Power Shift Project One Report

Final Report

Driving Change
Identifying what Caused Low-Income Consumers to Change Behaviour

GEER Australia
Group of Energy Efficiency Researchers

This report was commissioned by Energy Consumers Australia, and prepared for Ms Kerry Connors.

The report was prepared by

Professor Rebekah Russell-Bennett* – Queensland University of Technology
Dr Rowan Bedggood* – Swinburne University of Technology
Dr Charmaine Glavas – Queensland University of Technology
Mr Tim Swinton* – Queensland University of Technology
Dr Ryan McAndrew – Queensland University of Technology
Mr Ciaran O'Mahony – Swinburne University of Technology
Mr Flynn Pervan – Swinburne University of Technology
Ms Nicola Willand* – RMIT University

*GEER Australia members on this project

To cite this report

Russell-Bennett, R., Bedggood, R., Glavas, C., Swinton, T., McAndrew, R., O'Mahony, C., Pervan, F., & Willand, N. (2017). Power Shift Project One: Driving Change – Identifying what Caused Low-Income Consumers to Change Behaviour, Final Report, Brisbane: Queensland University of Technology and Swinburne University of Technology.

Funding acknowledgment

This project was funded by Energy Consumers Australia Limited as part of its Commonwealth-funded Power Shift project. The views expressed in this document do not necessarily reflect the views of Energy Consumers Australia or the Commonwealth Government.

About GEER Australia

The Group of Energy Efficiency Researchers (GEER) Australia comprises researchers and industry partners from across Australia who are committed to driving change in the energy sector towards improved outcomes for vulnerable Australians. Its purpose is to improve the energy-related wellbeing in households and communities in Australia, through collaborative research which achieves practical outcomes and informs future practice and policies. GEER's research and activities thus focus on energy efficiency as it relates to quality of life, affordability and environmental sustainability.

Acknowledgments

We would like to acknowledge the support of the project team in making the delivery of this research project possible.

Project Team and Key Roles
Professor Rebekah Russell-Bennett, Queensland University of Technology – Research Project Manager
Dr Rowan Bedggood, Swinburne University of Technology – Project Manager
Dr Charmaine Glavas, Queensland University of Technology – Researcher
Mr Tim Swinton, Queensland University of Technology – Research Fellow
Dr Ryan McAndrew, Queensland University of Technology – Research Fellow
Mr Ciaran O'Mahony, Swinburne University – Research Assistant
Mr Flynn Pervan, Swinburne University – Research Assistant
Ms Nicola Willand, RMIT University – Research Assistant
Ms Natalie Sketcher, Queensland University of Technology – Visual Designer

Executive Summary

During 2013–2016 the Commonwealth Government established a Low-Income Energy Efficiency Program (LIEEP) which funded 20 consortia across Australia to trial various initiatives to support low-income households to reduce their energy use and associated bills. Each LIEEP project completed a final report as part of its contract. The Group of Energy Efficiency Researchers (GEER) Australia, commissioned by Energy Consumers Australia as part of the Power Shift project, examined and synthesised the results of these reports in order to conduct a 'deep-dive' and extract key findings and learnings to help inform future actions. This step is vital to ensure that the collective learnings of LIEEP projects can be gathered and used to inform future policy, advocacy support and energy industry strategies. This may help support the rising hardship faced by many low-income households with respect to their consumption, bills, management and consequences of home energy use. In addition, this report describes the development of a segmentation framework, and revolves its insights and recommendations around the segments of people it identified.

Overview of LIEEP Projects

A total of 44 initiatives were designed by 20 consortia which represented 15 unique initiatives for LIEEP. These were targeted to nine distinct cohorts of residents in Australia, including the aged, disabled, young adults, new parents, those on social benefits, Aboriginal peoples, and culturally and linguistically diverse (CALD) peoples. Some projects targeted a more general population profile. One project covered a sample of the nation, and 19 were state/territory based.

