Life Course Centre
ARC Centre of Excellence for Children and Families over the Life Course

Pruning Gas, Powering Communities: Social Factors in Local Area Electrification

A research report for *Balancing Act: weighing up local gas decommissioning*
The University of Melbourne Social Science Research on Consumer Perspectives

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About the Life Course Centre

The Australian Research Council Centre of Excellence for Children and Families over the Life Course (Life Course Centre, www.lifecoursecentre.org.au) is a national research centre investigating the critical factors underlying deep and persistent disadvantage to provide new knowledge and life-changing solutions, for policy, service providers and communities. The Centre is administered by the Institute for Social Science Research at The University of Queensland and is a collaboration with the University of Melbourne, the University of Sydney and The University of Western Australia as well as leading international experts. It is supported by key Australian government and non-government organisations and community, business and philanthropic partners working at the front line of disadvantage.

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Executive Summary

Victoria's residential electrification is accelerating as more households replace gas appliances with electric ones (known as 'electrification'). For households, electrification requires upfront investment in new appliances, leading to lower running costs and reduced energy bills over time. Estimates of annual savings for an average household from electrification range from $990 to $2,230 (Department of Energy, Environment and Climate Change (DEECA), 2025a). The level of savings depends on household consumption patterns, dwelling characteristics, appliances replaced and whether accompanied by energy efficiency improvements, and access to and ability make use of on-site solar generation. Electrification coupled with decarbonisation of electricity generation contributes to lowering greenhouse gas emissions.[1]

In earlier research, *Enabling Electrification* (2023), we examined the equity implications of home electrification, particularly barriers and enablers to change for lower income households. Many households cannot transition due to insufficient upfront capital, rental tenure constraints, trust barriers, and other non-financial factors. As consumers electrify and disconnect from the gas network, fixed infrastructure costs are distributed across a shrinking customer base. Under current regulatory arrangements, this creates an inequitable dynamic: those least able to electrify bear progressively higher costs as others leave the gas network, disproportionately harming vulnerable households.

This second stage of research, *Balancing Act*, focuses on addressing uneven electrification. We investigate opportunities through strategic, area-based approaches to gas network decommissioning: targeting electrification to areas with aging gas infrastructure requiring costly upgrades and seeking to electrify all households in that area. This approach eliminates the need for the gas network upgrades – potentially saving hundreds of thousands of dollars – with those funds redirected (under changed regulatory settings) towards comprehensive financial and non-financial support for household electrification in affected areas. We assessed the likely impacts of a strategic area-based gas network closure on residential consumers, particularly those vulnerable to energy hardship, examining household perspectives on local area electrification, anticipated barriers, and required support mechanisms.

The technical feasibility and the regulatory options to effect this change are not covered in this report.

About the Study

We studied electrification in two Victorian sites: St Albans (Melbourne's west) and Morwell (Gippsland). Morwell was selected because a fully-funded electrification upgrade pilot program had commenced, creating an opportunity to understand the experiences of households who had accepted the upgrades offer and disconnected from the gas network. St Albans was selected for anticipated gas mains replacement expenditure, relative socioeconomic disadvantage and high cultural diversity, and limited electrification support additional to existing state rebates and loans. We wrote, administered and analysed in-depth surveys from eight households and conducted interviews with eight households in these two areas[2], plus three interviews with intermediaries, including project officers, installers and landlords.

[1] For the financial year to 30 June 2025 renewable energy was 42.4% of Victoria's electricity generation with a legislated target of 95% by 2035 (DEECA, 2025b)

[2] Some interviews involved multiple household members; however, for analysis purposes, each household is represented by the survey respondent.

Household energy use and hardship

The participant cohort was predominantly older (half of survey participants over 60), low- to moderate-income (most earning under $80,000, with three under $40,000), and heavily reliant on government payments such as the Age Pension, Disability Support Payment and JobSeeker. Households averaged two people and were mainly homeowners (six of eight, five owning outright), with two private renters; families with children and social housing tenants were under-represented. Most households (six) continued to use gas for hot water, cooking and/or heating, while two had fully electrified through the funded electrification upgrade pilot program. Solar uptake was high among homeowners (six households) but absent for renters. Energy hardship was pronounced: three households experienced financial stress, with average stress levels more than double the national average. Hardship was experienced because of rising energy (gas) costs and poor thermal performance (e.g., inadequate insulation and draughtproofing) .

Findings and Implications

Participants strongly supported Victoria's transition away from gas and expressed qualified support for strategic local area electrification. The following factors shape whether and how vulnerable households can participate: households' financial constraints; information barriers; relationship dynamics; and life circumstances.

Adaptive capacities

Household capacity to participate in strategic, area-based electrification varies substantially based on structural and relational factors. Households with outright home ownership, environmental motivation, sophisticated search processes, willingness to draw on diverse supports, and ability to execute change were more likely to participate. Conversely, financial constraints, disability, limited face-to-face and digital interactions, and language barriers negatively affect participation. Some households exhibited high vulnerability alongside relatively high adaptive capacity — outright ownership, energy literacy, and strong communication skills could offset disadvantages related to age, health, or limited financial resources. Renters represent a distinct challenge: despite strong awareness and motivation, concerns about jeopardising affordable rental arrangements were a barrier regardless of the nature of the landlord-tenant relationship.

Implication: *Targeted outreach and supports for renters and other households with low adaptive capacity are needed; leverage intermediaries engaged with vulnerable groups, and consider community-level mechanisms to activate high-capacity households as local champions.*

The rental triangle

Electrification among renters emerged as one of the most persistent and complex barriers in the study. Recruitment of landlord participants proved difficult even where upgrades were fully funded. Interviews revealed a 'rental triangle' dynamic between tenants, landlords and property managers that entrenches inaction:

- **Tenants** face the highest energy cost burdens and stand to benefit most from electrification yet lack authority to undertake upgrades and are reluctant to make requests for fear of rent rises.
- **Landlords** bear upfront costs while tenants receive bill savings limiting landlords' direct and short term financial incentive, although landlords stand to save from lower maintenance costs and future asset uplift value.
- **Real estate agents** often act as gatekeepers, prioritising minimal property disruption and landlord-as-client relationships.

This misalignment of incentives and power means housing tenure fundamentally shapes access to electrification, with renters – particularly those in precarious housing – facing the greatest exclusion.

Landlord–tenant relationships further influence upgrade feasibility. Three typologies were identified:

- **Pragmatic engagement:** landlords act when economically rational or regulatory requirements apply.
- **Relational engagement:** direct, positive relationships that may allow negotiation.
- **Minimal engagement:** limited interaction, mediated by property managers.

One landlord participating in EFCN demonstrated pragmatic engagement, framing the upgrades as sound property asset management. Even where relational engagement was exhibited renters were reluctant to request upgrades for fear of increasing rent or straining goodwill, particularly where affordable rent or long-term tenure was valued.

Social housing presents a strategic exception. With a single institutional landlord, clustered social housing offers potential for coordinated, area-level electrification. While institutional engagement challenges remain, tenants expressed strong support for upgrades. Social housing electrification could therefore deliver immediate equity benefits while demonstrating scalable transition pathways, provided coordination barriers and effective engagement are addressed.

Implications: *Prioritise social housing upgrades as scalable transition pathways; further develop landlord incentives and supports; communicate landlord value strategically to emphasise sound asset management and property uplift; energy performance disclosure requirements and minimum energy efficiency rental standards.*

Housing and health

Energy upgrade decisions are embedded in broader life circumstances and housing trajectories. Electrification opportunities and constraints shift dramatically across life stages and housing transitions – moving house, health events, employment changes, or major repairs – create windows of opportunity or additional barriers shaping household capacity to participate in area-level electrification.

Health emerged as both motivator and barrier to electrification. Health conditions drove transitions (asthma, indoor air quality concerns, and vision impairment), with specialised service providers creating pathways to electrification advice and support programs. Conversely, specific health requirements (diabetes-related needs for reliable cooking access during outages, and high continuous hot water demand for elderly care favouring instantaneous gas systems) also constrained transitions. Health issues simultaneously heightened awareness of gas-related risks while increasing energy vulnerability and, in some cases, limiting decision-making capacity to pursue upgrades.

Implications: *Electrification programs must be designed with flexible entry points and coordinated referral pathways that recognise housing-health-energy intersections. Electrification support needs to be accessible through existing touchpoints such as healthcare and disability providers, emergency repair schemes, etc. This enables automatic referrals when households are already navigating change rather than requiring separate, self-initiated engagement.*

Upfront and hidden costs

While participants recognised potential long-term bill savings, upfront capital costs presented insurmountable hurdles for many, especially those living paycheque-to-paycheque or on retirement savings. Cost extends beyond appliances to electrical upgrades, retrofitting spaces to accommodate

the new appliances, and new cookware. Even nearly fully electrified participants preferred paying monthly gas supply charge because the final appliance upgrade cost was too onerous.

Participants consistently described substantial 'hidden labour' involved in navigating upgrades – that is, 'search costs' of researching options, comparisons, understanding rebates, obtaining quotes, verifying tradespeople, and coordinating installations. These hidden costs represented significant barriers for households managing precarious employment, caring responsibilities, health challenges, or financial stress. The EFCN program helped to overcome these barriers through comprehensive end-to-end support and coordination. Participants said they would not have known where to start or would not have thought to electrify but for this intermediary role. Multiple households described the decision-making process as overwhelming, despite the existence of government supplier lists and comparison websites, revealing that information availability alone is insufficient without supported navigation pathways.

Implication: *Electrification support must address both financial barriers and hidden labour costs through comprehensive, end-to-end assistance not just rebates and information alone. Programs should assist with navigation support that reduces search costs, brokers trusted installers, and manages coordination.*

The resilience premium

Willingness to electrify is influenced not just by cost but also concerns for reliability and independence during crises. The 'resilience premium' – the value placed on energy autonomy and security – may be more prevalent in specific parts of the network, especially in rural or regional areas where frequent blackouts or extended outages may be more likely to occur. We learned that some households refused the free electrification offer in Morwell, because they perceived gas appliances to be insurance against grid vulnerability.

Implication: *Failure to address reliability concerns through tangible resilience measures will jeopardise electrification efforts especially in rural and regional areas. Programs should integrate backup solutions as standard upgrade pathways rather than positioning electrification as all-or-nothing.*

Trust, informal networks and local champions

Engaging households emerged as a likely challenge for strategic decommissioning. Participants exhibited scepticism toward unfamiliar sources, with even generous offers from the EFCN project initially perceived as 'too good to be true'. When information or recommendations came from trusted local champions — community organisations, friends, or neighbours — participants were more receptive, however engagement and recruitment for the program remained difficult due to scepticism noted earlier.

Trusted intermediaries accelerate transitions that might otherwise occur incrementally, or not at all. In Morwell, coordinating local installers to complete upgrades within two weeks generated high satisfaction. In St Albans, without formal coordination, households relied on informal networks including family connections with tradespeople, trusted intermediary advice from BSL's energy advisory team and neighbourhood-level coordination such as collective solar bulk purchasing.

Implication: *Trust deficits, risk aversion among vulnerable households and reasonable energy security concerns will limit participation in electrification. Programs should invest in trust building through local intermediaries. Successful engagement involves partnerships with trusted community organisations, local councils, neighbourhood champions and peer networks.*

The challenge of getting all households to electrify

Strategic decommissioning (or 'pruning') relies on all households within a defined area fully electrifying to avoid costly gas network replacement. Beyond previously identified barriers, achieving universal uptake will be challenging due to:

- **Life stage factors:** Older residents (particularly over 75) often see limited return on investment in switching late in life and are reluctant to undertake change.
- **Upgrade independence and attachment to gas:** Some households prefer to manage upgrades gradually and independently, or feel strongly attached to existing gas systems, making coordinated timelines difficult.
- **Engagement gaps:** Despite extensive outreach, some households remained uncontactable. This challenge is amplified in rental properties, where landlords and agents are difficult to engage and tenants lack decision-making power.

However, several enabling factors emerged:

- **Peer influence:** Visible upgrades and positive neighbour experiences increased sign-ups, suggesting strong neighbourhood effects.
- **Demonstration impact ('seeing is believing'):** Viewing high-quality installations in person shifted perceptions and built confidence.
- **Liquid petroleum gas (LPG) as a transitional option:** Offering LPG or bottled gas provided a pathway for households reluctant to fully electrify while still enabling gas network pruning.
- **Clear communication of savings:** Simple, evidence-based messaging about financial benefits was seen as critical to building support.

***Implication*:** *Whole-of-street electrification will require targeted engagement strategies, flexible pathways, and strong community-based demonstration effects.*

Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
BSL	Brotherhood of St. Laurence
CALD	Culturally and linguistically diverse
CSH	Climate Safe Homes
DEECA	Department of Energy, Environment and Climate Change
EFCN	'*Electri-FAIR-cation*'
GCCN	Gippsland Climate Change Network
HILDA	Household, Income and Labour Dynamics in Australia
LPG	Liquid petroleum gas
MNH	Morwell Neighbourhood House
RCAC	Reverse-cycle air conditioning
SEIFA	Socio-Economic Indexes for Areas
VEU	Victorian Energy Upgrades

1 Introduction

The imperative to slow climate change and meet emissions targets is driving a transition away from natural gas in Australia and overseas. This has important equity implications for consumers across Australia. Victoria has the largest proportion and number of residential gas consumers and is likely to provide guidance for a transition away from natural gas in other Australian jurisdictions. Understanding consumer perspectives on and potential impacts of the transition is important to inform future policy and targeted support measures. This includes providing input to Victoria's Gas Substitution Roadmap and guiding access arrangements – the regulated revenue determinations that set gas pricing.

Meeting Australia's climate obligations will necessitate substantial contraction or complete phase-out of existing gas distribution networks. However, Australia currently lacks established regulatory frameworks, policy mechanisms, or operational precedents for managed gas network decommissioning, presenting complex challenges across social equity, policy design, regulatory governance, financial viability, and safety management dimensions.

BSL's engagement with this issue stems from recognition that household electrification presents opportunities to significantly lower energy bills and improve health outcomes and thermal comfort. However, a disorderly or unplanned gas network wind-down presents significant risks of being inequitable and exacerbating energy stress, particularly for low-income households and renters.

1.1 The Balancing Act Project

BSL has initiated a research project, *Balancing Act*, to investigate how much gas network spending could be avoided and diverted to assist households, especially those facing disadvantage, to move away from fossil fuels by electrifying their homes. Balancing Act is particularly focussed on avoiding gas network replacement expenditure planned for residential areas, through residential electrification.[3] In the current five-year gas access arrangements (2023–2028), for example, there is more than half a billion dollars of planned gas pipeline replacement expenditure in Victoria alone (BSL, 2025). Gas consumers, through their bills pay for these infrastructure upgrades, which could be redundant within 20 years. The process of avoiding this replacement expenditure and shrinking the gas network with electrification is known as strategic decommissioning (also known as network 'pruning').

There are three parts to the Balancing Act project.

The **first** focuses on the technical conditions for equitable pruning. This involves developing a framework to assess proposals to shrink the gas network through strategic decommissioning. The second and third parts of the project are a case study in place. The **second** part of the project is a cost-benefit analysis of a hypothetical pruning proposal, and the **third** part seeks to understand the social barriers to and enablers for strategic, area-level electrification.

[3] Gas network augmentation necessitates lowering local gas use. In contrast, pruning requires every property in that area to disconnect from gas or switch to bottled gas — with no exceptions. If any households refuse to disconnect or switch to bottled gas in that area, the replacement expenditure cannot be avoided via pruning under the current rules in major Australian gas networks (see Sunk Costs report for further detail). Pruning is therefore more difficult to achieve but affords greater potential to shrink the gas network than avoiding augmentation. Both approaches would only constitute a small part of any plan to decommission a gas network, complementing other approaches.

The third part of the project is the subject of this report. BSL is partnering with the University of Melbourne to undertake research that explores the extent to which area-level electrification is socially acceptable and feasible amongst lower socioeconomic status and energy vulnerable households and communities.

This report will deepen understanding of how the energy transition can positively or negatively impact households already experiencing socioeconomic disadvantage and provide recommendations on how to manage potential adverse effects on wellbeing and financial position through policy and program interventions. We use mixed-methods to understand the key factors shaping electrification at both the household and community scale, including the level of both financial and non-financial support households require to electrify. Building on previous research on lower-income household electrification (Chandrashekeran et al., 2023, 2024), this study extends the analysis to explore the importance of social context such as life courses, built environment, preferences, motivation and decision making processes.

1.2 Policy Context

In Australia, Victoria and the Australian Capital Territory (ACT) are at the forefront of policy development for phasing out gas and accelerating electrification. The ACT has established a gas network closure date of 2045 and has put in place a series of policies to facilitate the transition away from gas. Victoria has similarly introduced several policy instruments designed to drive residential electrification and manage the gas network phase-out, including:

- Gas Substitution Roadmap
- Ban on gas connections for new builds
- Phase out of gas hot water appliances in owner-occupied homes
- Phase out of most gas appliances in rental properties

However, the current regulatory frameworks that apply to gas networks and inform investment decisions are not well aligned with the above policy context. Economic regulation of the gas network was designed for, and continues to, incentivise the growth of the network (Australian Energy Regulator, 2021). The question of what to do where capital recovery is at risk due to declining demand remains an unresolved commercial and regulatory question.

Costs of gas infrastructure are recovered mainly through consumer gas bills, and in Victoria that is overwhelmingly residential consumers (DEECA, 2025a). As greater numbers of consumers electrify their homes and disconnect from the gas network the significant fixed costs of the network are borne by those who remain on the network: households that stay on gas face higher network charges as fewer people use the system. Moreover, gas network businesses have proposed accelerated depreciation to shorten their networks' economic lives and recover their investment sooner and have increased disconnection / abolishment fees. This further increases the bills of those remaining on gas. Rising costs could then push more households to leave, driving prices up even further – a cycle known as the gas network 'death spiral' (Aas et al., 2020; Laws et al., 2017), although its speed and severity are unpredictable (ECA, 2024).

Whilst some consumers who can electrify choose not to, research shows that there is a significant population who lack the capacity to shift away from gas to all electric homes (Chandrashekeran et al., 2024). This research seeks to understand the experiences of household gas users who lack adaptive capacity to electrify their homes.

