text descriptions, or using different types of metrics. This reinforces that there is no "one size fits all" approach to collecting consumer information.

In some cases, participants expressed high confidence in their responses to differently framed questions, even where they contradicted each other. This highlights the need for refining the framing, context and methods of information collection and testing it thoroughly with diverse cohorts of consumers. Additionally, industry stakeholders should be cognisant of (and quantify) the **potential impacts of collecting erroneous data**. Errors may be reduced by, for example, collecting the data in multiple ways and triangulating responses, or – where information accuracy is critical to outcomes – collecting it indirectly from skilled trades people or directly through home visits, rather than from consumers themselves.



# Recommendations

Drawing on the findings in Section 3 and the insights described in Section 4 above, the following recommendations aim to improve support for consumer electrification decision making. The first set of recommendations (Section 5.1) are aimed at government and other agencies disseminating information to raise awareness of electrification opportunities for households and small businesses to start them on their electrification journey. The second set (Section 5.2) concern provision of detailed, tailored information to consumers during the critical 'Advice' stage of the journey, along with collection of information *from* consumers to shape accurate guidance. The final set of recommendations (Section 5.3) concern broader policy support for electrification.

## 5.1 Recommendations to support electrification awareness

### 5.1.1. Diversify messaging and media

- Recognise that consumer awareness of and openness to electrification is developed through information from multiple sources presented in diverse social and material contexts. Awareness campaigns should adopt a multi-pronged approach across different media to enable varied opportunities for electrification concepts to embed in the everyday life of consumers, including low pressure, low commitment information touchpoints as well as those prompting action.

- Messaging should not rely on environmental messaging alone, nor ignore it and focus solely on financial outcomes. People electrify for different reasons and often it is a combination of factors that drives decision making. It is important to highlight *all* the advantages of electrification, including improved comfort, controllability, etc., as well as environmental and financial benefits.

### 5.1.2. Embed information campaigns in wider contexts

- Support community groups (local and online) to build awareness and mutual learning about electrification through information sharing and feasibility demonstrations
- Align information and incentive campaigns with known electrification triggers, including predictable life-event windows or business cycles such as preparation for retirement or shop fit out processes
- Leverage the role of solar PV and home batteries in catalysing broader electrification efforts through information and follow-up engagement

### 5.1.3. Acknowledge concerns and challenges

- Acknowledge the existing low trust in the electricity sector as a starting point when asking consumers to further integrate electricity into their homes and businesses, and address how to ensure accountability
- Recognise and address the specific challenges of rental properties. For residential tenants, this includes short tenure and poor quality buildings and appliances. Small businesses typically have longer leases than households but also may need to invest in their own infrastructure.
- Acknowledge consumers' genuine and rational concerns about resilience during power outages and extreme weather events. Build community resilience with efforts to reduce the likelihood and severity of power outages and mitigate their impacts (e.g. Western Sydney community level extreme heat plan)

### 5.1.4. Communicate the electrification process end-to-end

- Develop communications that reflect the electrification process as a whole, helping consumers understand the full scope of what is involved and the place of individual steps within the journey, rather than framing it as a series of discrete, disconnected decisions
- Concentrate foundational, deeply reliable information resources for those in the early stages of the electrification journey, including addressing common misconceptions



## 5.2 Recommendations for decision-making tools

Consumers value resources that enable them to tailor information to their own needs and circumstances. Interactive planning tools can offer this support.

### 5.2.1. Strengthen credibility and completeness

- Support independent, non-commercial information sources and tools to overcome sectoral distrust
- Foreground upfront costs and available subsidies early in the user journey
- Include lifecycle calculations, long term cost of ownership, end of life options for disposal
- Provide clear information about when switchboard and wiring upgrades are (and aren't) required in relation to different appliance upgrades, individually and in combination
- Consider temporal factors in the user's life, including potential major renovations, anticipated length of tenure, age of existing appliances and major life events, and contextualise information and advice accordingly