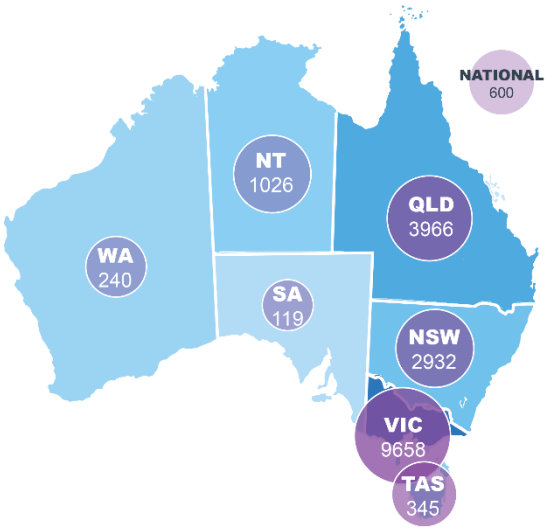
LIEEP took place across all states and territories in Australia, except for the ACT. Combined, 20 projects involved 32,498 people, reported on 18,886 people, and potentially reached 59,992. The dominance of project locations largely reflects the dominance of population locations: the eastern seaboard of Australia, except for Victoria which dominated with seven projects. Each project designed a way of supporting low-income households by installing retrofits to the home and/or providing a service to the household to increase their knowledge and behaviours regarding energy efficiency. For some, this extended to advocacy and helping the householder to access financial aid and utility-bill support products.

Recruitment of these diverse cohorts to participate in a LIEEP project required a variety of methods. Upon synthesising the recruitment methods described in each report it is evident that snowballing (a household referred by another household or community organisation) was the most frequently used recruitment method, followed by holding community information sessions and drawing upon local community organisations. These were considered 'trusted' sources, which was an extremely important factor when trying to reach people experiencing vulnerability and, in some cases, disadvantage. More traditional recruitment methods such as print media and advertising were used less frequently. With 18 projects using snowballing from a known source it is assumed it was a successful recruitment method. Further, it suggests that once a household gains trust in the provider and experiences the benefit of the initiative, they are quite willing to recommend others they know who could also benefit from receiving the initiative.

This result has an important implication for future projects and strategies for a national rollout of energy efficiency support. Firstly, it suggests that a personalised, nuanced aspect to the project is needed to reach low-income consumers. Secondly, it suggests that strategies to reach people *en masse*, which may draw upon financially more appealing mechanisms (e.g., SMS), may struggle to actually reach and engage the people they are most trying to reach. Thirdly, with 18 projects out of 20 using more than a single recruitment method it would appear that multiple recruitment methods, particularly from trusted sources, is more viable in reaching low-income households.

The effectiveness of each initiative trialled was determined by changes in energy consumption, energy bills and numerous co-benefits experienced by the household. Hence, a

significant amount of data were collected from each household, including information about the housing structure, householders, fixed and mobile appliances, energy consumption (in some cases, this was collected for a period of up to two years for a home: energy use 12 months before and 12 months after the initiative was received), energy efficiency behaviours and a range of other variables. Each LIEEP project was designed to be unique and data collected for each project were similarly unique. One consistency is that every project evaluated the impact of the initiatives it trialled in some way and improvements in one or more areas was achieved by all projects. Generally, households were found to experience lower bills, lower consumption of energy, and improved quality-of-home-life conditions.



Specifically, the average reduction in energy use, captured by measures of household electricity use, were between 2–12%. Given these figures are 'averages', some households experienced much greater reductions of electricity use and undetected savings on gas, while others increased their electricity consumption. This does not mean that the initiative trialled was unsuccessful. The LIEEP reports contain numerous anecdotal stories offering reasons for that increase, including that, for some, energy usage was already so low that they were unable to reduce it any further. For others, energy use increased slightly to facilitate an improvement of their health and wellbeing.

Complementing this finding is the measured adoption of energy efficiency behaviours in the home, indicating an average behavioural change between 30–80%. This reveals that electricity consumption declined at a much lower rate than the uptake of more energy efficient behaviours. An important aspect revealed through LIEEP was that some households were in an ideal state to reduce energy use, while others were not. If a home did not have insulation, or had energy-hungry appliances, then efforts to reduce consumption would result in a non-commensurate effect. It may also mean that better information resulted in the household maintaining its level of consumption, but enjoying improved thermal comfort or improved productivity (e.g., appliances used more frequently without overly increasing consumption).

In addition to measuring changes in energy usage and costs, most LIEEP projects reported that participants experienced other benefits as a result of the initiative trialled. For example, the householder may have learned more about how to become more energy efficient; feel more empowered and competent in managing their energy use, bills and providers; feel less stressed about their energy use and having to pay high bills; and/or feel more comfortable in the home as a result of improved thermal conditions or appliance use (e.g., updated lighting may allow the home to use lights more at night, and increase the study time possible for children in the family). The importance of future work around co-benefits is paramount in Australia due to the risk of serious health consequences in sub-optimal thermal conditions.