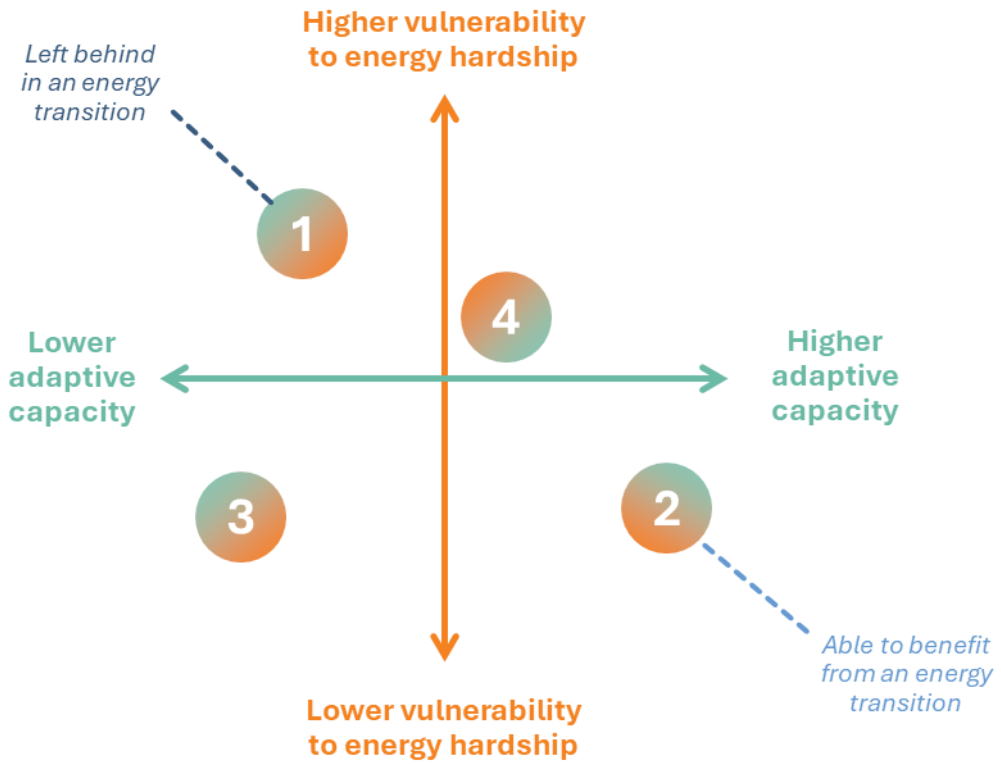
1.3 Enabling Electrification and Adaptive Capacity

Adaptive capacity refers to the ability of households to respond to and manage change in the context of residential decarbonisation and electrification. Key indicators of adaptive capacity include home ownership and tenure security as well as strong environmental motivations and sophisticated information-seeking approaches, including a willingness to utilise diverse formal and informal support networks (Chandrashekeran et al., 2024). Financial position (assets and resources) is important but is insufficient of itself to drive electrification in lower-income households. Life stage and available time and environmental values contribute to proactive forward-looking energy planning (Chandrashekeran et al., 2024).

Conversely lower adaptive capacity is shaped by financial constraints particularly an inability to afford the upfront costs of electric energy upgrades and rooftop solar. Renters in particular face structural barriers to adaptation despite strong motivation and reduced bills and operational costs.

High adaptive capacity and low energy hardship can drive a virtuous cycle of upgrades to reduce the risk of energy hardship, whereas low adaptive capacity combined with high energy hardship can produce negative feedback that compounds hardship and make electrification even less accessible.

Figure 1: A matrix of vulnerability to energy hardship and adaptive capacity in the context of an energy transition situating four typical categories of households (Source: Chandrashekeran et al., 2024)



The above work is focused on household adaptive capacity in relation to residential decarbonisation. There is a lack of research on adaptive capacity at the street or neighbourhood scale, and as a collective rather than individual capacity.

1.4 Understanding Household Adaptive Capacity in a Neighbourhood Context

Existing research, including *Enabling Electrification,* predominantly focuses on individuals or households as primary decision makers in assessing adaptive capacity to environmental changes (Vallury et al., 2022). There is less research and understanding of adaptive capacity across interconnected scales, and the importance of collective as well as individual characteristics (Siders, 2019; Vallury et al., 2022; Wesche & Armitage, 2010). Simply aggregating household data often misses the complex relationships, coordination, and power dynamics within and between groups that shape decisions and adaptation outcomes. (Vallury et al., 2022). Adaptation involves “cascading decisions across a landscape made up of agents from individuals, firms and civil society" (Adger et al., 2005)

Under a gas network pruning scenario, electrification needs to occur in a targeted area and the current Australian regulations would require full agreement (either to electrify or switch to bottled gas) across all gas users in the specified area if this happened in a major gas network. The feasibility of collective action at the street scale is a key question for this research. If adaptation processes are known to be geographically specific (Balta-Ozkan et al., 2021; Frazier et al., 2013; Graziano & Gillingham, 2015; Smit & Wandel, 2006), what are the key spatial dimensions that might influence the success or failure of street-level electrification? How is household decision-making embedded within relational, spatial, and institutional contexts that facilitate or hinder capacity to adapt?

Social relations and relational factors

The relational approach challenges conventional rational choice models of energy decision-making focusing instead on how social relations shape economic actions and decision-making (Tilly, 2015; Zelizer, 2000). Middlemiss et al. (2024) present evidence from the United Kingdom demonstrating limitations of frameworks assuming financial logic drives energy efficiency interventions. Mininni et al2024) further question common assumptions in policy and research that simply identifying a problem (e.g., electrifying households) means it can be solved. These critiques highlight that household decision-making encompasses broader needs, values, and social considerations extending beyond access to and accumulation of resources. Bolton et al. (2023) demonstrate that renovation decisions are shaped by dynamic social relations including family dynamics, tradespeople interactions, gender roles and the relational meaning of money, with trust-building and compatibility with household practices and life stages proving crucial.

Intermediaries

Low-carbon technology adoption is shaped by factors that go beyond the household. Trusted advisors and intermediaries play critical functions in facilitating energy decision-making, with contractors, installers, retailers, and technical consultants often shaping household decisions through their expertise, recommendations, and service offerings (Brocklehurst et al., 2021; Chandrashekeran et al., 2024; Kangas et al., 2018; Mininni et al., 2024). Energy intermediaries are third-sector organisations that bridge the gap between energy systems, policymakers, and households, helping residents navigate the complexities of energy markets, retrofit opportunities, and low-carbon technologies (Bouzarovski et al., 2025) while performing crucial care, advocacy, and sociotechnical support work within communities (Bouzarovski, 2022; Bouzarovski et al., 2025).

Energy intermediaries are important because they facilitate access to energy efficiency programs and renewable energy technologies for vulnerable households (Sequeira et al., 2024), build relationships of trust within communities that state agencies often cannot achieve (Sequeira et al., 2024), and play a transformative role in shaping how climate mitigation measures are implemented at the neighbourhood level (Bouzarovski et al., 2025), particularly during periods of energy crisis.

The role of energy intermediaries is underrecognised in the sector, although there is increasing scholarly recognition of their place-based impacts (Marsden et al., 2025) and the infrastructural labour they perform (Bouzarovski et al., 2025). Despite their crucial contributions to energy justice and demand-side interventions, these organizations face significant challenges including precarious project-based funding (Torrens & von Wirth, 2021), organisational instability, and the burden of mediating complex technical and regulatory systems with limited resources (Shaw et al., 2018) – issues that undermine their capacity to deliver sustained and meaningful change in the energy transition (Bouzarovski et al., 2025).

Peer effects and technology diffusion

Peer effects manifest through social interactions and spatial proximity, playing crucial roles in technology diffusion processes (Graziano & Gillingham, 2015). These effects represent influence that behaviours and choices of peers exert on individual decisions (Min, 2025; Scott & Carrington, 2011). Empirical research confirms spatial dimensions of these peer effects. Bollinger & Gillingham (2012) find that adoption of solar systems in a postcode increases probability of new adoption in that same area, with particularly strong effects observed at street level. Uptake is also influenced by housing density, building typology and tenure arrangements – factors that can exert stronger influence than socioeconomic, demographic, or political variables (Balta-Ozkan et al., 2021; Chandrashekeran et al., 2024; Graziano & Gillingham, 2015; Heiskanen & Matschoss, 2017).

Research on peer effects concentrates heavily on solar adoption, with limited understanding of peer influence for less visible electrification (Min, 2025). The limited existing evidence suggests that peer effects likely operate differently across these diverse technologies due to their varying visibility, complexity, and installation and retrofit requirements (Min, 2025).

Geographical context

Energy transitions intersect with broader patterns of urban socioeconomic differentiation and material deprivation (Bouzarovski & Thomson, 2018). Therefore, by examining community-level patterns, interactions, and relationships, area-level analysis can capture dimensions of adaptive capacity and injustice that remain invisible at the household level. The literature highlights the need for place-specific approaches to energy transition planning that recognise the unique socio-spatial dynamics of different communities.

1.5 Research Questions

Our key research questions are:

- What are the likely social-spatial impacts of a phased and targeted closure of parts of the gas network on residential consumers, particularly those vulnerable to energy hardship and on lower incomes?
- What are the barriers to and drivers for neighbourhood scale electrification amongst energy vulnerable and lower income households?
- What incentives and supports could enable these households and communities to electrify in a timely manner?

1.6 Methodology

Our study used a mixed methods approach, drawing on quantitative and qualitative research methods to understand current practices, perspectives and decisions about energy effectively. A literature review was conducted to inform the research and identify contributions and gaps in the wider literature.

Methods applied were:

1. **An online survey** – to characterise Victorian households experiencing vulnerability to energy costs, including sociodemographic information, built environment characteristics, indicators of energy hardship, current energy use and preferences, awareness and utilisation of government programs related to energy, and attitudes to a transition away from household gas.

   Our survey drew on questions from surveys conducted by the Australian Bureau of Statistics (ABS); the Household, Income and Labour Dynamics in Australia (HILDA) Survey; and complements recent surveys commissioned by Infrastructure Victoria (2021) and the Department of Environment, Land, Water and Planning (2021) which produced findings representative of Victoria's population by age, gender and metropolitan or regional location. A copy of our survey is included at Appendix A.

2. **One-on-one interviews** – we conducted one-on-one interviews to explore perspectives on the proposed energy transition, priorities and challenges in energy use in the home, capacity for electrification, and potential support measures. Interviews were conducted in-person and online and facilitated by the lead researcher on this project, with support from the additional researcher and staff from BSL. A translator was also employed when necessary. A semi-structured question guide was used to explore topics across six in-person interviews and five online / telephone interviews. For all interviews, a mixture of University of Melbourne researchers and BSL staff were present.

   The study design, protocols, and research tools were approved by the University of Melbourne Human Research Ethics Committee. All participants provided informed consent before participating in research activities, with assurance of confidentiality, anonymity, voluntary participation, and no adverse effects in case of refusal.

Site selection

The site selection process evolved over time and through collaborative discussions with AusNet and Gippsland Climate Change Network (GCCN)[4]. Site selection criteria emerged at the intersection of ideal research design and feasibility. The following considerations guided site selection:

1. Areas where replacement expenditure on residential gas mains was anticipated in coming years, but not within the immediate 6-12 months;
2. Areas with higher levels of socioeconomic disadvantage; and
3. Areas with culturally and linguistically diverse (CALD) populations

For the current five-year period, information is sometimes available at the suburb or street level on planned upgrades, although this varies by distributor and is usually not specific enough to identify places where pruning could occur. Data on gas pipeline type and leakage rates, which provides a pointer to areas where future upgrades are likely to occur, is also sometimes available in the gas access arrangement documents, although again this is often not specific and requires significant technical understanding.

Site 1: Spatially selected areas in the City of Brimbank

As a result, identifying sites where there is planned replacement expenditure was not straightforward. Drawing on publicly available maps, BSL identified areas in Melbourne's western suburbs where future gas mains replacement expenditure was anticipated beyond the current regulatory period. Analysis of Ausnet's Medium Pressure network[5] highlighted several terminal branches in the City of Brimbank

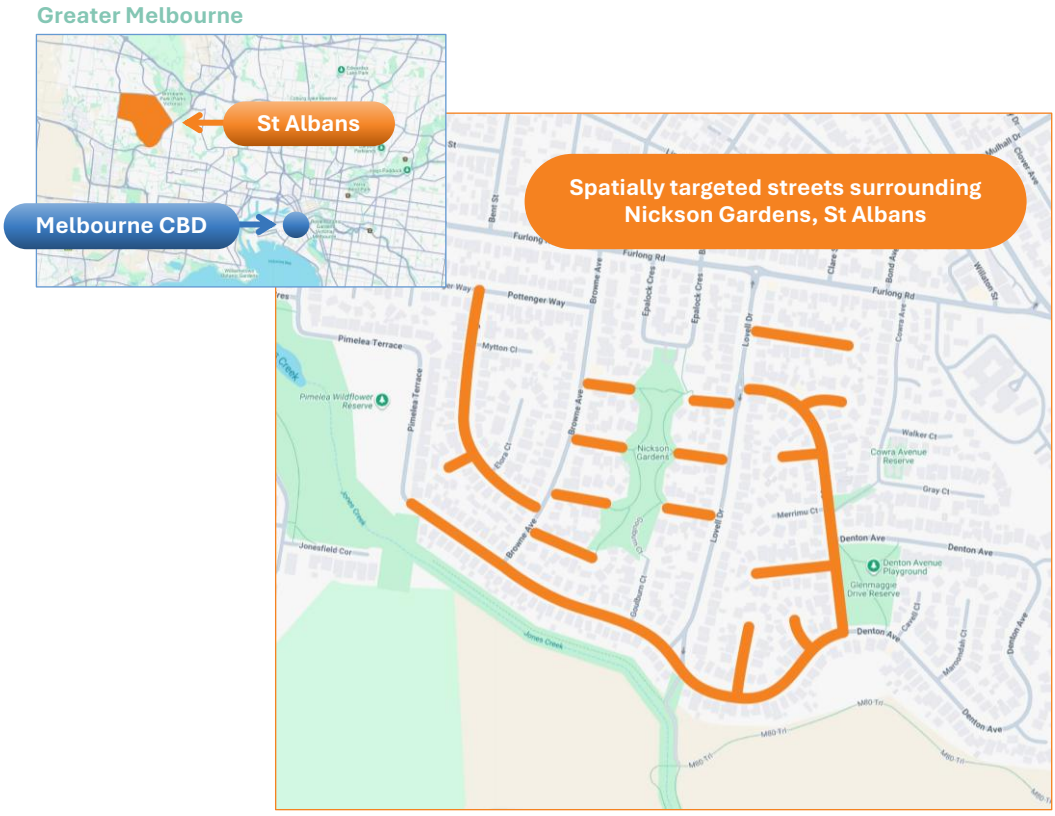
[4] GCCN is a not-for-profit organisation working to address climate change and promote sustainability by fostering collaboration between community, industry, and government.

[5] Gas pipeline infrastructure maps were obtained from AusNet's *Gas Network: Mains & Services Strategy*. Consultations with AusNet identified areas that would likely require future network upgrades based on the age and type (Medium Pressure: Polyethylene P4 and unprotected steel) where no immediate replacement arrangements had been established.

(governed by Brimbank City Council) that could potentially be decommissioned without affecting supply to the broader network.

Almost 100 streets and courts across four suburbs (St Albans, Sunshine West, Albanvale and Kings Park) were identified as likely meeting the technical criteria for gas mains replacement in the near future. Many of these streets comprised terminal branches likely capable of network pruning (Figure 2). Based on the above site selection criteria, these streets were considered strategically relevant for examining area-level electrification dynamics within the broader context of managed gas network transition planning.

Figure 2: Example of spatially targeted streets shown in orange in Melbourne's western suburbs



Site 2: The 'Electri-FAIR-cation' project

For the second fieldwork site, we focused attention on the experiences of households in parts of Morwell where AusNet (as the electricity service provider[6]) was funding a full electrification upgrades pilot program delivered by GCCN. The project, '*Electri-FAIR-cation'* (EFCN), had commenced and this created opportunities to understand the experiences of residential customers who had accepted the upgrades offer, installed electric appliances and disconnected from the gas network. The project is funded through an innovation program, which is ultimately paid for by other customers on the AusNet electricity network.

[6] In Victoria, electricity and gas distribution networks are regulated natural monopolies, with specific geographic areas allocated to individual distribution network service providers (DNSPs) who, under the DNSP framework, maintain exclusive responsibility for infrastructure provision and maintenance within their designated territory. In Morwell, AusNet serves as the electricity distributor, while Multinet Gas is the gas distributor. AusNet is also a gas distributor in other areas, including St Albans.

As a pilot, the EFCN project aims to service around 60 households in Morwell and therefore, only specific households on identified streets were invited to participate. Selection of streets was based on technical criteria applied by AusNet, who were interested in understanding the impact of electrification on circuit substations. This would inform future planning for the electricity network. Whilst this kind of project could have been rolled out in a range of geographies, Morwell was selected as AusNet wanted to understand the needs of vulnerable or low-income households with a view to informing electrification policy and planning (see Section 0). AusNet formed a partnership with GCCN to deliver the project. GCCN partnered with Morwell Neighbourhood House (MNH)[7] to support delivery and assist with the recruitment of vulnerable households in the specific spatial areas.