### 5.2.2. Make tools usable and accessible

- Design decision-making tools to enable engagement with different levels of understanding and at multiple touchpoints through all stages of the electrification journey. Tools should allow initial engagement with minimal cognitive effort, provide increasing accuracy and detail with repeated use, support iterative decision-making and enable consumers to develop their understanding as far as they want to
- Design tools for different user cohorts with multiple use cases: planning whole of home electrification; taking advantage of end of appliance life; identifying the next iterative step to take to maximise benefit from solar and battery
- Ensure tool design caters for consumers with different cognitive styles by providing and soliciting information in different forms, e.g. combining visual and text descriptions of appliances, technologies, etc.
- Carry out comprehensive user testing with a diverse cohort of consumers to avoid misunderstandings or potential confusion in text and images
- Minimise the amount of information consumers have to provide; where it is necessary and there is unavoidable complexity, collect data in different ways and triangulate to reduce errors
- Assess the impact on information provision of erroneous consumer inputs vs approximations and assumptions; focus only on critical information



## 5.3 Broader policy recommendations

As well as appropriate information to inform decision making, consumer electrification can be supported through availability of subsidies and rebates, suitable standards and regulations and training.

### 5.3.1. Policy approach

- To build consumer support for electrification and the transition, it will be necessary to improve policy and regulatory coherence through a system level approach where appliance upgrade and electrification policy aligns with broader, coherent infrastructural strategies. More generally, addressing the contradictions of increasing fossil fuel extraction for export, building data centres that massively increase demand while asking householders to be more efficient in their energy use, is necessary for building consumer support for electrification and the transition
- As the intended uses and financial returns of technologies like solar PV, battery storage, electric vehicles, and other energy efficiency upgrades are often interdependent and 'stackable', coordinating incentives across these and other technologies, rather than applying them in isolation, will help to promote electrification, while more siloed approaches risk locking in piecemeal change
- To minimise the various complications associated with electrification, provide specific support for more comprehensive whole-of-house or small business electrification efforts to maximise bang for buck while disruptions occur – particularly for small businesses where interruptions to normal operations can be costly

### 5.3.2. Training

- Develop industry readiness through training of installers, including developing skillsets across multiple appliances and technologies and broader understanding of electrification
- Develop training, resources and incentives for installers to provide accurate information to consumers about appliance costs and benefits, operation and maintenance needs

### 5.3.3. Standards

- A broad co-ordinated development of the regulatory environment is required to ensure that electrification is embedded structurally, e.g., through building standards, appliance standards and development approval processes
- Improve energy service level protections for renters in general, and support high quality upgrades for the rental stock, including through minimum rental standards processes occurring at state level



# Methods

Data collection for this project involved two surveys, 26 semi-structured interviews with households and small businesses, 7 semi-structured interviews with industry experts, and three focus groups. Surveys aided in establishing a baseline and everyday lives. Focus groups were used to further explore themes examined in the interviews by bringing together participants with diverse viewpoints, and facilitating discussion of these themes. All three methods are commonly used in energy research involving households and small businesses (CITE), and were selected for the complementary perspectives each could bring to our analysis.

## 6.1 Surveys

Two online surveys were carried out with the C1 'engaged household' cohort. Both surveys were created in Qualtrics and included a mix of multiple choice, matrix, Likert scale, ranking, grouping and open text questions. The first survey (n=186) was used to establish an understanding of what electrification activities had been carried out by this cohort and were planned for the future; the importance of different factors in their decision making, the importance of different types of information and trust in different sources. The second survey (n=203) aimed to quantitatively test some of the findings from interviews and focus groups, particularly around what consumers are able to tell us about their electrification needs, and the role of information in their electrification journey. Incomplete survey responses were removed from the data, the multiple choice and ranking questions analysed quantitatively and the open text responses coded thematically.

## 6.2 Interviews

Semi-structured interviews were used to explore the understandings and experiences of households and small business with electrification. A total of 26 semi-structured interviews were conducted: nine with C1 participants, ten with C2 participants, and seven with C3 participants. In each case interview guides were developed from salient themes identified during a review of relevant literature; these key themes were augmented with personalised questions relating to relevant demographic information, such as the composition of the participant's household or type of business. Depending on the cohort the interview guide themes and questions included: everyday routines (*'What does a typical day look like in your household/ business', 'Who usually handles the household in your home?'*), understandings of electrification (*'Have you heard the term electrification before?', 'What do you understand electrification to mean?'*), and direct or imagined experiences of electrification (*'Why did/ might you electrify?', 'What timeframes were/ might be important to you when electrifying?'*). As is common in similar qualitative research (CITE), however, the researchers departed from the interview guide when participants raised novel or otherwise interesting insights; in this way the researchers were better able to explore and understand participants' perspectives and experiences, including those unanticipated in the interview guide.