This report provides a guideline on how to reach various low-income groups in the future, by identifying the common needs of a broader group of low-income consumers, thus extrapolating LIEEP findings beyond those who directly participated. The baseline data (where it was available) indicated that participants generally had positive attitudes towards energy efficiency. This high benchmark explains the low maximum level of attitude improvement (9%). There were mixed levels of energy efficiency knowledge and competency improvements, with medium to high levels of comfort, stress reduction and self-efficacy improvements across the participant groups.

A Multi-Level Approach to Behaviour Change

The result of the deep dive into the LIEEP reports has resulted in the development of a three-level approach that represents the insights gained from the reports for influencing behaviour change. The three levels represent the following insights gained in the analysis:

1. Customer level: reaching low-income segments for energy efficiency.
2. Program level: developing effective programs for energy efficiency.
3. Stakeholder level: co-ordinating stakeholders of energy efficiency programs.

Customer-Level Insights

The key motivators and barriers for energy efficiency improvements reflect the low-income nature of the LIEEP programs, with cost and incentives being important as both motivators and barriers. The top five motivators were awareness, low perceived cost, incentives and rebates, comfort and improved health/wellness/stress. The top five barriers were high perceived costs, knowledge gaps, lack of trust, split incentives and low literacy/cultural barriers. The findings indicate that these motivations and barriers did not vary based on age group or cohort.

Three market segments have been qualitatively interpreted as arising from the analysis in the report. These market segments are the:

- **'New to Energy'** segment is largely determined by cultural background (e.g., CALD and aboriginal cohorts) and geographic location (for example, extreme climate zones and regional/remote areas)
- **'Energy Without Effort'** segment is largely determined by age group (e.g., representing young adults and young families) and psychographic variables (for example, high confidence, positive attitudes and high need for comfort)
- **'Stressed About Energy'** segment is largely comprised of mature consumers who have a high tolerance for discomfort, are price-sensitive, habitual in their behaviours and have low self-efficacy and competency.

Analysis undertaken assists industry and policy-makers to understand what mechanisms and approaches within LIEEP were effective in improving energy efficiency through changing the behaviour of low-income energy consumers. This approach avoids the misstep of assuming a one-size-fits-all approach by providing

guidelines to recruiting, engaging, educating and shifting the behaviour of distinctly different low-income energy consumer segments. Given the multifaceted nature of program delivery, it should be acknowledged that programs could be implemented by a variety of entities, such as government, community organisations or the electricity industry. A comprehensive summary of LIEEP project descriptions can be found in Appendix 1.

In identifying what caused low-income consumers to change their energy behaviours, it was clear that the pathway to consumer empowerment is different for each of these segments. For the 'New to Energy' segment, improvements in energy knowledge builds confidence and opens the possibilities to other opportunities to improve health and social welfare. For the 'Energy Without Effort' segment, ease and convenience are key to supporting existing knowledge into action to reduce energy consumption within their busy lives. For the 'Stressed About Energy' segment empowerment occurs through building knowledge and confidence to reduce wasteful energy usage, enabling the financial capacity to use electricity for thermal comfort to support health and welfare when needed.

'New to Energy' Segment Recommendations

The following factors are critical for reaching the 'New to Energy' market segment:

1. Use established community links to build legitimacy.
2. Contextualise any information to the participant's education level and cultural lens.
3. Position energy efficiency as an important life skill for the improvement of wellbeing.
4. Focus on capacity building of the community not the individual.

'Energy Without Effort' Segment Recommendations

The following factors are critical for reaching the 'Energy Without Effort' market segment:

1. Employ digital platforms for program delivery.
2. Engagement should be both convenient and responsive.
3. Position energy efficiency as fun and interesting.
4. Connect participants with each other.

'Stressed About Energy' Segment Recommendations

The following factors are critical for reaching the 'Stressed About Energy' segment:

1. Invest in building ongoing relationships with the participants.
2. Communication should be primarily face-to-face and in-home.
3. Provide graduated levels of support (i.e. filter information only as required).
4. Position energy efficiency as a low-cost solution that can build confidence.
5. Draw on established, trusted organisations to overcome worry.