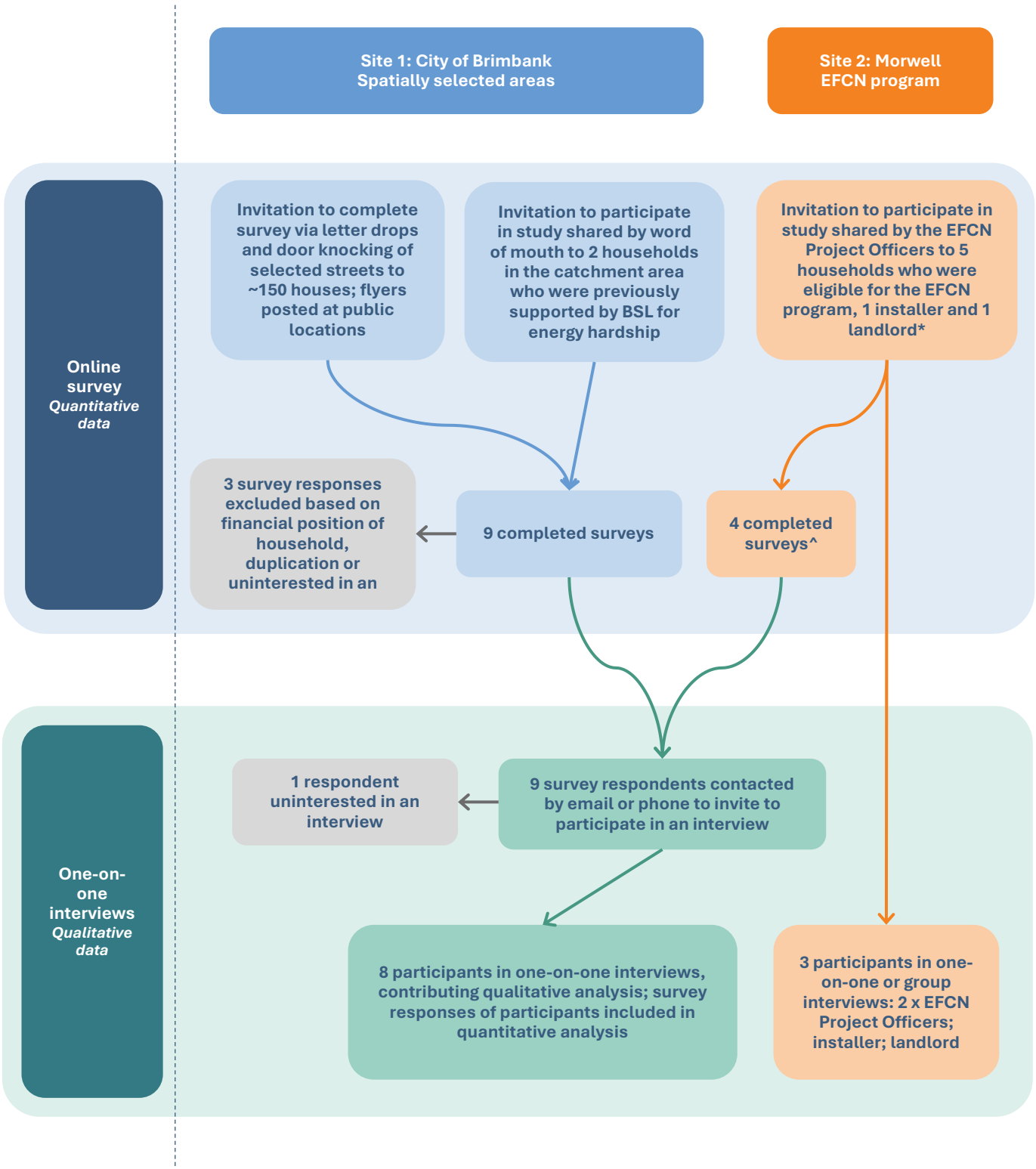
Data collection and analysis

The ABS defines 'low income' households as those in the lowest income quintile, excluding the bottom two percentiles (i.e., 3rd to 20th percentiles) (ABS, 2019-2020a). Based on the most recent data, this equates to households with an equivalised disposable income of less than $583 per week, or $30,316 per year. Many of our households fall into this income category; however, we recognise the potential for other household characteristics to contribute to energy vulnerability and have not applied strict inclusion criteria in line with the ABS low-income definition.

Recruitment for conducting surveys and interviews was done as follows:

[7] MNH is a community-based organisation providing local support services for individuals and families, and work to advance the welfare of those within Morwell and our surrounding communities.

Figure 3: Summary of recruitment strategy and data collection



*A landlord owning properties that were assessed for the program agreed to be interviewed

^ 1 household underwent an assessment for the EFCN program but declined to participate

The study recruited a small sample designed to generate qualitative insights rather than achieve statistical significance. Recognising energy-vulnerable households as a hard-to-reach population, the research combined quantitative and qualitative methods to capture nuanced household experiences. While the sample exhibited diversity across characteristics such as age, tenure, income and cultural background, it remained limited and cannot be considered representative. Despite this, the mixed-method approach yielded significant insights into the barriers and motivations shaping household electrification decisions.

The final household sample comprised equal geographic representation, with half the participants residing in St Albans[8], a suburb in the City of Brimbank, and the remaining half located in Morwell, a town in Gippsland.

Our survey collected information on people's housing, energy use and preferences (e.g., gas versus electric cooking), access to government energy programs, and opinion on electrifying their homes. In the interviews we asked people their perspectives on the proposed energy transition, priorities and challenges in energy use in the home, capacity for electrification, and potential support measures.

Survey respondents received a $30 retail voucher. Preliminary analysis of survey data was used to check that the respondents met the inclusion criteria for the research. 11 interviews were held between July and October 2025, including six in-person and five online. Household interview participants received a $100 retail voucher.

1.7 Site Profiles

St Albans, Melbourne

St Albans is a suburb in the City of Brimbank in Melbourne's western suburbs, characterised by significant socioeconomic disadvantage and high cultural diversity. The suburb has a one of the lowest ranked SEIFA index scores, placing it among the most disadvantaged areas in Victoria (ABS, 2023). St Albans has a high CALD population, with over 60% of residents born overseas (ABS, 2022), a cohort who have been identified as facing significant barriers to electrification (Chandrashekeran et al., 2024).

While Brimbank Council offers some electrification support through its "100% Renewable Brimbank" program – including webinars and access to the Solar Savers Program – electrification remains a nascent issue in the area with limited concerted push to electrify homes. Brimbank Council is currently installing a community battery in Sunshine West to support grid resilience, which may encourage increased household solar adoption in the area – solar installation often represents a tipping point for broader household appliance upgrades (Chandrashekeran et al., 2024). However, direct support for households the local area to electrify appliances remains limited. Households can access statewide initiatives such as Victorian Energy Upgrades (VEU) and Solar Homes, although these lack spatial targeting and localised coordination to facilitate area-level transitions. Some households had also accessed help through small-scale programs like BSL's Climate Safe Homes (CSH)[9], but these tend to be limited in scale and reach.

The lack of fully funded or hands-on electrification programs or community initiatives in the area made St Albans a suitable study site, as a contrast to our second site. This limited level of local support reflects many Victorian neighbourhoods where residents must navigate electrification largely

[8] Although the identified catchment area included several suburbs within the City of Brimbank, all four recruited participants happened to reside in St Albans.
[9] More information on the program can be found at Climate Safe Homes.

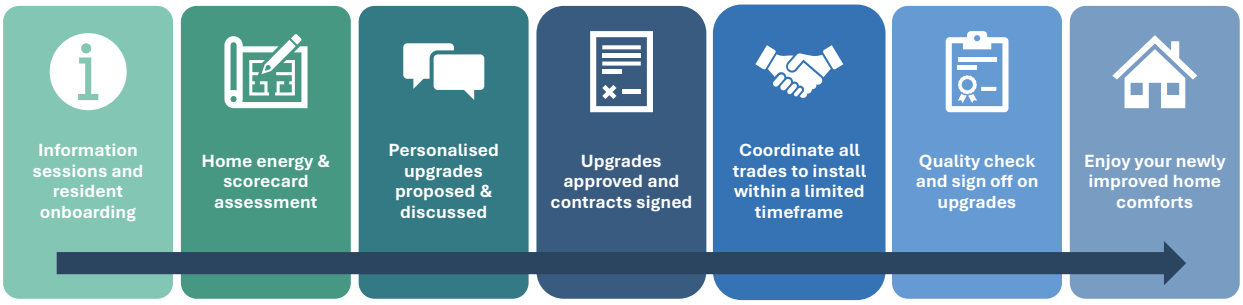
independently. We are not proposing this as a desirable model; rather, it provides a baseline for understanding household dynamics in the absence of intensive local coordination, offering insights into the barriers and support gaps that need to be addressed.

Morwell, Gippsland

Morwell as a second research site provides a related and contrasting case study with St Albans. Located in regional Victoria in Gippsland, Morwell similarly registers a low SEIFA index, reflecting concentrated socioeconomic disadvantage somewhat comparable to St Albans. However, as a regional town, Morwell presents different socio-relational dynamics as well as a unique electrification support landscape through the implementation of the EFCN project.

The EFCN project offers eligible households comprehensive, fully funded electrification upgrades with end-to-end expert advice, coordination of trades and decision-making supports, a stark contrast to households based in St Albans. The initiative eliminates out-of-pocket costs for participating households and provides coordinated service delivery through a trusted, local single-point-of-contact. Participating households receive upgrades that includes removal of gas appliances, energy-efficient electric heating, cooling and cooking, as well as solar panels, insulation, and draft treatments. A summary of the EFCN project experience is provided below (Figure 4).

Figure 4: The EFCN customer experience[10]



[10] Supplied by GCCN personnel.

Electrification support

There are significant differences in support for electrification between the two Victorian locations. The key differences are highlighted in the Table 1 below.

Table 1: Summary of electrification support across the two Victorian sites

St Albans		Morwell
Standard Support (n = 2)	**CSH Program (n = 2)**	**EFCN Program (n = 4)**
No targeted recruitment	Targeted to chronic health issues, not location specific	Targeted, resourced, street specific, recruitment campaign linked to high value offer
Access to local, national and statewide programs and subsidies[11]	Additional subsidies for upgrades	Fully funded upgrades up to ~$20k
Significant up-front costs	Small co-contribution or fully funded	No out-of-pocket costs
Trusted intermediaries independently navigated	Trusted intermediaries: BSL personnel, accredited installers	Trusted intermediaries: project officers, local accredited installers, neighbours
High search costs	Low search costs	Low search costs
Energy Scorecard Assessment at own cost (VEU rebates available)	Energy Scorecard Assessment not included	Energy Scorecard Assessment included in package

[11] Refer to Appendix C for a summary of existing initiatives households can access.

2 Results

Refer to Appendix D
Summary of survey data for a detailed summary of our survey data.

2.1 Household Profiles

Age, gender and country of birth

The participant sample (*n=8*)[12] comprised predominantly older males, with half of the participants aged over 60 years and five of eight identifying as male. Nearly all participants were born in Australia, with only two exceptions: one participant born in England and another in Vietnam.

Household size

The average household size was two people, with two participants reporting living alone and one in a group household arrangement. One household included an adult child living with their parent(s). Households with children under 18 years of age are under-represented in this sample.

Income and income support

Three households reported an average annual income of less than $40,000 per year, two of which lived alone and received Disability Support Payments. Of the remaining households that provided their annual income data, no household income exceeded $80,000 per year.

Income support was nearly universal amongst participants, with all but one household receiving at least one form of government payment. Of the four retired households, three received the Age Pension while one received Disability Support Payments. Two households received multiple income support payments, and all households eligible for additional payments accessed at least one of Rent Assistance, Energy Supplement and the Pension Supplement.

Employment

Of the four participants under 60 years of age, three were not employed. Two were actively looking for work, with one of these households also receiving JobSeeker payment support. Two households reported care responsibilities as amongst their main day-to-day activities.

Education

Among participants where data was collected, all had completed either high school or a trade qualification, with one individual additionally holding a university degree.

Housing

The participant sample comprised six homeowners and two renters in private rental accommodation. Among homeowners, all but one household owned their home outright. People living in social housing are under-represented in this sample.

[12] Some interviews involved multiple household members; however, for analysis purposes, each household is represented by the survey respondent.

All households live in separate houses.

2.2 Current Energy Use

The household energy infrastructure assessment revealed significant reliance on traditional gas-based systems, with six households (75%) still utilising gas for their energy needs. Among the remaining households, two had recently transitioned to fully electric systems, both of which were participants in the EFCN project.

Five households have a gas hot water system, with one household utilising a gas-boosted solar hot water system. The same proportion of households use gas for cooking, while electric ovens were present in majority of households. Gas heating was not as common, with only three households using a gas system. Notably, one household had a gas panel heater; however, safety concerns had rendered this appliance non-operational and is unused. Majority of the surveyed households were equipped with reverse cycle air conditioning (RCAC), providing cooling and heating capacity as an alternative to gas systems. Table 2 shows the number of households with different combinations of gas appliances in their home, with the most prevalent configuration comprising gas cooktop, hot water system, and heating (50% of households) – a finding consistent with previous research indicating similar prevalence rates of 53% for this appliance combination (Chandrashekeran et al., 2024).

Table 2: Household gas appliance combinations

Current gas appliance mix	n = 6
Heating, cooktop and hot water	3
Cooktop, oven and hot water	1
Hot water only*	1
Cooktop only	1

*Solar hot water system with gas booster

Solar system adoption was high, with six households having a photovoltaic system installed. Of the two participants lacking solar systems, one is eligible for the EFCN project upgrades and is scheduled to receive solar panels and energy-efficient appliances in the near future. Notably, the two households without solar panels were renters.

2.3 Energy Hardship

Financial stress

Households face financial stress when they are unable to meet basic financial commitments because of a shortage of money. Our survey measured financial stress based on seven events[13] which may have occurred in the previous 12 months, as used in the HILDA Survey. A household is considered to be in

[13] These events are: could not pay electricity, gas or telephone bills on time; could not pay rent or mortgage on time; asked for financial help from friends or family; were unable to heat home; went without meals; pawned or sold something; asked for help from welfare/community organisations.

financial stress if two or more indicators apply. Based on this definition, three households in our survey were identified as being under financial stress, linked to lower age, the presence of a household member with a disability and unemployment. There was a relatively even spread of financial stress indicators.

Participants in this study had an average financial stress score of 1.6 (on a 0–7 scale). This is higher than the average score of 0.7 for households in a nationally representative HILDA sample of the Australian population (Wilkins et al., 2021).

To complement the survey findings, our interview data revealed financial stress as a critical underlying concern among the majority of the participants. Discussed in more detail below, the key financial pressures included:

- Concerns for rising energy costs and bill savings
- The upfront cost of appliances
- Retirement planning and long-term financial (in)security
- The cost of housing (rent in particular)

Energy hardship

Recent rises in energy costs have emerged as a critical driver of energy hardship, intensifying financial pressures on households and potentially forcing trade-offs between essential needs such as heating, food and healthcare. Energy hardship occurs when households cannot adequately meet their basic energy requirements due to affordability constraints, with rising prices, especially gas prices, pushing vulnerable populations into positions where they may need to compromise on necessities or alter their practices to maintain their access to energy.

One household who had both RCAC and central gas ducted heating rarely used the RCAC for heating purposes due to its limited spatial coverage. The system was only installed in one room and could not adequately heat the whole house. However, a recent rise in gas prices resulted in a change in household energy practices as a cost mitigation strategy, which included using the RCAC and portable heaters in other rooms where necessary:

> *"I have turned [the RCAC] on a couple of times since the last gas bill. The last gas bill knocked me around a bit."*
> **Male participant, 70-79 years, private rental**

Similar financial pressures were felt by other households, particularly those with central gas ducted heating:

> *"And energy bills have been going up, especially gas bills, for some time. We noticed the gas bills within one year. But once we got the central gas heating installed, we noticed within the space of two seasons... how much [gas] gone up."*
> **Male participant, 60-69 years, outright homeowner**

Limiting energy use

Three households were conscious of trying to limit their household energy use as a strategy to reduce energy costs and/or avoid unnecessary energy consumption. While the majority of households did not go without heat, two households had been unable to adequately heat their homes due to financial constraints in the past 12 months.

One household that reported experiencing financial stress prioritised thermal comfort over energy reduction largely due to health-related concerns. This household indicated they would forgo other essential needs, such as meals, in order to maintain heating and still meet their energy bill obligations.

Thermal comfort

Energy hardship in many households can be directly attributed to the poor thermal performance of existing housing stock. Dwellings with inadequate insulation and poor sealing struggle to maintain comfortable indoor temperatures, effectively "*leaking heat*" during winter and failing to retain cooling in summer. These structural inefficiencies create thermal discomfort for occupants and force households to consume excessive energy to achieve basic thermal comfort, or alternatively, to endure uncomfortable living conditions if, for example, financial constraints limit energy use. This highlights that energy hardship is not solely a function of energy costs or household income but is also shaped by the thermal integrity of the built environment itself. Several participants shared their experiences of poor thermal performance withing their homes:

> *"It leaks heat really well... [Run RCAC] during the day, at least three to four hours just to try and get some heat into the house and hope it sticks around."*
> **Male participant, 30-39 years, private rental**

> *"I could feel the cold air coming from underneath the house all the time."*
> **Female participant, 40-49 years, outright homeowner**

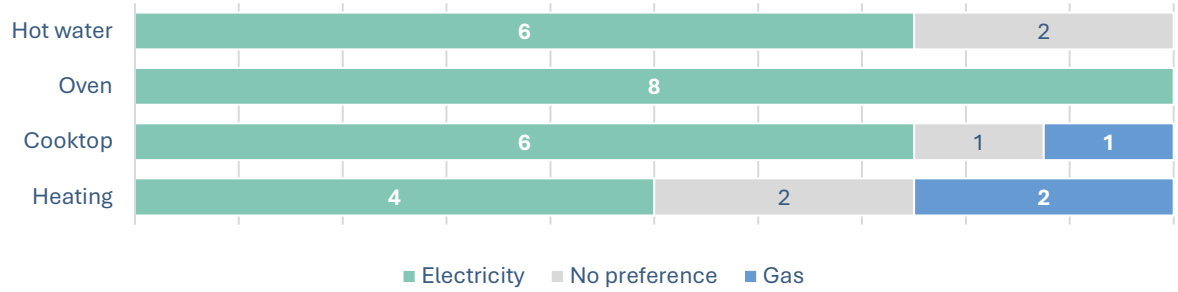
2.4 Energy Preferences and Attitudes

Energy preferences

Generally, gas was not the preferred source of energy (Figure 5).

A strong preference for electric cooktops was displayed, which diverges from previous research (62% gas vs. 24% electricity (Chandrashekeran et al., 2024)) and broader population trends, where an Australian survey found 43% preferred gas stovetops largely on the basis that they perform better (The Australian Institute, 2023). Despite the strong preference for electric hot water systems and cooktops (Figure 5), five participants have a gas hot water system and another five have a gas stovetop.

Figure 5: Energy preferences for different household appliances



Interviews revealed distinct attitudes towards a preference for gas for two households. One household demonstrated strong emotional and experiential attachment to their central gas heating, based on positive associations in their family home. This participant declined the EFCN project offer, with the prospective removal of their gas heating system serving as a primary motivating factor in that decision. However, this household remained open to future renovation and electrifying their appliances on their own timeline, demonstrating that preference does not necessarily equate to opposition.