We also conducted seven C4 industry expert interviews. These interviews also encompassed common themes such as the information needs of households and small businesses (*'What types of information do you think households/ businesses need?', 'Are the trusted sources of information about electrification changing?'*), and how electrification is changing (*'Has the nature of electrification changed in recent years, and if so, how?', 'Do you anticipate that electrification will change in the next five to ten years?'*). However, as we were more concerned with the specific expertise of the interviewees, these interviews tended to focus on their personal and professional experiences with electrification.

All interviews were conducted online via Teams, except for one conducted in-person. All interviews were professionally transcribed and then analysed in NVivo using a combination of inductive and deductive coding.

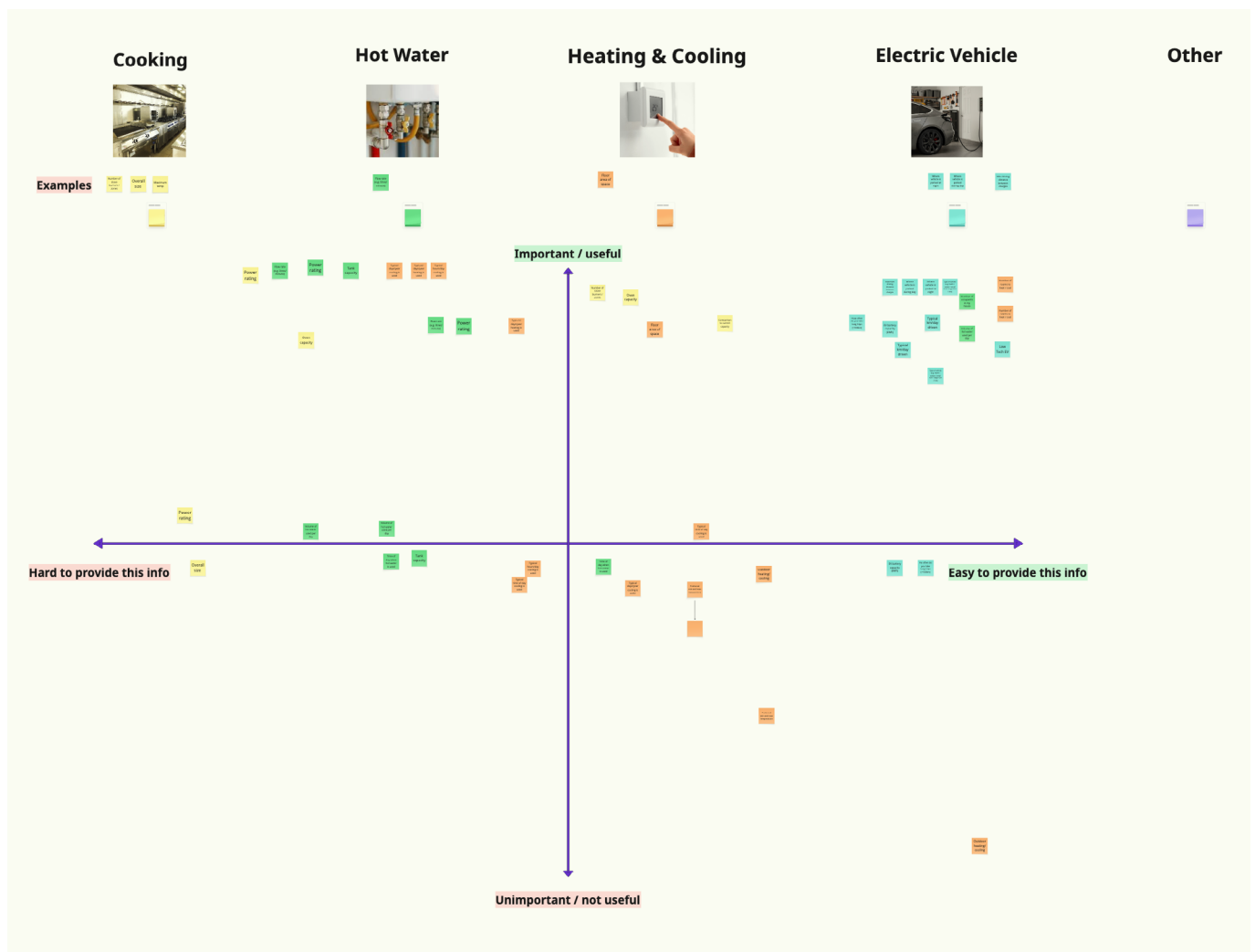
## 6.3 Focus groups

Three online focus groups were conducted: two combining C1 and C2 participants, and one with C3 participants. A total of eleven participants were selected to take part in the focus groups – three C1, six C2, and two C3 – to reflect a variety of electrification experiences and perspectives. Focus