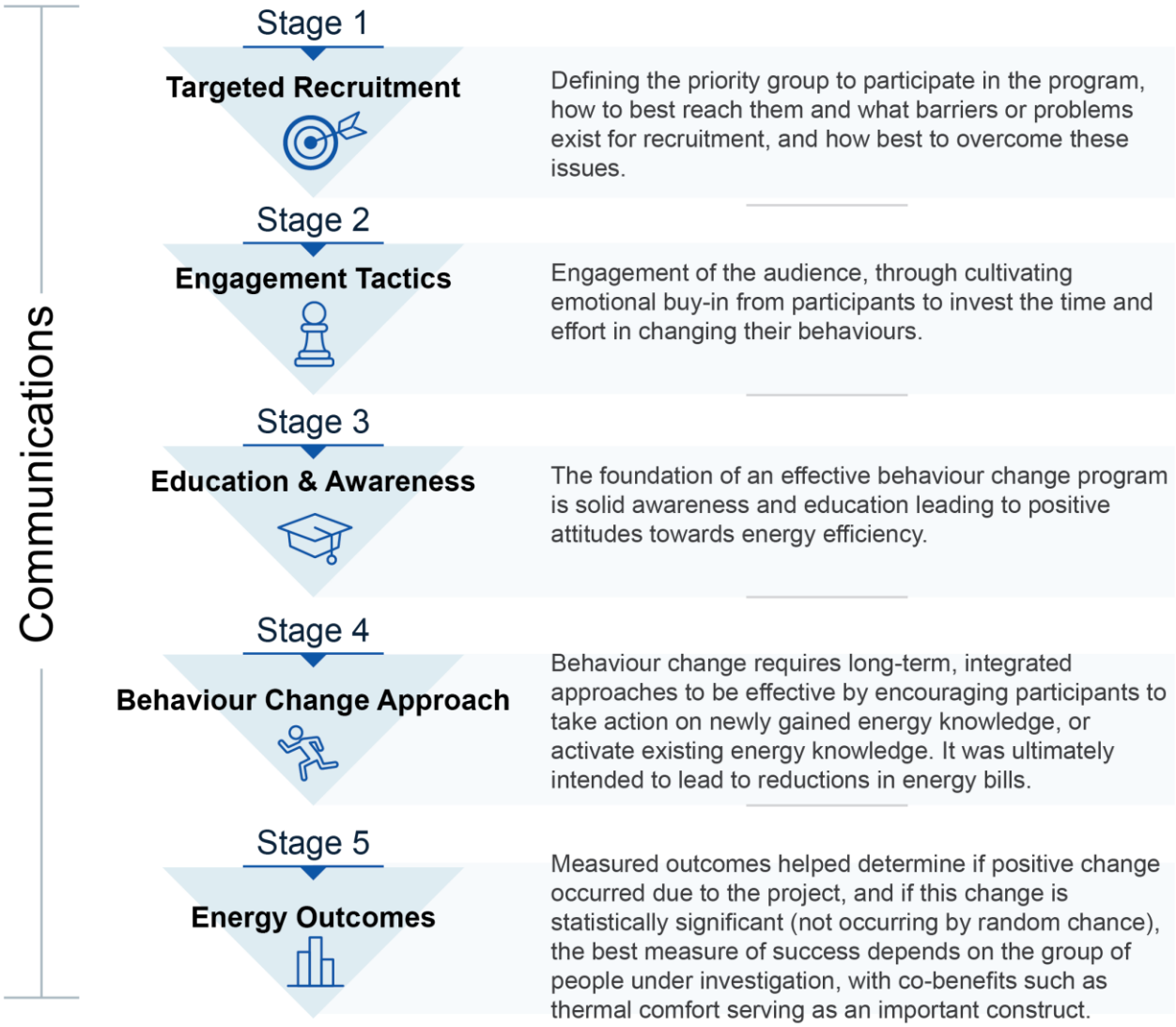
Program-Level Insights

The analysis undertaken has identified the following overall critical success factors for the successful implementation of future energy efficiency programs that aim to support low-income households:

1. Contextualise and tailor projects to fit the lifestyles and values of the target market.
2. Develop trusting relationships to build legitimacy.
3. Draw from an evidence-base.
4. Balance project needs with participant needs.
5. Resource projects appropriately across the entire delivery process.

Stakeholder-Level Insights

A program delivery framework was developed out of the analysis to understand how the LIEEP programs achieved the outcomes and to drive outcomes in future programs for low-income households. This framework consists of five stages: recruitment, engagement, education, behaviour change approach and outcomes (see next page for illustration).