Another household preferred gas for heating, believing it was more efficient at heating the home. However, the participant also recognised the safety risks associated with gas appliances and was aware that using the gas heater would not be taking advantage of the household's solar power generation during the day, highlighting that it would not make economic sense to use gas appliances:

> *"Now I got the solar panel, so I think it's better to be on electric."*
> **Male participant, 60-69 years, outright homeowner**

Changes in preferences

Interviews revealed that changes in energy preferences occurred as a result of experiences with electrification upgrades. Discussions about new technology exceeding expectations, with preferences and attitudes often being based on preconceived understandings of less efficient, older technology:

> *"The older generation [think] that gas is cheaper than electricity… I think education on that might be important and that the products have improved [compared] to what they used to be"*
> **Female participant, 40-49 years, outright homeowner**

> *"We're talking about we've got satellites and we've got phones and they're all the smart things and we're still cooking on fire."*
> **Male participant, 70-79 years, private rental**

Households with new appliances meant they sometimes needed to adjust their behaviours and practices, which for one household in particular, took a bit of time:

> *"It's a bit of a shift…because we used to be encouraged to use electricity when it was cheapest overnight."*
> **Male participant, 60-69 years, outright homeowner**

However, despite initial preferences for gas appliances, attitudes towards newly installed electric appliances were positive, with participants reporting that the appliances performed as effectively, if not more, than their gas predecessors, while also reducing energy bills and environmental impacts. One participant stated they *"love it"* when asked about their new induction cooktop.

Resistance to change

The interviews also revealed resistance to change as a significant factor influencing electrification, though this was not necessarily characteristic of the participants themselves (rather related to neighbours or people local to the area). Multiple interviewees identified generational patterns of reluctance, particularly among older householders who are less willing to electrify as they are often comfortable with existing appliances, prefer familiar technology or *""…don't want to talk to them…, I don't want anyone in my house""*. As one participant put it:

> *"The problem is, with this town, there's a lot of old people here, and they're sort of happy with what they're doing and what they've got… Older people don't quite like change. They're complacent with what they've got."*
> **Male participant, 70-79 years, private rental**

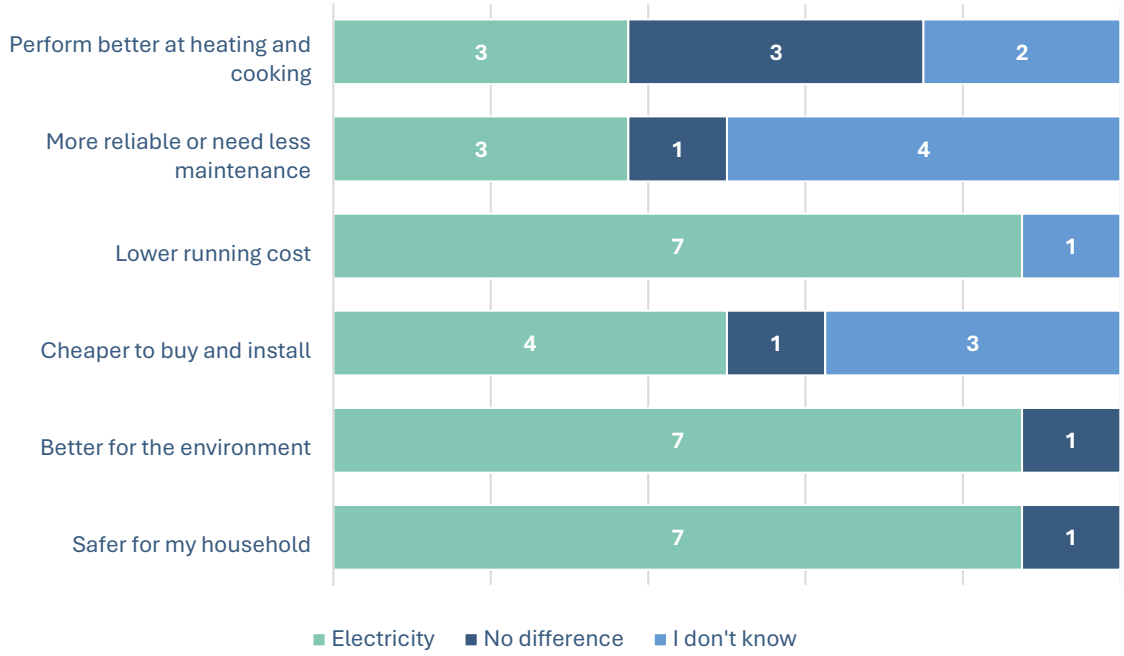
Others echoed this sentiment, noting that "*there are always going to be people that hold on to certain ways of doing things*", and that "*the younger ones are 100% on board. The older ones not.*" This generational dimension was consistently acknowledged across interviews, highlighting a demographic cohort with limited willingness and capacity to pursue household electrification, irrespective of whether financial support programs are available.

Perceptions about gas and electricity

When surveyed about the comparative benefits of gas versus electric appliances across multiple criteria, participants demonstrated a clear preference for electric, with no category in which gas appliances were perceived as more beneficial than their electric counterparts (Figure 6). Three categories emerged as particularly decisive in favour of electric appliances, with seven households (88%) identifying electric systems as superior in terms of lower running costs, environmental performance, and household safety.

Notably, half of the households expressed uncertainty regarding the comparative reliability and maintenance requirements of gas versus electric appliances, potentially pointing to a knowledge gap amongst the participants about appliance performance and care.

Figure 6: Perceived benefits of electric vs gas appliances



2.5 Awareness and Utilisation of Current Programs

Financial support

All households eligible for energy concessions (close to a 17.5% reduction in electricity bills and a reduction in gas bills) were aware of and utilising them. Only one household was not eligible, as they were not low income earners holding a Pensioner Concession Card, Health Care Card, or Veterans' Affairs Gold Card. Through their CSH program, BSL personnel facilitated access to energy concessions for one household who had previously been unaware of the initiative, emphasising the role of trusted intermediaries in connecting households with available support mechanisms.

> *"The lady from BSL helped me to...[get] the discount [to] apply for my utility"*
> **Male participant, 60-69 years, outright homeowner**

Awareness of the Solar Homes Program was also high amongst our participants, with only one household unaware of the program. Access to the program was limited to two participants, who were

homeowners. Two additional participants, while uncertain whether they had accessed the program, would have likely accessed it as part of their upgrades through either CSH or EFCN.

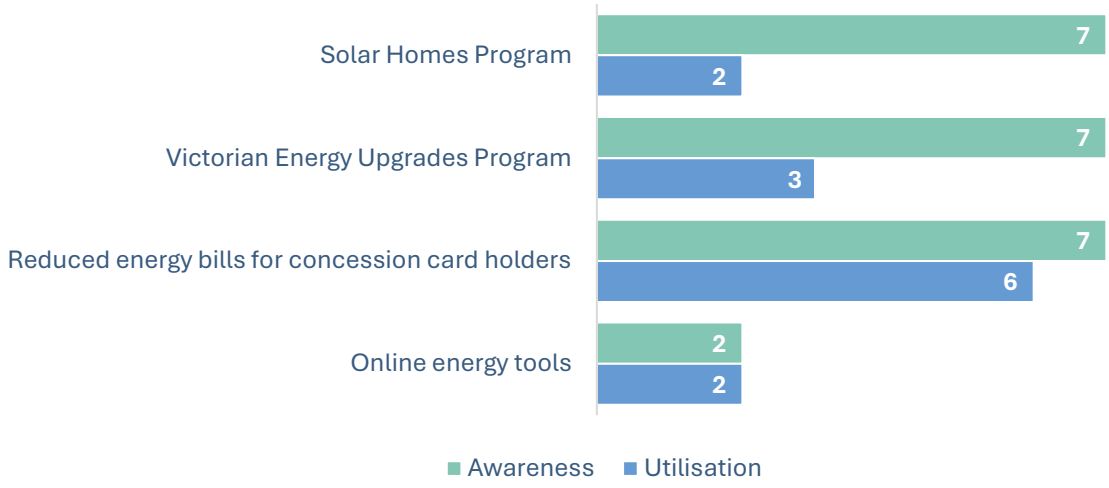
High awareness but low uptake of the VEU program was identified (7 and 3, respectively). Two participants who had heard of the VEU program were uncertain whether they had personally accessed it. Both households were participants in the CSH program, and VEU rebates were likely accessed on their behalf by program intermediaries.

Only one household – self-motivated and environmentally conscious – had independently accessed both VEU and the Solar Homes programs without intermediary support. This contrast highlights how trusted intermediaries can facilitate electrification for households who may lack awareness of specific rebates or the capacity to navigate processes independently.

Of those that were aware of the online tools, only two participants had accessed them. However, this figure is likely understated, as interviews revealed that some households has undertaken detailed search processes to inform their energy-related decisions, which likely included the use of online energy tools.

The lack of awareness for online energy tools could suggest information access barriers and highlights potential gaps between available digital resources and household capacity to locate, navigate and utilise them effectively. Although this is a very small sample, this points to the need for a combination of resources that are accessible and provides user-friendly information on electrification pathways for households.

Figure 7: Awareness and utilisation of energy-related programs



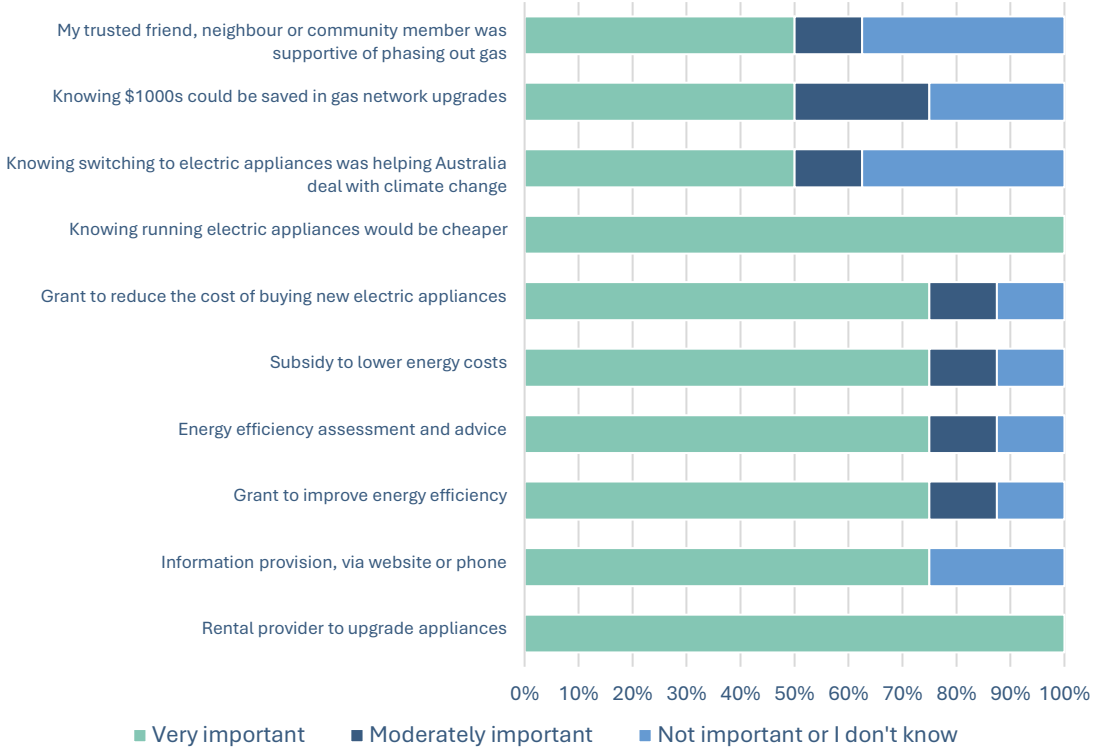
Influence of potential support measures

Survey respondents were asked to rate the importance of potential support measures in enabling household and neighbourhood-level transitions away from gas (Figure 8). Support was strongest for measures offering direct financial benefits, including grants, subsidies and opportunities for reduced energy bills through overall lower running costs, highlighting the importance of economic considerations participants perceived capacity to electrify. Although the sample included only a limited number of renters, these respondents emphasised the critical importance of rental provider-

initiated appliance upgrades in rental properties, again highlighting tenure as a key determinant of electrification feasibility amongst this vulnerable population.

Analysis of information-based measures, such as guidance on how to transition and awareness of neighbour support, revealed more varied responses, suggesting that information alone may be insufficient without corresponding financial or structural enablers. Notably, knowledge that switching could help avoid gas network upgrade expenditure also had mixed levels of importance across households, likely reflecting participant scepticism. While cost avoidance at the network level may be viewed positively, the absence of structural mechanisms to ensure those savings are redistributed to support household transitions across the neighbourhood creates uncertainty about the overall benefits. This finding suggests that clear articulation of how much savings translate into direct household benefits or community reinvestment in electrification support programs will be necessary to effectively motivate and influence households in their future electrification decisions.

Figure 8: Importance of support measures to households

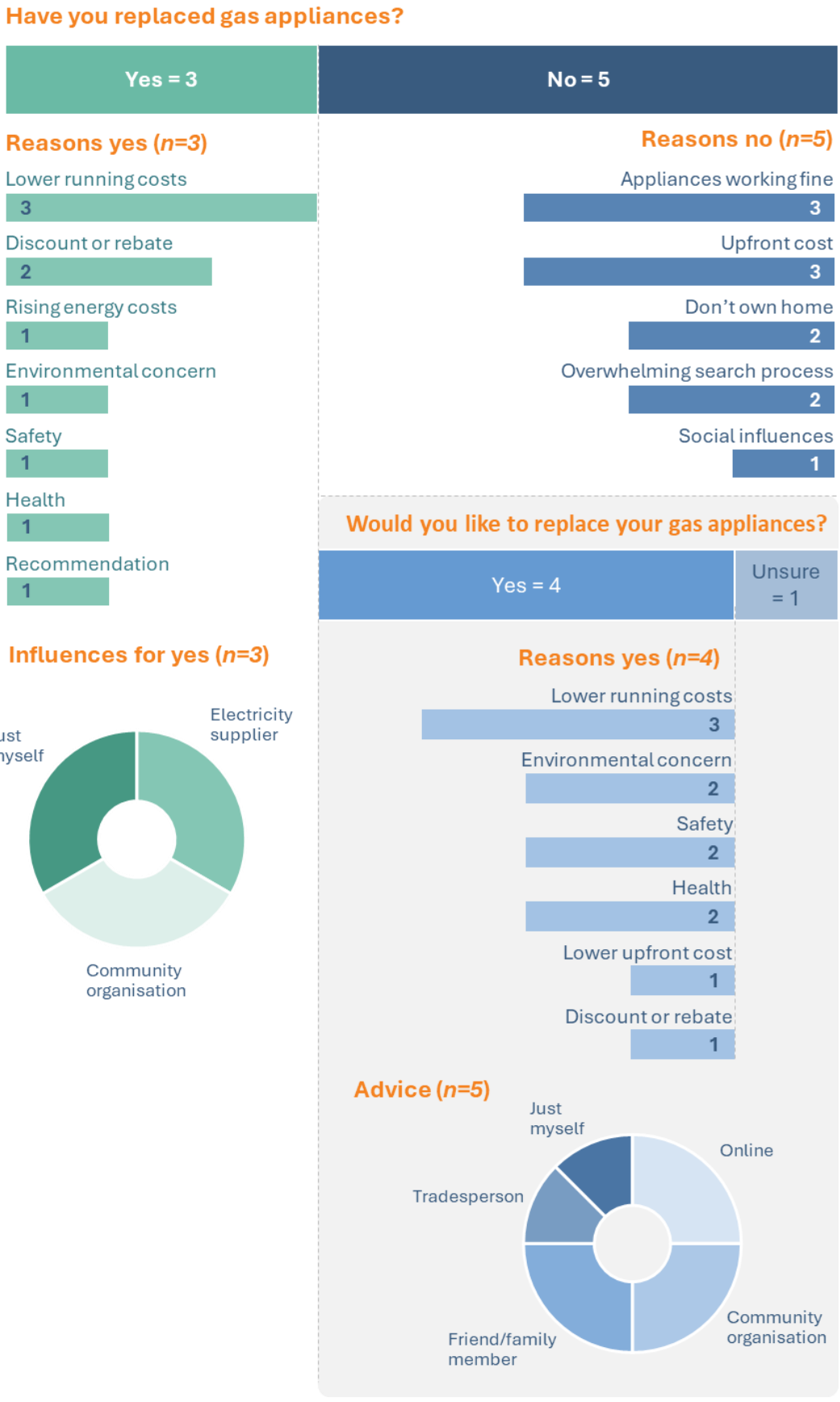


2.6 Appliance Replacement Patterns and Electrification Motivations

Past appliance replacements

Figure 9 provides a summary of survey responses regarding appliance replacements in the last five years, motivations and barriers to electrification, and preferred sources of energy advice.

Figure 9: Household appliance replacement, motivations and influences



Survey responses indicated three households replaced gas appliances with electric alternatives in the past five years, including two EFCN program participants. Replaced gas appliances included heaters, cooktops, hot water systems and ovens. The most common motivations for transitioning to electric were perceived lower running costs and access to discounts or rebates. When asked who or what influenced their replacement decisions, responses revealed diverse patterns including community organisations, electricity suppliers or self-directed decision-making without external influence.

The most common reason for not upgrading was that existing gas appliances were in working order, indicating that proactive planned appliance switching appliances is less common and replacement typically occurs reactively following appliance failure. Upfront cost emerged as a significant barrier to electrification. Both renting households indicated housing tenure as a constraint for upgrading appliances.

Of the five participants who had not switched their gas appliances, four reported that they would like to do so in the next five years. All four identified lower operating costs as a driver, reflecting economic considerations as a key element to electrification decision-making. Environmental benefits, safety concerns, and health factors were also reported as motivations. When asked where they would seek energy advice, participants most commonly identified online resources, friends or family members and community organisations as preferred information sources. Notably, only one household indicated they would consult a tradesperson, potentially reflecting limited trust in industry professionals. This suggests that informal knowledge networks and self-directed research represent trusted pathways for energy decision-making among these households.

Economic, environmental and health factors

Economic considerations

Survey data showed that three of the five participants who had not replaced gas appliances reported upfront costs as a barrier. However, interview data revealed that upfront costs constrained even households that had successfully electrified multiple appliances, with one stating:

> *"It cost us a hell of a lot to get it done and installed."*
> **Male participant, 60-69 years, outright homeowner**

Among those planning future replacements, lower running costs was a key motivator (80%). One household noted that electric appliance costs would be lower than like-for-like gas replacement, creating switching incentives at least at time of replacement. Another recognised that transitioning to electric would enable access to government rebates and discounts on offer, further reducing upfront costs.