groups were conducted via Teams and included two Mirro board tasks. These tasks were refined between each focus group, and also adapted to suit either the household or small business context.

In each task participants answered questions via the Miro board, with the researchers asking follow-up questions or prompting discussion to

further explore participants' views. Focus groups each took 90 minutes. Similar to the interviews, they were professionally transcribed and then thematically analysed.

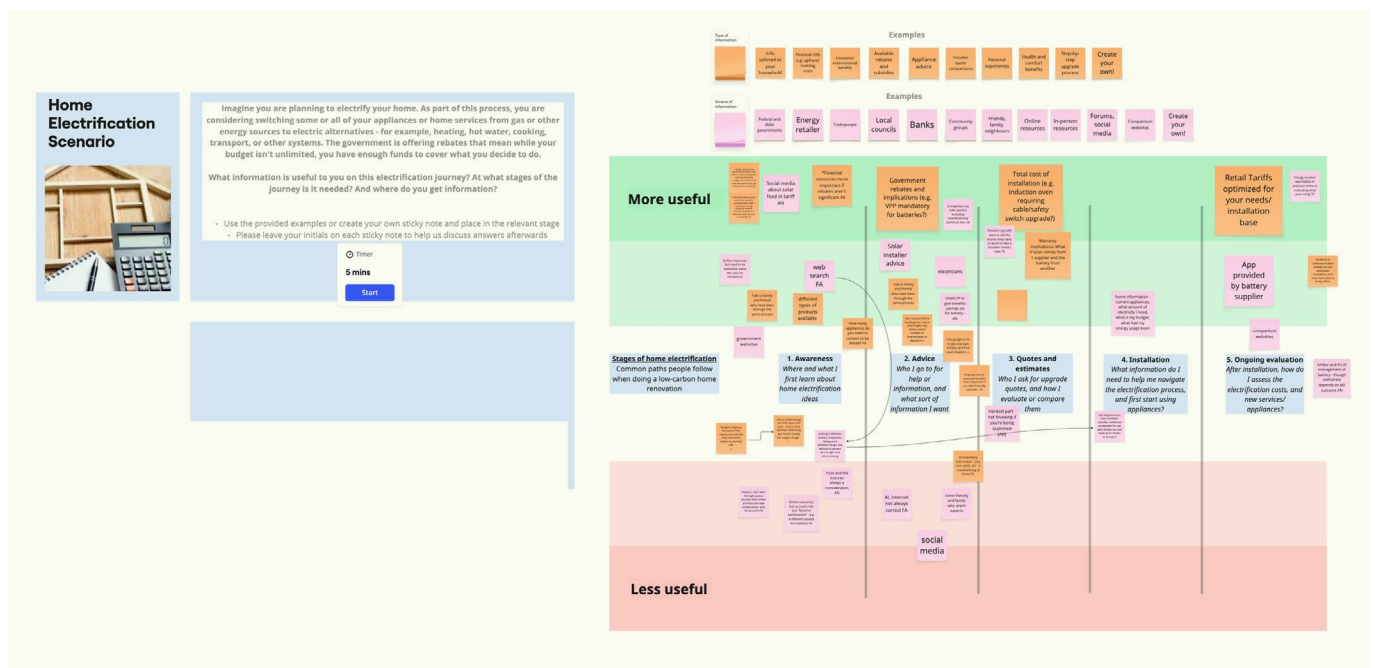
The first task explored the difficulty with which participants could answer questions about the types of appliances and services in their home. The task developed between groups (one example is shown in Figure 24). In essence participants were asked to provide information about their existing appliances (e.g. the type of hot water system in their home), their energy usage (e.g., pattern of hot water use) and future plans (e.g. type of electric vehicle they would consider). The questions were asked in different ways (e.g., visual alternatives versus textual descriptions) and using different metrics. Participants were variously asked to comment on and discuss the difficulty of answering and their confidence in their answers.