This framework was then used to understand how stakeholders such as industry, policy-makers, community and government can have a co-ordinated approach to energy efficiency programs. There are seven insights for co-ordinating stakeholders that arise from analysis of the LIEEP program reports and the broader social change evidence base:

1. Evidence-based design
2. A customer-centric approach
3. Data collection and administration
4. Framework specific to energy efficiency
5. Governance across initiative elements
6. Technology to underpin program initiative
7. Behaviour change as a focus

The deep dive into LIEEP reports has revealed broader issues and challenges which lead to numerous conclusions. First, the need for a unified effort to support the variety of low-income households is paramount. Major, recurring issues of energy affordability, ongoing disadvantage, fear and a real incapacity to make the changes needed in their lives means that most low-income households face a dire future as it relates to energy. Reported levels of ‘co-benefits’ indicate that factors of stress, thermal comfort,

confidence, control and self-efficacy as they relate to energy will become worse unless low-income householders receive assistance. There is no margin for these factors to worsen as they have already reached untenable levels for many.

In the short-term, efforts should be directed towards ensuring that those who are eligible are placed immediately on a payment plan and provided access to financial support by energy providers. We found that most low-income households were unaware that there were support options available to them from energy providers, and that when dealing with their providers some found it to be an unsavoury experience. This needs to be turned around so that the low-income household is seen as a viable and important segment of the market. Also requiring immediate action is reform for landlords and the obligations they have to their tenants. Ensuring that their rented properties meet minimum requirements, and stimulating their motivation to work 'with' tenants, rather than from a place of disinterest, is urgently needed.

In the longer term, low-priced energy supply options need to be available, so that people can choose the level of service with which they receive energy, and thus the price they pay. Just like flying a plane, safety is paramount, but the extra services can differentiate providers and provide cheap and affordable options to those with limited disposable income. Also vital is a reform of regulation such that housing stock across Australia is reviewed in terms of meeting minimum energy efficiency standards. There is an opportunity for government to lead the way here, and refit all social housing homes to a high energy efficiency level, which would not only set the standard, but provide much more affordable housing, of decent quality, to those most in need. We believe that joining forces to provide an eco-system of support to Australians experiencing vulnerability in their lives is a viable solution; one that would also improve the household energy experiences of all Australians.

Abbreviations for LIEEP Programs

BA	Bright Actions
BTH	Beat the Heat
EE3A	Energy Efficiency in the 3rd Age
ES	Energy Saver
FPF	Future Powered Families
GBS	Get Bill Smart
GHW	Green Heart Wisdom
GS	Glenelg Saves
HEEUP	Home Energy Efficiency Update Program
KEEP	Koorie Energy Efficiency Project
MM	Manymak
NGSC	North Grampians Shire Council
OGH	Our Green home
PD	Powerdown
PP	PowerPlay
PS	Powersave
PSR	Powersaver
RYJ	Reduce your Juice
SCT	Smart Cooling in the Tropics
SOH	Switched on Homes

Contents

List of Tables

List of Figures

1. Purpose of Research Project

Running from 2013–2016, the Commonwealth Government's Low-Income Energy Efficiency Project (LIEEP) was established to provide grants to 20 consortia of government, business and community organisations to trial new and innovative approaches to assist low-income and vulnerable households to overcome identified barriers to energy efficiency and to better manage their energy use (LIEEP Guidelines, 2012). These key barriers included information failure (in the report we adopt the term 'lack of knowledge'), capital constraints (in the report we adopt the term 'cost') and split incentives, which prevent low-income households from adopting more energy efficient practices. LIEEP projects overall explored new and innovative ways to deliver approaches for the implementation of energy efficient technologies, whilst assessing costs and benefits, benchmarking data, and establishing effective administration and communication tools (LIEEP Guidelines, 2012, p. 3). The culmination of these projects is represented in 20 individual project evaluation reports.

As part of the Power Shift Project, Energy Consumers Australia (ECA) commissioned the Group of Energy Efficiency Researchers (GEER) Australia to conduct a 'deep dive' into these reports with a view to extracting key information and learnings not readily apparent within a single report. The aim of this deep dive was to identify what caused low-income consumers to change behaviour. In particular the deep dive sought to identify different market segments within the LIEEP participants and their behaviour change responses to the LIEEP initiatives.