Environmental motivations and constraints

Interviews demonstrated strong environmental awareness, with participants recognising environmental benefits of electric over gas appliances:

> *"I would rather it be moved to something like that, that's more ecologically conscious and better for the long term future than...upgrading something that is probably going to, ideally, be gone in the near future itself anyway"*
> **Male participant, 30-39 years, private rental**

> *"...it's cleaner energy... Gas isn't clean energy"*
> **Male participant, 70-79 years, private rental**

However, capacity to act on environmental motivations was often constrained by financial limitations, life course and housing tenure:

> *"...with four kids, you can't – and... if you're not... having got a well-paid job, you can't really afford to be environmentally friendly"*
> **Female participant, 70-79 years, outright homeowner**

Health and safety factors

Health and safety considerations emerged in interviews as significant factors shaping gas appliance perceptions. Concerns included the air quality impacts of gas and potential poisoning risks, adverse respiratory effects for household members with asthma, fire hazards from open flames on gas stovetops, and the explosion risk of gas heating systems – a risk that came to fruition for one participant. As explored in Section 4.3, health-related concerns function paradoxically both as motivators for and, in certain contexts, barriers to electrification.

Household energy journeys

The following household energy journeys illustrate diverse pathways, motivations and barriers to appliance replacement and electrification, revealing how individual circumstances and values, support systems and trusted intermediaries shape household energy transitions. All names are pseudonyms.

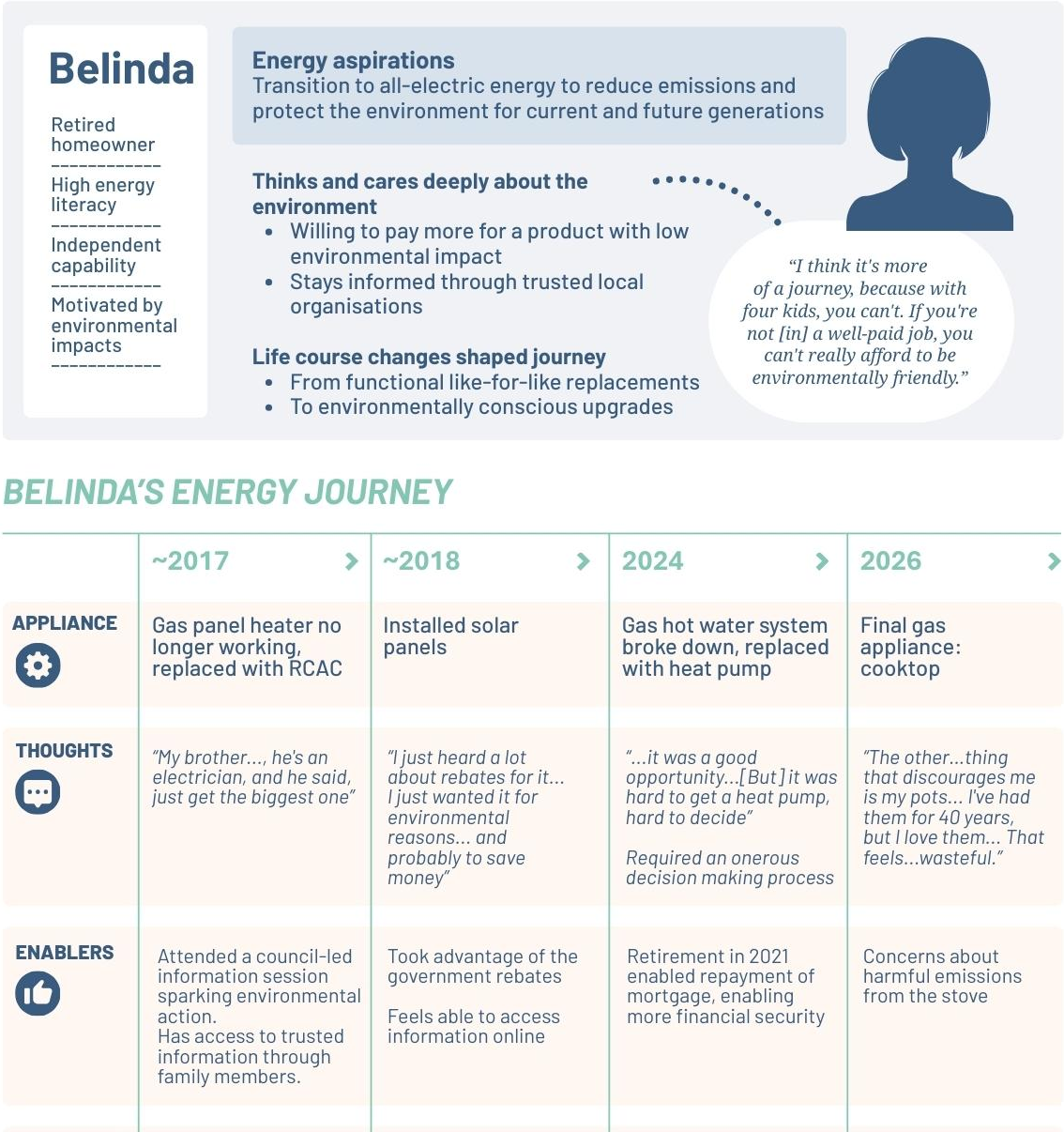
Progressive household electrification

Interview data revealed that two of the four St Albans households had undertaken electrification upgrades[14]. Both demonstrated progressive, incremental transitions over time, with each retaining only one gas appliance. These households were characterised as environmentally conscious and self-motivated to electrify. One household required access to financial support programs to proceed due to financial stress. For this household, upgrade timing predominantly aligned with necessity-driven replacement cycles when appliances failed or reached end-of-life, creating opportune moments for electrification investment.

Another household with high digital and energy literacy independently navigated government rebate systems and research processes to electrify, drawing on information from trusted local organisations, online resources and social networks. Being a retiree she had time to research environmental aspects and the resources to prioritise environmental impact over cost savings. Belinda's journey, detailed in Figure 10, illustrates how even highly motivated and capable households face complex hidden and emotional barriers in the final stages of transition. The hidden costs of complete electrification proved a barrier for Belinda, such as the costs retrofitting the kitchen for a new stovetop, as did letting go of cherished 40-year-old cookware.

[14] Includes participants who have converted gas appliances to electric appliances.

Figure 10: Environmental motivation constrained by hidden barriers



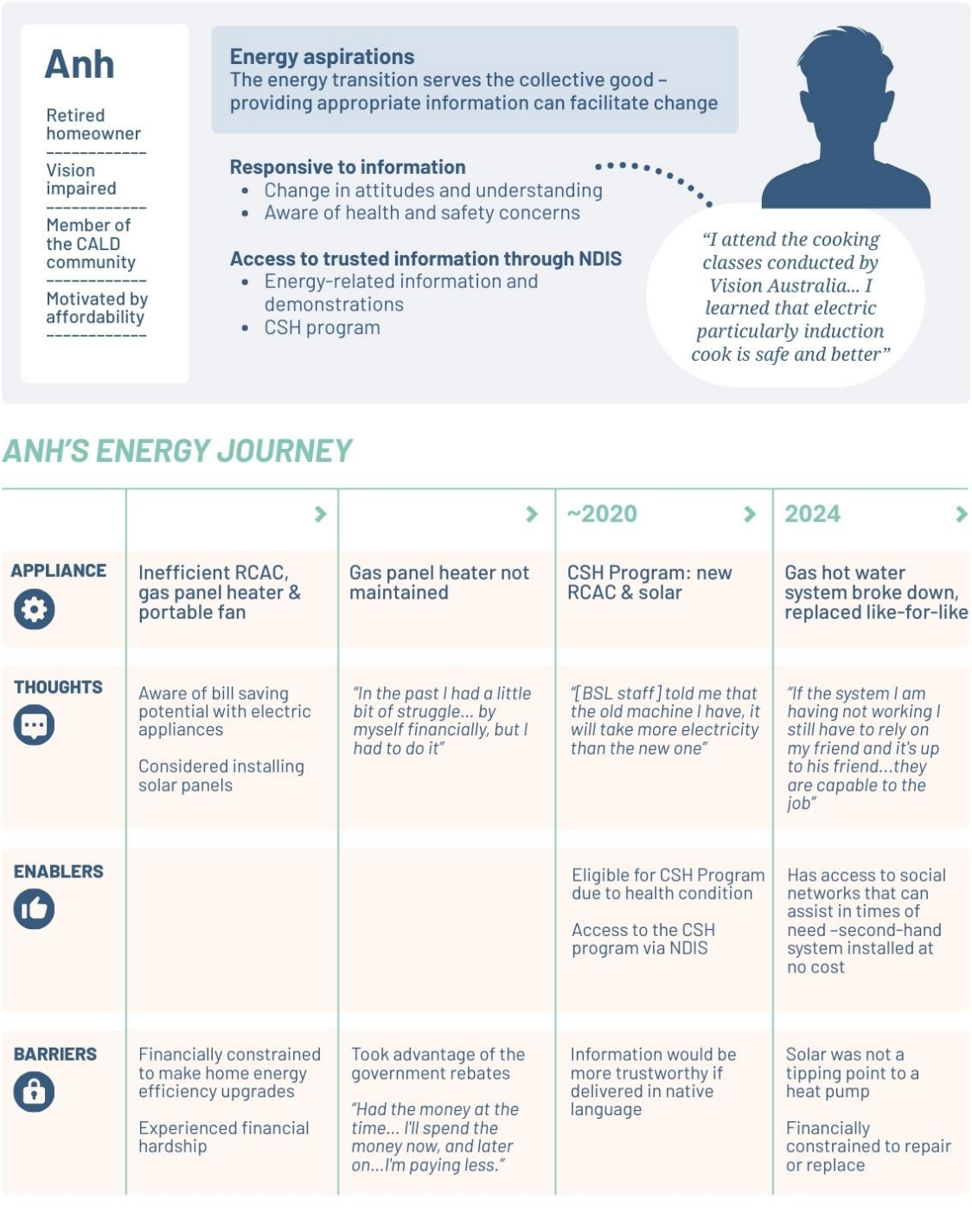
Energy efficiency improvements

Two households pursued energy efficiency measures without replacing gas appliances.

A retired vision-impaired homeowner, Anh, from a CALD background with relatively low digital and energy literacy, depended on culturally appropriate support through trusted intermediaries to enable their electrification journey (see Figure 11). The CSH program enabled installation of a new RCAC and solar panels, substantially improving thermal comfort and reducing energy bills.

This participant was reliant on financial support programs to enable these upgrades and would not have done so otherwise. Interviews revealed that this household depended on their social relations for appliance maintenance and repairs, indicating that future electrification decisions would be dependent upon advice from these informal support networks and upfront cost would be a key determining factor.

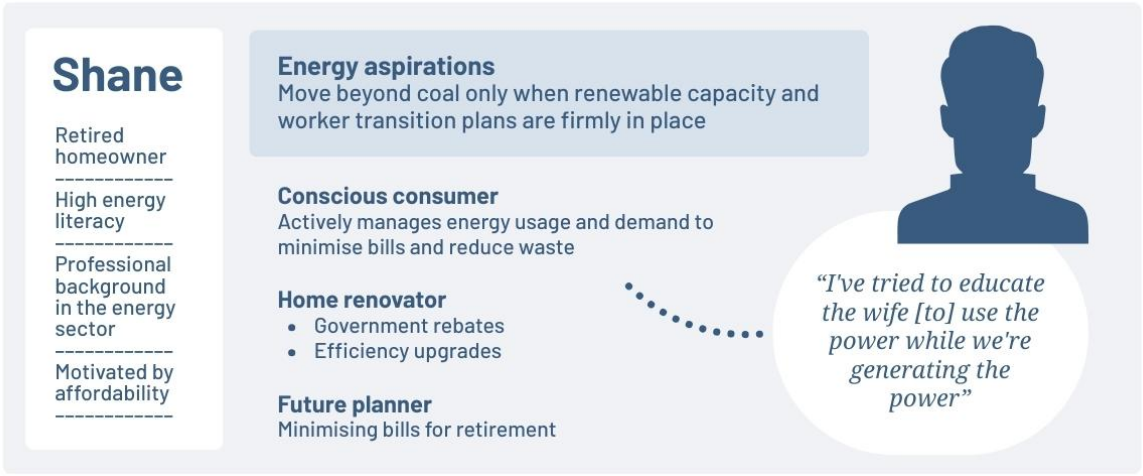
Figure 11: Electrification through trusted intermediaries



A retired homeowner, Shane, with professional energy sector experience, exemplified a staged approach to home improvement. In anticipation of retirement. they sought to reduce ongoing energy

costs (see Figure 12). As continuous home renovators, they incrementally upgraded insulation, installed RCACs, and added solar panels to enhance comfort and efficiency and capitalise upon government rebates. However, Shane never conceptualised these actions as part of an electrification pathway. Coming from a region where heating was essential and gas was the norm, Shane assumed gas was the best heating option: *"I never actually thought about getting off gas… Everybody I know had natural gas heating.*" This case illustrates how energy efficiency and renewable energy adoption can occur as part of broader renovation strategies without necessarily being framed as 'electrification' by households themselves. It also shows that electrification is not necessarily a linear unidirectional process, and that pro-electrification actions like solar panel installation, can be followed by the installation of central gas heating.

Figure 12: Progressive home renovation without electrification intent



SHANE'S ENERGY JOURNEY

	2005–2010	2015	2020	2024
APPLIANCE	Installed RCAC	Installed solar panels	Gas ducted heating	EFCN Project: full home electrification
THOUGHTS	Installed RCAC mainly for cooling, relied on wood fireplace for heating	"...get myself into a space that when I was retired, that I was cutting all the energy bills down as low as I possibly could."	*"...get myself into a space that when I was retired, that I was cutting all the energy bills down as low as I possibly could."*	*"I just thought it was some sort of scam going around at the time. And then I started talking with a few people on the street..."*
ENABLERS	Home renovations enabled energy efficiency upgrades: • 2 x RCACs • Insulation	Took advantage of the government rebates *"Had the money at the time... I'll spend the money now, and later on...I'm paying less."*	Replacement of fireplace as the main source of heating due to: • Aging • Cost	Had access to trusted information through social networks. Access to a generator; no concerns during blackouts
BARRIERS			Solar was not a tipping point to electric heating: *"I come from the era of heating was always dearer and gas was cheaper..."*	Initial lack of trust and scepticism towards fully funded upgrades

3 Strategic Decommissioning: Attitudes and Feasibility

3.1 Attitudes Towards Transition in Victoria

Six of eight households surveyed strongly supported government efforts to reduce residential gas consumption and home electrification over the next 30 years:

> *"If you ask me and I have to replace anything, it's definitely electricity."*
> **Female participant, 50-59 years, outright homeowner**

One household expressed disbelief that gas was still being used in homes:

> *"...it's old, it's old technology... To light a flame, a house of kids, a light a flame to cook, it's wrong."*
> **Male participant, 70-79 years, private rental**

Two were neutral including the one participant who refused the EFCN program offer. The other respondent expressed qualified support, contingent upon renewable energy sources being available when needed, and just transitions for workers in coal-fired power stations:

> *"So, it's not just about what's the cheapest way to decarbonise. It's also about what the consequences and impacts, particularly at a local level, are."*
> **Male participant, 60-69 years, outright homeowner**

Households recognised clear benefits of electric appliances including environmental, health, financial, thermal comfort and safety. Interview responses identified bill savings and financial benefits as key drivers for electrification amongst households. Environmental benefits were the top priority for one household. The motivations identified through our interviews complement the survey findings presented in Figure 9.

3.2 Redirecting Gas Network Funds to Support Household Electrification

Interview participants were presented with a hypothetical scenario to explore attitudes toward local area electrification as an alternative to planned gas network upgrades (see to Appendix E Gas network decommissioning scenario).

Strong initial support

Prima facie there were positive attitudes towards the scenario option to avoid gas network expenditure at a very local scale and redirect funds for electrification of the affected homes.

Participants described the approach as making "*perfect sense*" and representing substantial cost savings, with one noting the network expenditure was "*a lot of money considering it wouldn't cost that much to upgrade a house to all electric.*" Environmental motivations were also prominent, with one participant stating:

> *"Absolutely. I mean if there's a better, more ecological way of doing it, absolutely go for it. 100% agree with it."*

Male participant, 30-39 years, private rental

Other emphasised the transition away from gas as the future direction:

> *"…if everyone's going to be switching further towards electricity, then it's pointless to be upgrading the gas."*
> **Female participant, 40-49 years, outright homeowner**

> *"Absolutely, 100%. I would rather it be moved to something like that that's more ecologically conscious and better for the long-term future than, you know, upgrading something that is probably going to ideally be gone in the near future itself anyway."*
> **Male participant, 30-39 years, private rental**

Two respondents were more cautious in their support, conditional on sufficient renewable energy capacity being available to support increased electricity demand and acknowledgment that the scenario represented an ideal rather than guaranteed outcome:

> *"Well, it's got them off the gas, and as long as if they get them onto the electricity, as long as we've got enough renewables to get them people onto the electricity, well, why not?"*
> **Male participant, 60-69 years, outright homeowner**

> *"Yeah, in a perfect world. Yeah, that does seem like that'd be a good…way of going about things."*
> **Male participant, 18-24 years, homeowner with mortgage**

Household choice vs a mandatory approach

Upon further discussion, questions emerged about whether residual households who were reluctant to disconnect from gas should be made to do so, recognising that an avoided upgrade would require everyone in the affected area to willingly switch away from gas (or to bottled gas as an alternative). When asked what should happen if there were a very small number of households, or even a single household, not wanting to fully electrify, support for mandating residual households to electrify in this scenario was equivocal and qualified.

Some participants endorsed information-led persuasion and positive neighbourhood-level encouragement:

> *"I think it depends on the information. If they got the information and they understand about the benefits, they will move, they will change…. I agree [they need] to be encouraged"*
> **Male participant, 60-69 years, outright homeowner**

> *"You're never going to be able to convince 100% of people, but you should try as much as you can to sell the argument in a positive light."*
> **Male participant, 30-39 years, private rental**

> *"I agree that there should be pressure put on them to say: 'Hang on, we're all doing it, and if you don't do it, it won't happen.' But there should be meetings and stuff about that…and clarify the value they're getting and how it's going to change them."*
> **Male participant, 70-79 years, private rental**

One household assumed that the impact of not opting for electrification could be reflected in bills:

> *"Just bump up their bills so that they have to get off…So they're going to have this massive gas bill and that's going to give them incentive to go off it. I don't think we need to make laws or regulations that tell people that they have to do something."*
> **Female participant, 70-79 years, outright homeowner**

While this reflects the reality that bills increase at a network-wide level as customers leave the gas system, such cost increases are not visible at the local neighbourhood level due to how gas network costs are socialised across the entire customer base.