**Figure 24:** Task one, in which participants were asked to explain the ease and accuracy with which they could describe the types of appliances in their home.

The second task explored what types and sources of information participants would need in a speculative home renovation scenario where government rebates were generous (as shown in Figure 25). Participants were asked to place sticky notes representing different types and sources of information in the relevant stage of the journey, and to indicate the usefulness of each on a Y axis ranging from 'less useful' to 'more useful'. Example types (e.g. 'financial info', 'personal experiences') and sources (e.g. 'local council', 'online resources') of

information were provided, and participants were encouraged to generate their own. Once placed, sticky notes were discussed as a group to elicit further insights on participants' thoughts and experiences. The activity was then repeated with a revised scenario in which participants were still electrifying but without the same degree of government financial support. This two-scenario design served several purposes: the initial, financially unconstrained scenario allowed participants to engage with the activity under ideal conditions, encouraging speculative thinking informed by, but not necessarily restricted to, their current circumstances; the second scenario then enabled us to examine how information needs shifted under more constrained financial circumstances reflective of participants' situations.



**Figure 25:** Task two, in which participants were asked to explore the usefulness of different types and sources of information during the electrification of their home or small business.

## 6.4 Participants and recruitment

The research participants consisted of four cohorts (C1-C4) selected to give a range of experience and perspectives on the subject of electrification. These cohorts were:

- C1: 'engaged households', representing individuals who already have energy monitoring equipment or other consumer energy resources (CER), such as solar panels, batteries etc.
- C2: 'less engaged households', representing individuals who did not have any CER.
- C3: 'small businesses', representing individuals who own or otherwise make significant decisions impacting on energy use (e.g. appliance purchases, selecting energy plans) in a small business. These participants may or may not have had experience with electrification.

<sup>7</sup> <https://www.acap.org.au/post/energy-data-platform-available-at-unsw>

<sup>8</sup> <https://www.solaranalytics.com.au>

- C4: 'industry specialists', a diverse group comprising individuals members of the energy industry, but particularly those with knowledge or professional experience of electrification.

Participants in all cohorts were 18 or over.

C1 'engaged household' participants were recruited for the surveys via emails sent to participants in the ACAP Energy Data Platform who had previously given consent to be contacted for recruitment into energy-related research projects. This group comprises predominantly house owner-occupiers, most with rooftop solar installed, who are either subscribed to Solar Analytics monitoring or to Wattwatchers' My Energy Marketplace, both of which provide enable consumers to view their energy consumption and generation at a circuit level. This cohort includes a mix of early adopters and early majority for rooftop solar, and their use of energy monitoring indicates a high level of engagement with their household energy use.

C1, C2 and C3 interview participants were selected to reflect diversity in terms of age, gender, income, and location (including state or territory, and whether participants lived in regional or metro areas). C3 participants were recruited to include a wide spectrum of business types; these included hospitality venues, catering services, furniture manufacturers, consultants and a horse trainer, with businesses variously based in rented or owned buildings, including commercial premises and home offices.

C1 interview participants were selected from survey respondents who agreed to be contacted for interview. An agency was used to recruit C2 and C3 participants for interviews according to the above demographic requirements. C4 participants were identified via personal and professional networks; they encompassed the spectrum of electrification work, from hands-on, practical professions (e.g. electrician, builder) to systems-level work (e.g. energy policy, advocacy). C4 participants worked in household and community electrification (2), energy research at a university (1), home design and construction (1), electrical services (1), electric vehicle advocacy and policy (1), and electrification advocacy (1).

We selected these cohorts to get a range of perspectives on household and small business electrification, including both those with and without first-hand home electrification experience, small business owners with a range of electrification experience, and a variety of experts involved in various aspects of electrification.

Survey participants were entered into a prize draw to win an \$500 gift card and interview and focus group participants were offered gift cards ranging from \$50 to \$150 as an incentive to participate and in appreciation of sharing their time and knowledge. All research was conducted in line with UNSW human ethics guidelines.

The participant names used in this report are all pseudonyms.

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