Informed by social marketing theory, this project has built on the foundation research of the LIEEP pilots by analysing the 20 pilot study reports. Apart from providing an overview, the analysis has led to the development of a consumer segmentation framework, which facilitates recommendations to be made on the basis of behavioural traits and common consumer needs to a broader group of consumers than in the original LIEEP program. The findings reported here are expected to inform stakeholders about the relative value of the LIEEP trials and provide insights and guidelines of how best to support low-income households with regard to using energy in their homes.

The intention of the deep dive was to:

a) identify the characteristics and key learnings of different interventions and engagement channels, in terms of their success and relative impact
b) identify traits/characteristics of the LIEEP low-income households and where there is evidence on how those affected their behaviour and decision-making, with the aim of informing a consumer segmentation framework
c) recommend interventions relevant for consumers wider than those low-income groups targeted by LIEEP, based on common needs or behavioural traits.

2. Deep-Dive Process

There are 20 LIEEP projects with varying levels of data included. There was variation in the type and quality of the data collected across the projects, ranging from projects with extensive data points, including control groups, to projects with minimal data; all but one project (NGSC)[1] was included in the deep-dive analysis of quantitative data. While the quantitative data from this report was excluded as the 'sample size was statistically insignificant' and 'there [was] also a large error attached to these calculations given the small sample size' (NGSC, 2016, p 10), the qualitative data and comments were included in the deep dive. The reports, collectively, represent approximately 4000 pages that needed to be reviewed to conduct the deep

[1] Projects are referred to throughout the report in their abbreviated form. Please refer to the 'Abbreviations for LIEEP Programs' on page 11 for full project names.

dive. Accordingly, it was essential to design a rigorous process to ensure key elements were not overlooked.

To conduct the deep dive into the LIEEP reports, three steps were followed:

1. An overview of the LIEEP programs was produced which involved a detailed table of the programs (matrix), which captured key elements across all LIEEP reports. The matrix was then synthesised to highlight key aspects of interest in LIEEP results.
2. Analysis of LIEEP participants was undertaken to develop a segmentation profile of low-income earner participants.
3. Insights were ascertained for reaching and influencing each of these segments to generate energy efficiency behaviour change.

3. Definition of Low-Income Earners

This report draws from the definition of 'low-income households' as outlined in the LIEEP Guidelines Report (2012). Each LIEEP project was required to indicate the particular type of low-income household being targeted as part of their trial. One or more of the following indicators were used by projects to define low-income households:

- household income was in the bottom two quintiles of the Australian population – The Australian Bureau of Statistics data (2013) defined Quintile 1 (lowest quintile) as less than $512 per week or $26,624 per year, and Quintile 2 as $512 to less than $975 per week or a maximum of $50,700 per year
- the householder was in receipt of an Australian Government concession card
- household income was mainly derived from income support payments
- the householder was a member of a particularly disadvantaged target group, for example Aboriginal, culturally and linguistically diverse people (CALD), new arrivals, or is a person with a disability
- high energy needs due to either individual or locational factors, for example disability or climate (high energy usage relative to household size and composition)
- the householder was participating in an energy hardship program
- the householder was disconnected or at risk of disconnection from their energy source.

The term 'households' includes private dwellings, such as houses, flats, home units and caravans, but generally excludes government-owned public housing (LIEEP Guidelines Report, 2012). Although reference to households is made, this research project is primarily concerned with findings reported at the level of the LIEEP participant, who may reflect one of several household users of energy.

4. LIEEP Participant Summary

Each of the 20 consortia prepared a report reflecting the design, implementation and results of their individually funded project. These reports form the basis of analysis for this report. A total of nine participant cohorts were identified as being targeted by a LIEEP project, and which formed part of the analysis for identifying segments in this report. The key participant from a household, rather than the whole household, is the level (unit) of analysis. Participant cohorts across LIEEP projects were classified into nine cohort groups based on a combination of different demographic factors:

1. Aged
2. Apprentices and trainees

3. CALD
4. General (participants were targeted nationally, or not identified beyond 'low income')
5. Aboriginal
6. New parents
7. Social benefit recipients
8. Tenants
9. Young renters

Where possible we have sought to identify characteristics of LIEEP households. The category 'Social benefit recipients' is used to denote vulnerable consumers more broadly – a number of LIEEP pilots focused on a geographic area and did not report on individuals by demographic details. A summary of LIEEP projects and the associated cohort is outlined in Table 1.