Another participant indicated support for mandates, stating *"I'd be mandating it"* when resistance was based purely on personal preference rather than legitimate constraints such as health conditions, financial hardship, tenure or other substantive barriers to electrification. However, their position was immediately qualified with equity concerns by indicating that mandating households to electrify would not be fair for low-income households stating that "*they should definitely be given support*".

However, majority of households expressed discomfort with forcing reluctant households to shift away from gas, highlighting concerns about fairness, agency, imposing costs and disruption on others, and resistance to top-down mandates:

> *"I don't like being told things"*
> **Male participant, 60-69 years, outright homeowner**

> *"I wouldn't like to pressure anyone"*
> **Landlord of several properties eligible for the EFCN offer**

> *"It's a hard thing to make people do something"*
> **Male participant, 70-79 years, private rental**

One participant further empathised with potential holdouts:

> *"If we were the one that didn't really want to swap over from gas to electric… I really wouldn't want to be asked to pay for it to electrify everything."*
> **Male participant, 18-24 years, homeowner with mortgage**

Initial enthusiasm for the strategic decommissioning concept contrasts sharply with discomfort about implementation mechanisms that compromise household agency or impose costs on vulnerable households.

3.3 Who Should Pay?

On the question of who should bear the cost of area-level electrification to avoid gas pipeline expenditure, all participants acknowledged that this was a difficult question to answer, with views evolving throughout the discussion. There was some support for the gas networks bearing the cost, but support was qualified when we explained that ultimately that cost would be borne by the remaining gas customers.

Responses broadly fell into three categories, reflecting emphases on government responsibility, industry contribution and household capacity:

- Government-electricity industry partnership;
- Government funding or individual contribution only when supported by subsidies or incentives; and
- Cost-sharing.

Government-electricity industry partnership

Multiple participants believed costs should be shared between government and the electricity sector, with one household describing the ideal as:

> *"...the electric company and the government do it as a joint venture."*
> **Male participant, 30-39 years, private rental**

Multiple participants argued that contribution from electricity companies to household upgrade costs was justified by direct commercial benefit. As households transition from gas, electricity distributors gain expanded customer bases and increased consumption, resulting in "*a boost in revenue*". As one participant noted, the shift away from gas means "*less money in their pocket, more money in the electric company*" when justifying electricity sector investment in household electrification support. Another argued:

> *"[Electricity companies could] recover with their bills...in the first three or four years by small increments because they'll have that many customers."*
> **Male participant, 70-79 years, private rental**

Participants viewed government involvement as essential but differed in their understanding of what form this should take. Some participants emphasised the need for direct government financial contributions to support household electrification, reflecting expectations that government should enable equitable transitions through funding assistance. However, one participant articulated a more nuanced perspective, recognising that fiscal constraints limit government capacity for sole funding responsibility. This participant emphasised that government should focus on coordination and strategic planning for energy transitions:

> *"They must have a plan...It's just saying: 'Well, that's the way we're going to go...There's no real backup...It's just like we're (the government) going to knock all these power stations down and build windmills'."*
> **Male participant, 70-79 years, private rental**

These perspectives suggest that while government should take responsibility for planning and coordinating energy transitions the reality of limited public funds necessitates industry contributions, particularly from electricity companies positioned to benefit from increased customer demand.

Government funding or individual contributions with support

Three participants emphasised individual household responsibility, though they all qualified this with the need for incentives and targeted government or industry support to enable participation:

> *"I think the government should help because it's got an effect. If those people can save money, they're going to put money back into the community."*
> **Female participant, 50-59 years, outright homeowner**

Participants suggested the following support mechanisms to facilitate household electrification:

- **Scaled financial support:** Participants suggested tiered or means-responsive assistance – such as subsidies or incentives that adjust according to household income or ability to pay – to ensure that support is fair and accessible.
- **Accessible finance options:** Accessible financing mechanisms – such as instalment payment plans or low-interest loans – emerged as essential support infrastructure, with participants describing willingness to self-fund upgrades if financing options were available:

> *"I would have been willing to pay [upgrades] off, definitely... It's just I didn't have access to getting that."*
> **Female participant, 40-49 years, outright homeowner**

Recognition of household financial diversity was prominent in these responses. One participant observed:

> *"Alongside a street there are combinations of people...some they can afford to spend more, some they are very poor."*
> **Male participant, 60-69 years, outright homeowner**

This recognition shaped perspectives on cost allocation models. Households experiencing financial hardship were identified as necessarily dependent on government support mechanisms to enable electrification participation, while more affluent households were viewed as possessing greater capacity for direct financial contribution. However, participants also identified that financial capacity does not automatically translate to willingness to pay – even higher-income households respond to financial incentives and may resist upgrades where personal cost advantages are not clearly demonstrated:

> *"I think people with money still want to save money"*
> **Female participant, 70-79 years, outright homeowner**

> *"The rich people they definitely can, but they may object to it."*
> **Male participant, 60-69 years, outright homeowner**

This suggests that universal financial incentive structures, rather than income-targeted support alone, may be necessary to maximise voluntary participation across diverse socioeconomic contexts.

Scepticism associated with voluntary individual action was prominent. One participant stated:

> *"I just don't see the people are going to do it themselves unless they're ecologically minded individuals themselves."*
> **Male participant, 30-39 years, private rental**

Housing tenure emerged as a barrier (further discussed in Section 4.2), with one participant noting the impossibility of achieving comprehensive transitions:

> *"There's no way a renter can pay for it. I don't think the landlords are that interested in paying for it, unless the renters pay more rent and the government can't afford it."*
> **Male participant, 70-79 years, private rental**

Cost-sharing

One participant proposed distributing costs universally across both gas and electricity network users, arguing this approach was equitable given ongoing infrastructure maintenance regardless of energy source:

> *"...just distribute the cost across both electricity and gas. That's fair because now the grid is like, getting taxed and then you will need to maintain that."*
> **Female participant, 50-59 years, outright homeowner**

This participant also emphasised that broad cost-sharing would reduce individual burden:

> *"...if everybody chips in, the cost comes right down."*
> **Female participant, 50-59 years, outright homeowner**

Conceptual appeal: Recognises that the energy transition generates both winners and losers; socialising costs may be more equitable than concentrating financial burden on specific geographic areas or demographic groups affected by network planning decisions.

Implementation challenge: Universal cost-sharing presents practical challenges within existing regulatory frameworks that separate gas and electricity network cost recovery mechanisms.

4 Findings and Implications

While policy discussions about electrification often focus on technical and economic feasibility and environmental benefits, our research reveals a far more complex landscape of financial constraints, information barriers, relationship dynamics, and life circumstances that shape whether and how vulnerable households can participate in the energy transition.

Through interviews with participants several critical themes emerged that challenge conventional cost benefit assumptions about residential electrification and highlight the specific barriers as well as the strengths and enablers for lower income communities. These themes reveal that the path to electrification is not simply a matter of technology adoption of financial incentives, although these are important, but is deeply embedded in the social, economic, spatial and relational contexts of people's lives.

4.1 Household Adaptive Capacity

Adaptive capacity for electrification is shaped by a combination of factors including the resources available (assets); information contexts (learning); ability to influence change (agency); and ability to change strategies or alter practices (flexibility) (Chandrashekeran et al., 2024). Amongst our participants, indicators of higher adaptive capacity included tenure and outright ownership, strong environmental motivation, sophisticated search and learning processes, willingness to draw on diverse formal and informal supports, and ability to make decisions and execute change. Search and learning processes were linked to financial position and home ownership, but also life stage and time availability. Environmental drivers for electrification significantly enhanced adaptive capacity, translating into constructive, forward-looking energy upgrade planning.

Lower relative adaptive capacity and higher vulnerability were impacted by financial constraints (particularly upfront costs), disability, limited face-to-face and digital interactions, and language barriers. Intermediaries including government service agencies and social welfare organisations were enabling factors, with information provision helping households access upgrades and understand benefits on financial, health, and safety grounds.

Renters had more limited agency. Despite strong financial and environmental drivers and high awareness of available supports, renters were not on pathways towards electrification. Concerns about requesting too much and jeopardising affordable rent constrained action, though very close landlord relationships could enhance agency.

Some cases demonstrated high energy vulnerability but relatively high adaptive capacity. Vulnerability related to age, chronic health problems, home-bound routines, and limited financial capital for upfront costs. However, outright ownership, high awareness of resources, strong communication skills, and high energy literacy could offset these vulnerabilities. Personal circumstances including health conditions, caring responsibilities, and past trauma significantly shaped everyday mobility, social relations, and sense of security. Notably, participants with high adaptive capacity and motivation could become local champions, benefiting program recruitment – collective benefits not well captured in household-focused frameworks.

Implication

- **Targeted outreach and supports for renters and other households with low adaptive capacity are needed**

- **Leverage intermediaries for vulnerable groups, and consider community-level mechanisms to activate high-capacity households as local champions**

4.2 The Rental Triangle: Navigating Split Incentives

Recruitment challenges

The challenges facing renters emerged as one of the most intractable barriers to electrification. Recruitment of renter participants proved difficult, with only one renter successfully recruited in the St Albans area. Similar challenges were reported for the EFCN program itself, with one homeowner participant describing their unsuccessful attempts to encourage renter participation on their street:

> *"I contacted their real estate agents to try and get [them] onboard and let the owners know... I just find it shocking that...the real estate agents or the landlords won't do these upgrades"*
> **Female participant, 40-49 years, outright homeowner**

Tenants, landlords and property managers

Interviews revealed a complex three-way dynamic between tenants, landlords and property managers, where misaligned incentives, power imbalances, and communication breakdowns effectively prevent energy upgrades:

- **Tenants:** Experience the highest energy cost burden and would benefit from efficient electric appliances reducing bills, yet cannot make improvements to properties they do not own. Lack agency to initiate upgrades without landlord approval.
- **Landlords:** Bear upfront costs for appliance upgrades but capture limited direct financial benefit, as reduced energy bills accrue to tenants. May be unaware of available free upgrade programs or perceive administrative burden outweighs uncertain returns.
- **Property managers:** Focused on minimising property disruption and maintaining landlord relationships, often acting as gatekeepers.

This 'rental triangle' reveals how housing tenure fundamentally shapes access to electrification, with those in the most precarious housing situations facing the greatest barriers. These findings reinforce identified in our previous research (Chandrashekeran et al., 2024).

The role of property managers was not explored in the research but is worth further exploration in follow up projects.

Landlord-tenant dynamics

Beyond the structural barriers posed by the rental triangle, the nature of landlord-tenant relationships shapes the feasibility of electrification. Three distinct landlord-tenant relationship typologies emerged:

- **Pragmatic engagement:** Landlords willing to undertake improvements when economically rational or required by regulation.
- **Relational engagement:** Landlord is a friend or family member, or has direct, positive communication with their tenant, potentially enabling more flexible negotiation around property modifications.
- **Minimal engagement:** Limited direct landlord-tenant interaction, with communication primarily mediated through property managers.

Where we did manage to interview renters, the landlord-tenant relationship fell within the relational engagement category, characterised by less distanced and in one of the two cases, very close. In the latter case this sense of care and reciprocity in the tenant-landlord relationship translated into long term tenure for the tenant expecting to remain in the property indefinitely. The other maintained a direct, positive relationship with their property manager and landlord. However, even within these relational proximity could not overcome the split incentive dynamic. Both tenants were appreciative of their landlords' efforts to keep the rent affordable and were reluctant to ask for costly upgrades. One participant was discouraged by the *"trade off between... having... a very reasonable rent, not rocking the boat too much"*. While another was unwilling to burden the landlord with the installation costs:

> *"I don't want to put him under any expense because he's looking after me"*
> **Male participant, 70-79 years, private rental**

A landlord in Morwell who is part of the EFCN program represented pragmatic engagement and was already on a path to electrification in his multiple properties through upgrading to electrical appliances at end-of-life. Upgrades were motivated by the durability of the product, warranty and simplicity, and the availability of reliable electricians. This case suggests that some landlords may be receptive to electrification when framed around asset management and maintenance efficiency rather than tenant energy cost reduction.

Social housing: an exception with scale potential

However, there are exceptions. For area level decommissioning, clustered social housing presents opportunities to scale up electrification because there is a single responsible 'landlord'. Whilst there have been institutional challenges to securing participation of social housing in the local area, there was support for the upgrades from social housing renters. An EFCN engagement officer reported:

> *"...there were a lot of houses where [the public housing tenants] were super keen to get upgrades with like solar and things like that. Many of them said that we've been, we've gone 10-20 years without receiving anything from... the department. The last thing we got was a gas heater."*
> **EFCN Project Officer**

This suggests that social housing electrification could yield both immediate tenant benefits and demonstrate viable pathways for area-level transitions, though coordination remains a critical implementation challenge.

Implication

- **Prioritise social housing upgrades as scalable transition pathways**
- **Develop landlord incentives and supports**
- **Communicate landlord value strategically to emphasise sound asset management and property uplift**
- **Create energy performance disclosure requirements and further develop minimum energy efficiency rental standards**

4.3 Life Course and Housing Journeys: Timing Matters

Our interviews revealed that decisions about energy upgrades do not occur in isolation but are deeply embedded in participants' broader life circumstances and housing trajectories. Electrification opportunities and constraints shift dramatically across different life stages and housing transitions –

moving house, retirement, health events, employment changes, or major repairs all create windows of opportunity or additional barriers. One participant declined the fully-funded EFCN offer, preferring to integrate electrification into their own planned renovation timeline:

> *"Because eventually we're renovating anyway and the stuff [the EFCN project] was doing it just like, oh, well, if we're renovating and everything, I'll just do it when that comes around… then we'll just replace it with an electric one."*
> **Male participant, 18-24 years, homeowner with mortgage**

For another participant the financial benefits of electrification made sense in the context of their life course and planning for retirement. This is a related but slightly different decision-making calculus to the traditional return on investment or payback period:

> *"…well, really at the end of the day, it was a case of I had the money at the time. I was sort of trying to get myself into a space that when I was retired, that I was cutting all the energy bills down as low as I possibly could. I'll spend the money now, and later on…I'm paying less."*
> **Male participant, 60-69 years, outright homeowner**

It is possible to imagine a similar set of considerations for adults planning a family with reduced earnings due to caring responsibilities, for example.

Participants made decisions about energy within the context of complex, often unstable housing journeys, where short-term tenancies, uncertainty about future moves, or more pressing household needs took precedence. Understanding these temporal dimensions helps explain why even engaged and informed households may not act on electrification opportunities.

An important context for the participants' decision-making was the dominant discourse at the time they made decisions about appliances and housing. A number of participants reflected on how the narrative around gas had changed over time. Older participants reflected on the positioning of gas as a clean 'natural' fuel in the 1980s and beyond, and active state-led campaigns to encourage gas use. Even until fairly recently gas has been recommended as a cheaper source of energy, particularly for hot water:

> *"I come from the era of [electricity] was always dearer and gas was cheaper…"*
> **Male participant, 60-69 years, outright homeowner**

This has translated into landlords being encouraged to install gas hot water systems to lower household energy bills. Indeed, even in the mid-2010s when there were incentives to install solar, gas was still being promoted on environmental and affordability grounds by governments.[15] It is important to see the views and choices of participants in light of this evolving conversation around gas and changing societal perspectives on the role of gas in the energy mix. As one participant reflected:

> *"…when we got the gas, that was just prior to the big push that gas was going up and… just before gas became a dirty word."*
> **Male participant, 60-69 years, outright homeowner**

[15] An example is the agreement made in October 2014 between Tas Gas Retail and Regional Development Victoria, a Victorian government agency, which committed to connecting 10 regional Victorian towns to reticulated gas networks. Works extended over several years, with some connections not completed until as late as 2021 [see Media Release].

Health conditions enable and constrain electrification

Health emerged as a multifaceted factor in household electrification decisions, functioning simultaneously as a motivator for transitioning away from gas appliances and, paradoxically, as a barrier that constrained energy-related decisions for some participants. The presence of health conditions not only heightened household awareness of gas-related risks but also created pathways to specialised service providers who could facilitate referrals to electrification advice and support programs. However, health issues also increased energy vulnerability and, in some cases, limited household capacity to pursue appliance upgrades.

Health conditions as a motivator

Households identified health conditions as a significant driver in decisions to either fully electrify their homes or reduce reliance on gas appliances where complete electrification was not immediately feasible.

Asthma and indoor air quality: For households with members experiencing asthma or other respiratory conditions, gas appliances represent a persistent health burden. Gas stoves and heaters (particularly those without a flue) emit pollutants directly into living spaces, which can trigger asthma attacks and worsen symptoms (Ewald et al., 2022). One household stated that having gas appliances indoors was "*a big no no*" due to the health risks associated with one member being a "*bad asthmatic*". Without adequate ventilation – a challenge in many homes, particularly challenging during colder months when windows remain closed – these pollutants accumulate, creating ongoing exposure that cannot be easily avoided. For these households, electrification offers a direct pathway to reducing indoor air pollution and improving daily respiratory health, while also eliminating the risk of potentially fatal poisoning from gas appliances.

Vision impairment and cooking safety: One participant with vision impairment was introduced to induction cooking through a demonstration facilitated by Vision Australia. This experience enabled the participant to recognise the safety risks associated with gas stovetop cooking, particularly the hazard of inadvertently leaving burners ignited – a scenario that poses significant risks of fire, property damage, and personal injury when visual confirmation is not possible. Induction technology emerged as the safest cooking option, with electric coil or radiant stovetops also posing safety concerns due to retained heat:

> *"I attend[ed] the cooking classes conducted by Vision Australia and I learned that electric particularly induction cook[ing] is safe and better."*
> **Male participant, 60-69 years, outright homeowner**

Although financial constraints and limited household cooking meant the participant had not personally transitioned to an induction cooktop, the awareness gained through this intervention enhanced their adaptive capacity and informed decision-making regarding electric appliances. This finding has broader applicability for households with young children or other situations where unattended gas cooktops present elevated safety risks.

Health conditions as a barrier

Health conditions also functioned as significant barriers to electrification, limiting decision-making capacity and, in the case of the EFCN program, preventing participation despite eligibility.

Diabetes and food access: One household with diabetes declined the EFCN offer due to concerns about cooking access during power outages. The participant explained that as a diabetic, *"she can't go without having food cooked and so she would be resistant to getting off gas cooktop"*. Notably, this household did not express a preference for gas cooking per se; rather, their concern centred on energy reliability. This case underscores the importance of incorporating resilience measures – such as

battery storage or backup generation – into household electrification programs to address legitimate energy security concerns for health-vulnerable populations.

Old age and hot water demand: Another household with an elderly couple requiring approximately *"five hours of continuous hot water flow per day"* from an instantaneous gas system presented a different technological challenge. Their hot water consumption, comparable to that of an aged care facility, exceeded the capacity of available heat pump systems. Although the household expressed openness to participating in the EFCN program, current heat pump technology could not adequately meet their hot water requirements, revealing a gap in available electrification solutions for households with intensive care needs.

Mental health and decision-making capacity: The cognitive burden of energy-related decisions represents a substantial, yet often overlooked, barrier to household electrification. Multiple households described the decision-making process as overwhelming, as discussed in Section 4.5. For households experiencing mental health challenges or cognitive difficulties, this burden becomes even more acute. One household exemplified this dynamic: despite having only one gas appliance remaining, the participant has been unable to complete their electrification journey due to experiencing *"brain... fog"* and *"not being able to really focus and concentrate on it properly"*.

Implication

- **Electrification programs must be designed with flexible entry points and coordinated referral pathways that recognise housing-health-energy intersections**
- **Electrification support needs to be accessible through existing touchpoints, such as healthcare and disability providers, emergency repair schemes etc., enabling automatic referrals when households are already navigating change rather than requiring separate, self-initiated engagement.**

4.4 Up Front and Hidden Cost Barrier

While participants recognised the potential for long-term bill savings through electrification, the upfront capital costs presented an insurmountable hurdle for many. Our interviews revealed that even when the logic of payback periods appeared favourable and potential savings were substantial, households living paycheque-to-paycheque or on retirement savings struggled to access the initial investment required. This finding underscores a fundamental inequity in energy transitions: those who would benefit most from reduced running costs are least able to afford the technology that delivers these savings. Participants articulated a clear need for financial assistance mechanisms that address upfront costs, not just ongoing bills. Survey data complemented this, with participants indicating that support measures offering direct financial benefits, including grants, subsidies and opportunities for reduced energy bills through overall lower running costs were generally the most important considerations for electrifying (Figure 8).

Hidden costs also were raised by participants, with the cost of the appliance being just one of a range of costs arising from electrification. A very proactive environmentally motivated participant said:

> *"It's one thing to replace the cooktop but there's other costs that along with it. Electrician, plumber disconnection."*
> **Female participant, 70-79 years, outright homeowner**

Close to full electrification, but for the stovetop, she explained that she was willing to put up with the monthly supply charge because the upfront cost of a new stove, the work required to adjust the

benchtop for the new induction stove, and the potential inability to use existing pots deterred her from taking the final step to get off gas in the home.

> *"The other one little stupid thing that stops me from changing my...not stops me, but discourages me is my pots...I've had them for 40 years, but I love them."*
> **Female participant, 70-79 years, outright homeowner**

4.5 The Hidden Labour of Energy Decision-Making

The invisible work

The energy transition, from the perspective of our participants, requires not just money but capacity. Participants consistently described the substantial but largely invisible work involved in navigating energy upgrades. Before even dealing with the financial cost of new appliances or systems lies the "search costs" – the time, effort, and cognitive load required to research options, compare products, understand rebates, obtain quotes, verify tradespeople, and coordinate installations. For households already managing the demands of precarious employment, caring responsibilities, health challenges, or financial stress, this hidden labour represents a significant and often prohibitive barrier. As mentioned above, the key household capacities that made a difference were energy literacy, time, social relations to seek trusted advice, and prior practical experience (home renovations, electrical upgrades etc.).

The depth of analytical work done to make informed energy decisions became particularly evident in one case. A participant with accounting training — though no longer working in that profession — spent considerable time compiling ten years of energy bills and conducting detailed cost-benefit modelling. The analysis cross-referenced billing patterns with previous upgrades and household changes, creating a comprehensive evidence base for future decisions. While this exercise proved invaluable for both informing choices and building confidence in their validity, it highlighted the lengths to which some households go to make energy decisions: in this case effective decision making benefited from time, and specialised financial expertise that most households simply do not possess.

Different pathways

The process of electrification varied across participants, with some undertaking unplanned, reactive replacements in response to appliances breaking down, while others engaged in more deliberate consideration of electrification through self-directed research, health-related motivations or advice from social relations. However, receiving some third-party energy advice from organisations such as their local council, BSL or GCCN enabled participants to move beyond one-off replacement decisions towards more comprehensive electrification planning.

For example, one participant trusted the advice provided by BSL regarding appliance efficiency – recalling that the BSL personnel *"told me that the old machine I have will take more electricity than the new one"* – and this trusted expert guidance gave the participant confidence to proceed with their upgrade. This example demonstrates how intermediary organisations can enable households to navigate technical decisions and reduce decision-making uncertainty.

Trusted sources of information

Victorian government advice was also valued by some:

> *"It was hard to get a heap pump hard to decide who you would like to get it from. Like the Victorian government in that they have a list of approved suppliers and I*

was good at that one. I was conscientious. I looked at like their reviews and stuff like that."
Female participant, 70-79 years, outright homeowner

On energy comparison sites:

"I know how they work, but I've used a couple of them, but in conjunction, I've used the government one as well. The reason why we're on the plan we're on now is through the government one."
Male participant, 60-69 years, outright homeowner

Another participant used Choice magazine and energy star ratings to inform decisions. Survey data revealed limited awareness of specific online energy tools designed to provide electrification advice, with only two households indicating they had heard of and accessed such resources (Figure 7). However, this likely understates actual engagement with online energy information, as many households reported conducting self-directed research online and would have likely encountered energy advice websites without explicitly realising. As one participant noted:

"[If] someone gives me a good recommendation I'll look into it absolutely. But generally... the internet's a great tool. Might as well use it."
Male participant, 30-39 years, private rental

The need for simplified, supported transitions

Multiple households described the decision-making process as overwhelming, revealing how the complexity of researching appliances, comparing costs, understanding technologies, and coordinating installations creates significant hidden labour that extends beyond financial considerations alone. There is a need for simplified, supported pathways that reduce the hidden labour required to achieve household energy transitions, as discussed further in Section 4.7.

Implication

- **Electrification support must address both financial barriers and hidden labour costs through comprehensive, end-to-end assistance not just rebates and information alone**
- **Programs should assist with navigation support that reduces search costs, brokers trusted installers, and manages coordination**

4.6 The Resilience Premium: Experience in Morwell

Participants in Morwell expressed a distinctive perspective shaped by their lived experience of energy system vulnerability. The frequency and extent of blackouts (most recently the severe storm in February, 2024) created an acute awareness of energy security and resilience that influenced attitudes toward electrification. One participant described how this concern had led households decline the EFCN program offer:

"I've spoken to people in this street and their reasons for not taking up this offer to get electricity was because "if the power goes out, I can't light my gas stove to make a cup of tea.""
Male participant, 60-69 years, outright homeowner

For these households, energy decisions are not only about cost or environmental impact but about reliability and independence during crisis. This 'resilience premium' – the value placed on energy autonomy and security – emerged as a powerful but under-recognised factor in household decision-

making, suggesting that electrification messaging focused solely on savings or emissions may miss what matters most to communities with direct experience of energy system failure.

On the other hand, one participant from Morwell who fully electrified had a diesel generator for camping that he used when electricity supply failed. Rather than seeing this as a maladaptation or downside of electrification, he proudly told neighbours that he was watching television during the most recent blackout using the generator.

Implication

- **Failure to address reliability concerns through tangible resilience measures will jeopardise electrification efforts especially in rural and regional areas**
- **Programs should integrate backup solutions as standard upgrade pathways rather than positioning electrification as all-or-nothing**

4.7 Trust, Champions, and the Power of Local Networks

Building trust through local intermediaries

A striking finding from our research concerns the role of trust and local intermediaries in enabling – or preventing – household electrification. Participants demonstrated considerable scepticism toward information from unfamiliar sources, government programs, or energy retailers, reflecting both past experiences of being misled and a broader wariness of systems that have not served them well. This was particularly evident with recruitment for the EFCN program. In some cases, the generosity of the EFCN offer was 'too good to be true' and that was a major cause of mistrust. Interviews with engagement staff from GCCN and MNH revealed the depth of distrust:

> *"It's just hard to get the foot in the door to have the conversation. Once you start talking and people are actually listening...then it became a little easier... once you can convince them that this is not a scam..."*
> **EFCN Project Officer**

GCCN's partnership with MNH was strategic:

> *"...they have the reputation in the area to be helpful. It's... a point of trust, which is a big factor".*
> **EFCN Project Officer**

Informal networks and demonstration effects

It was the demonstration day at the MNH that helped overcome fears for one participant who later became a local champion of the program:

> *"...because it was hosted at the Neighbourhood House, and they let me know it was not a scam either, in an immediate way."*
> **Female participant, 40-49 years, outright homeowner**

However, when information or recommendations came from trusted local champions — community workers, neighbours, family members, or respected local figures — participants were significantly more receptive. An initially sceptical Morwell participant who was attached to gas for heating was convinced of the opportunity afforded by the EFCN program on the street:

> *"I just thought it was some sort of scam going around at the time. And then I started talking with a few people on the street"*
> **Male participant, 60-69 years, outright homeowner**

The street level conversations were seen as a real help by engagement officers:

> *"...the people living on the street actually having those conversations is a huge benefit because you have people who work odd hours, shift workers, things like that...".*
> **EFCN Project Officer**

This points to both recruitment challenges for electrification programs and opportunities for more effective, community-embedded approaches. It was important to hear about spaces for informal communication at the street level, because from an outsider research perspective when conducting the research there was a lack of foot traffic, relatively high security and limited eye contact and conversation in the areas where the participants lived. However, participants described functional neighbour relations that had been strengthened through shared experiences around safety concerns. As one participant explained:

> *"... everyone kind of keeps themselves around the very... low economic area and [there's] a lot of crime. It's best to just keep your doors locked most of the time... But...my neighbours are great... And we talk a lot more now because I've actually provided camera footage..."*
> **Female participant, 40-49 years, outright homeowner**

The accounts from participants of neighbour-to-neighbour conversations suggested that this was not the whole story and forms of sociality and street-level care occurred. One participant soon to undergo the electrification upgrades in Morwell was convinced that once people on the street start seeing the trucks and the work going on, they will develop an interest in the program and be more open to recruitment having seen it in action on their street. This suggests that the actual demonstration of upgrades, whether it be in the MNH or on the street, may have a compelling effect:

> *"Once they see one or two people doing it, seeing trades out there, they will get interested and try to get on board"*
> **Male participant, 70-79 years, private rental**

The EFCN program helped to build informal networks of trust that formal programs rarely access. There are implications for program design about how to tap into existing informal networks to drive electrification at the local area level.

Reducing search costs through supported pathways

The complexity of navigating household electrification creates substantial search costs, as discussed in Section 4.5. These hidden barriers prove particularly overwhelming for households managing financial stress, caring responsibilities, or health challenges. One household described the challenges and confusion faced:

> *"Well, I wouldn't have known what products to get at all and where to start, what direction to look at... I've never done anything like this on my own, so it was definitely helpful to have someone that knew what they were doing."*
> **Female participant, 40-49 years, outright homeowner**

> *"It's just I didn't have access to getting that, I didn't know where to start and with such price differences on what you get told from one to another. Like, I've looked at quotes where it said that it was like, you know, from, you know, $6,000 and*

something and you can pay it off over a period of time and then you go down here and like you're getting quotes from $12,000... Are they trying to rip me off?"
Female participant, 40-49 years, outright homeowner

The EFCN program in Morwell significantly reduced these search costs through comprehensive, end-to-end coordination. Households were provided with energy assessments and scorecards to inform upgrade priorities, integrated energy advice, and scheduling of accredited installers. Local installers completed work within two-week periods where possible, generating notably high satisfaction:

"I've got no complaints. All the tradies have all done a great job."
Male participant, 60-69 years, outright homeowner

"I was ecstatic with the program. I was so grateful for the program... it really helped."
Female participant, 40-49 years, outright homeowner

In contrast, St Albans participants relied on informal social networks to navigate appliance selection and installations. Examples included family connections – *"My brother... he's an electrician, and he said, just get the biggest one, or get the one from Bunnings"* – and trusted intermediary advice from BSL personnel who provided energy efficiency and appliance guidance through their upgrade programs. One participant described collective action within their neighbourhood demonstrating neighbourhood-level coordination emerging organically:

"[A] number of people got solar with the one provider in this area...they got together and mass bought the panels and the inverters"
Female participant, 50-59 years, outright homeowner

The critical role of organisational support was evident in participant reflections on alternative scenarios. When asked what would have happened without BSL assistance, one participant stated:

"We would have been in trouble a big time. We would have still gone to electrification, but very slow."
Female participant, 50-59 years, outright homeowner

This response underscores how trusted intermediaries accelerate transitions that might otherwise occur incrementally over extended timeframes, if at all. This highlights the importance of coordinated support programs in facilitating timely household electrification, especially for energy-vulnerable populations who may lack the capacity to independently navigate complex technical and financial decisions.

Implication

- **Trust deficits, risk aversion among vulnerable households and reasonable energy security concerns will limit participation in electrification**
- **Programs should invest in trust building through local intermediaries**
- **Successful engagement involves partnerships with trusted community organisations, local councils, neighbourhood champions and peer networks**

4.8 The Challenge of Getting All Households to Electrify

The premise of strategic decommissioning or pruning is to avoid replacement expenditure by getting all households on a street (or similar area) to fully electrify.[16] While there were many households who were willing to electrify with the appropriate supports (such as financial, advice, facilitation), convincing *all* households in an area to agree will be challenging.

Along with the barriers already discussed, the interviewees highlighted some additional challenges.

- **Life stage factors:** One participant in their late 70s noted that several people in the street who hadn't taken up the offer were over 75 and didn't see the value in switching at this stage of their life. He had checked if they were interested, but they were not. He surmised that they were content enough with what they had and not keen to change things at this stage.
- **Upgrade independence and attachment to gas:** Another participant expressed a preference for undertaking upgrades themselves over time, rather than a third party completing them. The same participant expressed a strong connection to their gas ducted heating. A pruning timeframe, even with strong incentives, is unlikely to suit such participants.
- **Engagement gaps:** For all their efforts, the EFCN team were unable to contact some households despite using a variety of channels. This highlights the difficulty any whole-of-street campaign will face, a challenge amplified for rental properties where landlords and property managers are hard to access, and tenants lack agency.

Addressing these issues will be a challenge for strategic decommissioning. However, some opportunities to address this did emerge in the interviews including:

- **Peer influence:** Seeing neighbours get an upgrade, or hearing from neighbours or friends that the upgrades were reasonable quality resulted in more people getting to sign up for upgrades. This neighbourhood effect is likely to be critical for any successful pruning pilots.
- **Demonstration impact ('seeing is believing'):** One participant highlighted that they changed their view upon seeing the upgrades at the MNH and they were impressed with the quality and installation.
- **LPG as a transitional option** Providing the opportunity to switch to LPG was seen as a useful out to enable those who didn't want to get off gas to continue to benefit from gas, even if the gas network was pruned.
- **Communicating the savings:** Several participants highlighted the importance of communicating the benefits of electrification in a simple way, with clear evidence of the savings.

Implication

Whole-of-street electrification will require targeted engagement strategies, flexible pathways, and strong community-based demonstration effects.

[16] Gas network augmentation necessitates lowering local gas use. In contrast, pruning requires every property in that area to disconnect from gas or switch to bottled gas — with no exceptions. If any households refuse to disconnect or switch to bottled gas in that area, the replacement expenditure cannot be avoided via pruning under the current rules in major Australian gas networks (see Sunk Costs report for further detail). Pruning is therefore more difficult to achieve but affords greater potential to shrink the gas network than avoiding augmentation. Both approaches would only constitute a small part of any plan to decommission a gas network, complementing other approaches.

References

Aas, D., Mahone, A., Subin, Z., Kinnon, M. M., Lane, B., & Price, S. (2020).The Challenge of Retail Gas in California's Low-Carbon Future Technology Options, Customer Costs, and Public Health Benefits of Reducing Natural Gas Use. California: California Energy Commission (Energy Research and Development Division). Retrieved from https://ww2.energy.ca.gov/2019publications/CEC-500-2019-055/CEC-500-2019-055-F.pdf

Australian Bureau of Statistics. (2022). St Albans (Western Metropolitan): 2021 Census All persons QuickStats. Retrieved from https://www.abs.gov.au/census/find-census-data/quickstats/2021/SED27807

Australian Bureau of Statistics. (2023). *Socio-Economic Indexes for Areas (SEIFA), Australia*. Retrieved from https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/2021#interactive-maps https://www.abs.gov.au/census/find-census-data/quickstats/2021/SED27807

Adger, N. W., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change*, *15*(2), 77–86. https://doi.org/10.1016/j.gloenvcha.2004.12.005

AusNet. (2022). *Gas Network: Mains & Services Strategy*. Retrieved from https://www.aer.gov.au/system/files/ASG%20-%20GAAR%20-%20AMS%2030-52%20Mains%20and%20Services%20-%201%20July%202022%20-%20PUBLIC_0.pdf

Australian Energy Regulator. (2021). *Regulating gas pipelines under uncertainty: Information paper*. Retrieved from https://www.aer.gov.au/publications/reports/performance/regulating-gas-pipelines-under-uncertainty-information-paper, accessed 10 October 2025.

Balta-Ozkan, N., Yildirim, J., Connor, P. M., Truckell, I., & Hart, P. (2021). Energy transition at local level: Analyzing the role of peer effects and socio-economic factors on UK solar photovoltaic deployment. *Energy Policy*, *148*, 112004. https://doi.org/10.1016/j.enpol.2020.112004

Bollinger, B., & Gillingham, K. (2012). Peer Effects in the Diffusion of Solar Photovoltaic Panels. *Marketing Science*, *31*(6), 900–912. https://doi.org/10.1287/mksc.1120.0727

Bolton, E., Bookbinder, R., Middlemiss, L., Hall, S., Davis, M., & Owen, A. (2023). The relational dimensions of renovation: Implications for retrofit policy. *Energy Research & Social Science*, *96*, 102916. https://doi.org/10.1016/j.erss.2022.102916

Bouzarovski, S. (2022). Energy and labour: Thinking across the continuum. *Progress in Human Geography*, *46*(3), 753–774. https://doi.org/10.1177/03091325211051478

Bouzarovski, S., Karpinska, L., Sugar, K., & Śmiech, S. (2025). Networked, fragmented, unequal: The emergent landscape of home energy advice provision in England. *Applied Geography*, *181*, 103682. https://doi.org/10.1016/j.apgeog.2025.103682

Bouzarovski, S., & Thomson, H. (2018). Energy Vulnerability in the Grain of the City: Toward Neighborhood Typologies of Material Deprivation. *Annals of the American Association of Geographers*, *108*(3), 695–717. https://doi.org/10.1080/24694452.2017.1373624

Brocklehurst, F., Morgan, E., Greer, K., Wade, J., & Killip, G. (2021). Domestic retrofit supply chain initiatives and business innovations: An international review. *Buildings & Cities*, *2*(1). https://doi.org/10.5334/bc.95Chandrashekeran, S., de Bruyn, J., Bryant, D., & Sullivan, D. (2023). *Enabling electrification: Addressing the barriers to moving off gas faced by lower-income households*. Australian Research Council Centre of Excellence for Children and Families over the Life Course & the Brotherhood of St. Laurence.

Brotherhood of St. Laurence. (2025). *Gas networks in transition: Submission to the Australian Energy Market Commission (AEMC)*. Retrieved from https://www.aemc.gov.au/sites/default/files/2025-11/3._brotherhood_of_st_lawrence_-_grc0082_cp_submission.pdf

Chandrashekeran, S., De Bruyn, J., Sullivan, D., & Bryant, D. (2023). Enabling electrification: Addressing the barriers to moving off gas faced by lower-income households. Australian Research Council Centre of Excellence for Children and Families over the Life Course & the Brotherhood of St. Laurence, Melbourne. Retrieved from https://www.bsl.org.au/research/publications/enabling-electrification/

Chandrashekeran, S., De Bruyn, J., Sullivan, D., & Bryant, D. (2024). Electrification and lower-income households in Australia: An integrated analysis of adaptive capacity and hardship. *Energy Research & Social Science*, *116*, 103688. https://doi.org/10.1016/j.erss.2024.

Energy Consumers Australia. (2024). Turning down the gas: Minimising consumer risk. Retrieved from https://energyconsumersaustralia.com.au/sites/default/files/wp-documents/report-doc-turning-down-gas-minimising-consumer-risk.pdf

Ewald, B., Crisp, G., & Carey, M. (2022). Health risks from indoor gas appliances. *Australian Journal of General Practice*, *51*(12), 935–938. https://doi.org/10.31128/AJGP-08-22-6535

Department of Energy, Environment and Climate Change. (2025a). Gas Substitution Roadmap: Update 2025. Retrieved from https://www.energy.vic.gov.au/renewable-energy/victorias-gas-substitution-roadmap

Department of Energy, Environment and Climate Change. (2025b). Victorian renewable energy and storage targets. https://www.energy.vic.gov.au/renewable-energy/victorian-renewable-energy-and-storage-targets

Frazier, T. G., Thompson, C. M., Dezzani, R. J., & Butsick, D. (2013). Spatial and temporal quantification of resilience at the community scale. *Applied Geography*, *42*, 95–107. https://doi.org/10.1016/j.apgeog.2013.05.004

Graziano, M., & Gillingham, K. (2015). Spatial patterns of solar photovoltaic system adoption: The influence of neighbors and the built environment ‡. *Journal of Economic Geography*, *15*(4), 815–839. https://doi.org/10.1093/jeg/lbu036

Heiskanen, E., & Matschoss, K. (2017). Understanding the uneven diffusion of building-scale renewable energy systems: A review of household, local and country level factors in diverse European countries. *Renewable and Sustainable Energy Reviews*, *75*, 580–591. https://doi.org/10.1016/j.rser.2016.11.027

Kangas, H.-L., Lazarevic, D., & Kivimaa, P. (2018). Technical skills, disinterest and non-functional regulation: Barriers to building energy efficiency in Finland viewed by energy service companies. *Energy Policy*, *114*(C), 63–76.

Laws, N. D., Epps, B. P., Peterson, S. O., Laser, M. S., & Wanjiru, G. K. (2017). On the utility death spiral and the impact of utility rate structures on the adoption of residential solar photovoltaics and energy storage. *Applied Energy*, *185*, 627–641. https://doi.org/10.1016/j.apenergy.2016.10.123

Marsden, G., Bouzarovski, S., Balani, K., Bodden, S., Kasprowicz, V., Martiskainen, M., Rattle, I., Sugar, K., & Wade, F. (2025). (Re-)locating 'place' in energy demand: Implications for research and policy. *Geoforum*, *165*, 104375. https://doi.org/10.1016/j.geoforum.2025.104375

Middlemiss, L., Davis, M., Brown, D., Bookbinder, R., Cairns, I., Mininni, G. M., Brisbois, M. C., Hannon, M., Owen, A., & Hall, S. (2024). Developing a relational approach to energy

demand: A methodological and conceptual guide. *Energy Research & Social Science*, *110*, 103441. https://doi.org/10.1016/j.erss.2024.103441

Min, Y. (2025). Spatial dynamics of low-carbon transitions: Peer effects and disadvantaged communities in solar energy, electric vehicle, and heat pump adoption in the United States. *Energy Research and Social Science*, *121*. Scopus. https://doi.org/10.1016/j.erss.2025.103981

Mininni, G. M., Brown, D., Brisbois, M. C., Middlemiss, L., Davis, M., Cairns, I., Hannon, M., Bookbinder, R., & Owen, A. (2024). Landlords' accounts of retrofit: A relational approach in the private rented sector in England. *Energy Research & Social Science*, *118*, 103742. https://doi.org/10.1016/j.erss.2024.103742

Scott, J., & Carrington, P. J. (2011). *The SAGE handbook of social network analysis*. SAGE publications.

Sequeira, M. M., Gouveia, J. P., & Joanaz de Melo, J. (2024). Can local organizations act as middle actors in energy support? Exploring their functions, motivations, challenges, and needs. *Energy Efficiency*, *17*(7). https://doi.org/10.1007/s12053-024-10262-5

Shaw, C., Hurth, V., Capstick, S., & Cox, E. (2018). Intermediaries' perspectives on the public's role in the energy transitions needed to deliver UK climate change policy goals. Energy Policy, 116, 267–276. https://doi.org/10.1016/j.enpol.2018.02.002

Siders, A. r. (2019). Adaptive capacity to climate change: A synthesis of concepts, methods, and findings in a fragmented field. *WIREs Climate Change*, *10*(3), e573. https://doi.org/10.1002/wcc.573

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, *16*(3), 282–292. https://doi.org/10.1016/j.gloenvcha.2006.03.008

Tilly, C. (2015). *Identities, Boundaries and Social Ties*. Routledge. https://doi.org/10.4324/9781315634050

Torrens, J., & von Wirth, T. (2021). Experimentation or projectification of urban change? A critical appraisal and three steps forward. *Urban Transformations*, *3*(1), 8. https://doi.org/10.1186/s42854-021-00025-1

Vallury, S., Smith, A. P., Chaffin, B. C., Nesbitt, H. K., Lohani, S., Gulab, S., Banerjee, S., Floyd, T. M., Metcalf, A. L., Metcalf, E. C., Twidwell, D., Uden, D. R., Williamson, M. A., & Allen, C. R. (2022). Adaptive capacity beyond the household: A systematic review of empirical social-ecological research. *Environmental Research Letters*, *17*(6), 063001. https://doi.org/10.1088/1748-9326/ac68fb

Wesche, S., & Armitage, D. R. (2010). From the Inside Out: A Multi-scale Analysis of Adaptive Capacity in a Northern Community and the Governance Implications. In D. Armitage & R. Plummer (Eds.), *Adaptive Capacity and Environmental Governance* (pp. 107–132). Springer. https://doi.org/10.1007/978-3-642-12194-4_6

Wilkins, R., Vera-Toscano, E., Botha, F., & Dahmann, S. C. (2021). *The Household, Income and Labour Dynamics in Australia Survey: Selected findings from waves 1 to 19*. Melbourne Institute: Applied Economic & Social Research, University of Melbourne.

Zelizer, V. A. (2000). The Purchase of Intimacy. *Law & Social Inquiry*, *25*(3), 817–848. https://doi.org/10.1111/j.1747-4469.2000.tb00162.x

Appendices

Appendix A
Survey

See separate attachment.

Appendix B
Summary of support payments

Payment	State or Commonwealth	Eligibility	Does it appear on bills?	Is it in our survey?
Rent assistance	Commonwealth	Renter who receives income support payments, with thresholds	No	Yes
Pension supplement	Commonwealth	Receiving Age Pension, Jobseeker, Carer Payment, DSP in some circumstances, various other payments	No	Yes
Utilities allowance	Commonwealth	People on DSP who are younger than 21 with no dependent children	No	Yes
Energy supplement	Commonwealth	Receiving income support payment or ABSTUDY. Some people who get FTB or seniors healthcare card.	No	Yes
Concessions (annual electricity, winter gas, excess gas, life support, medical cooling, non-mains)	State	Live in Victoria (equivalents in other states) Have concession card (pensioner, healthcare card, DVA gold card) Concessions beyond annual electricity and winter gas have requirements specific to them	Yes	Yes
Utility Relief Grant	State	Live in Victoria (equivalents in other states) Concession card **plus** at risk of disconnection **plus** one of 4 criteria around hardship	Paid to retailers against debt	No
Energy bill relief fund	Commonwealth	Universal	Yes	No*
Power Saving Bonus	State	Provides a payment of $100 for eligible Victorian concession card households	No	No

*Everyone is eligible and paid automatically except some embedded network customers, so there was limited reason to ask.

Appendix C
Summary of programs and subsidies available for households

Local Government (City of Brimbank)	Victorian Government^	Federal Government

• **Solar Savers**
  • Access to quality products, quotes and installers
  • Removes costs associated with 'hidden labour'
	• **Solar Homes***
	  • Solar PV
	  • Hot water systems
	• **Victorian Energy Upgrades (VEU)**
	  • RCAC
	  • Hot water systems
	  • Induction cooktops
	  • Draught proofing
	  • Energy Scorecard Assessment
		• **Small-scale Renewable Energy Scheme**
		  • Solar PV
		  • Hot water systems
		• **Cheaper Home Batteries Program**
		• **No Interest Loans Scheme**
		  • Loans for low-income households

*Eligibility criteria apply

^The Victorian Government programs are considered in our survey

Appendix D
Summary of survey data

Table A1. Survey respondent characteristics (*n* = 8)

Age	**n**
18–29 years	1
30–39 years	1
40–49 years	1
50–59 years	1
60–69 years	2
70–79 years	2
Gender	**n**
Female	3
Male	5
Country of birth and language	**n**
Born outside Australia	2
North-West Europe	1
South-East Asia	1
Speak language other than English at home	1
Highest level of education	**n**
Completed high school	2
Trade qualification or Certificate III/IV	4
Bachelor Degree	1
Employment status	**n**
Employed full-time	1
Not employed, looking for work	2
Not employed, not looking for work	1
Retired	4
Care responsibilities	**n**
Care as one of main activities	
Care for someone with illness or disability	1
Any care	1

Table A2. Household characteristics, housing and financial situation (*n* = 8)

Household type	**n**
Lone person	2
Couple with child(ren)	1
Couple	4
Adults, related or unrelated	1
Include household members aged <18 years	0
Household size	
Mean	2
Range	1 – 3
Housing tenure	**n**
Private rental	2
Own with mortgage	1
Own outright	5
Dwelling type	**n**
Separate house	8
Location	**n**
Greater Melbourne	4
Regional Victoria	4
Annual household income	**n**
$20,000 to $39,999	3
$40,000 to $59,999	1
$60,000 to $79,999	3
Prefer not to say	1
Income support, household-level	**n**
Any	7
By type	
Age Pension	3
Disability Pension	3
JobSeeker	1
Other	1
Additional payments, household-level	**n**
Rent Assistance	2
Pension Supplement	2
Energy Supplement	3
Energy bills	
Special arrangements with energy retailer	1

Table A3. Financial stress

Financial stress score (0-7)	Mean (SD)
Overall	1.6 (1.8)
Financial stress indicators, past 12 months	**n**
Unable to heat home	2
Could not pay energy or phone bills on time	2
Could not pay mortgage or rent on time	1
Went without meals	2
Pawned or sold something	2
Asked for financial help from friends or family	3
Asked for help from welfare organisations	1

Table A4. Current energy use

Mains gas	**n**
Overall	6
By location	
Greater Melbourne	4
Regional Victoria	2
By housing tenure	
Private rental	2
Owner-occupier	4
Solar power	n
Overall	6
By housing tenure	
Private rental	0
Owner-occupier	6
Heating	n
Central heating	4
Reverse-cycle air conditioner	6
Portable electric heater	2
Wood fireplace or stove	1
Gas heating	3
By housing tenure	
Private rental	2
Owner-occupier	1
Cooktop and stove	n
Gas cooktop	5
Electric cooktop – induction	3
Gas oven	1
Electric oven	7
Extent of limiting energy use	Mean (SD)
Overall score, 1–5	3.2 (1.5)
Extent of limiting energy use	n
1. Not conscious of limiting energy use	1
2. Slightly aware	2
3. Moderately aware	2
4. Very aware	2
5. Extremely aware	1
Extremely/Very aware of limiting energy use	
By age	
Under 60 years	1
60 years or above	2

Table A5. Energy preferences

Appliance		n
Heating	Electricity	4
	Gas	2
	No preference	2
Cooktop	Electricity	6
	Gas	1
	No preference	1
Oven	Electricity	8
	Gas	0
	No preference	0
Hot water	Electricity	6
	Gas	0
	No preference	2

Table A6. Changing appliances within the home within five years

Replaced gas appliances with electric ones	**n**
Overall	3
Heater	2
Cooktop	2
Hot water system	3
Oven	1
Motivations	
Believe electric appliances to have lower running costs	3
Discount or government payment	2
Believe electric appliances to be better for environment	1
Believe electric appliances to be safer	1
Believe electric appliances to be better for health	1
Recommendation	1
Influences	
Community organisations	1
Electricity supplier	1
Self	1
Have not changed gas appliances to electric ones	**n**
Overall	5
Barriers	
Currently appliances are working fine	3
High upfront cost of buying new appliances	3
Don’t own home	2
Overwhelming search process	2
Social influences	1
Trusted advice	
Community organisations	2
Friend / family member	2
Online	2
Self	1
Tradesperson	1
Would like to change gas appliances to electric ones	**n**
Overall	4
Motivations	
Believe electric appliances to have lower running costs	4
Believe electric appliances to be better for environment	2
Believe electric appliances to be safer	2
Believe electric appliances to be better for health	2
Lower cost to purchase an electric appliance	1
Discount or government payment	1

Table A7. Attitudes towards electric and gas appliances

Performance	**n**
Electric appliances perform better for heating and cooking	3
There is no difference in performance	3
Unsure	2
Reliability	**n**
Electric appliances are more reliable or require less maintenance	3
There is no difference in the reliability	1
Unsure	4
Running costs	**n**
Electric appliances have lower running costs	7
There is no difference in the running costs	
Unsure	1
Upfront costs	**n**
Electric appliances are cheaper to buy and install	4
There is no difference in the upfront costs	1
Unsure	3
Environment	**n**
Electric appliances are better for the environment	7
The environmental impacts are the same	1
Safety	**n**
Electric appliances are safer	7
There are no differences in safety	1

Table A8. Opinions about policies relating to gas

Perspective on Victorian Gas Transition	**n**
Strongly support	6
Neutral	2
Perspective on ending expansion of gas network locally	**n**
Strongly support	6
Neutral	2

Table A9. Awareness and utilisation of energy-related programs

Solar Homes Program	**n (interview data)**
Awareness	7
Accessed	2 (2)
By housing tenure	
Owner-occupier	2
By electrification support	
Standard	1
CSH Program	1 (1)
EFCN Program	(1)
Victorian Energy Upgrades Program	**n (interview data)**
Awareness	7
Accessed	3 (2)
By electrification support	
Standard	1
CSH Program	(2)
EFCN Program	2
Reduced energy bills for concession card holders	**n**
Awareness	7
Accessed	7
Online energy tools	**n***
Awareness	2
Accessed	2

*Likely understated – interview data revealed online research was more frequent than the survey data suggests

Table A10. Attitudes towards possible support measures

Support measures	**n**	**%***
Believe this would be very important		
Grant to improve energy efficiency	6	75
Grant to purchase electric appliances	6	75
Information provision, via website or phone	3	75
Energy efficiency assessment and advice	6	75
A subsidy to reduce electricity costs	6	75
Rental provider to upgrade appliances	2	100
Knowing running costs are cheaper	4	100
Knowing switching was helping deal with climate change	4	50
Knowing $1,000s could be saved in gas network upgrades	4	50
My social networks are supportive of the transition	4	50

*Proportions were calculated based on completed responses only, excluding blank or missing answers

Appendix E
Gas network decommissioning scenario

Interview participants were presented with a hypothetical scenario to explore attitudes toward local area electrification as an alternative to planned gas network upgrades. This scenario provided the context for participants' responses regarding electrification planning, community decision-making, and cost allocation.

Background information

The following context was provided:

- **Environmental rationale:** Gas used in households is a fossil fuel, which contributes to carbon pollution and climate change. Unlike electricity, there is not a vast amount of renewable gas available. Gas production and use will need to reduce significantly to halt runaway global warming.
- **Current infrastructure planning:** Gas companies are still planning upgrades to the existing gas network that supplies homes. These upgrades are not cheap, with estimates of approximately $350,000-$650,000 per kilometre to replace each kilometre of pipe in Australia – infrastructure that will soon become redundant.

The hypothetical

Participants were asked to consider the following proposition:

If a gas company was planning to upgrade the gas pipes in their street, rather than proceeding with the upgrade, they could instead use those same funds to:

1. Electrify all houses on the street (replacing every gas appliance with new electric appliances); and
2. Remove the old gas pipe infrastructure entirely (with no gas remaining)

The scenario assumed that the cost of upgrading a gas pipeline would be similar to the cost of electrifying homes. Importantly, all households on the street would need to be on board.

Questions explored

The scenario prompted participants to consider:

- **Support:** Would participants be supportive of this approach as a requirement on gas companies?
- **Feasibility:** Do participants think it would be easy to get their street to agree to do this if it was paid for?
- **Funding responsibility:** Participants were asked who they think should pay for this. Four options were presented as examples; participants were not limited to these options:
  - Gas companies (via remaining gas customers);
  - Electricity companies (via electricity users);
  - Government (via taxpayers); or
  - Individual householders.
- **Subsidy levels:** What percentage of financial support (0%, 50%, 100%, other) should households receive, and should this vary by household type or income level?