Table 1 Project Cohorts

Cohort	Project
Aged	ES
Aged	SOH
Aged	EE3A
Aged	GS
Aged	NGSC
Apprentices & trainees	PP
CALD	BA
Culturally and linguistically diverse people (CALD)	PSR
General	GBS
General	OGH
General	SCT
Aboriginal	MM
Aboriginal	KEEP
New parents*	FPF
Social benefit recipients	PS
Social benefit recipients	HEEUP
Social benefit recipients	PD
Social benefit recipients	GHW
Tenants	BTH
Young renters	RYJ

*Note: *New parents are defined as parents where the oldest child is 15 years or younger.*

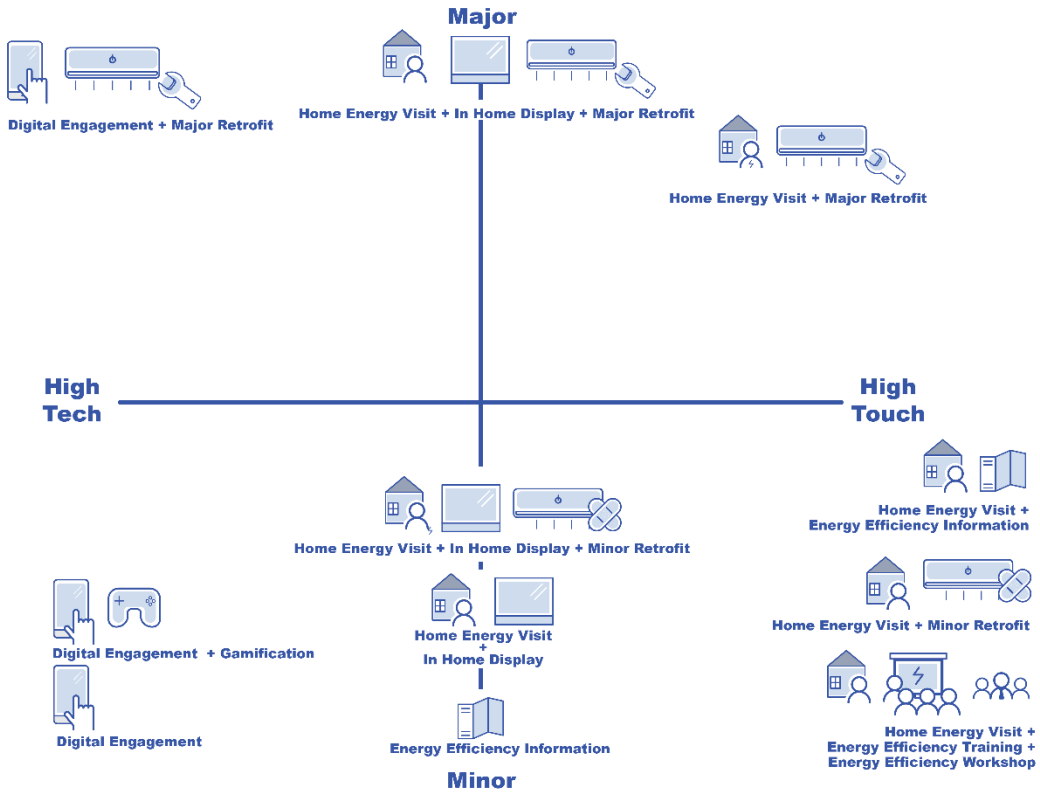
Initiatives trialled across LIEEP projects to assist in influencing lower energy use and/or energy bills included either a single initiative or multiple initiatives, depending on the project, from the following:

- **Home energy visits (HEVs):** a personal visit to a person's home to discuss their energy usage, bills, tips, payment and support plans, provider offers and personalised attention.
- **Major retrofits:** involves installing new energy technologies to the dwelling such as insulation and replacement of large appliances (e.g., heating/cooling, hot water systems or refrigerators).
- **Minor retrofits:** involves installing or providing minor energy savings devices, such as replacement of lighting, draught sealing or window coverings.
- **In-home displays (IHD):** provides a real-time measure of energy use in the home which can alert householders to usage, spikes and costs via a display or app.
- **Energy efficiency information:** providing information via brochures, pamphlets, workshops or training.
- **Digital engagement:** involved using digital technologies to engage and/or communicate with households regarding energy efficiency, which may involve one-to-one or online communities.

- **Gamification:** using gamification to encourage the practice of energy efficiency behaviours by stimulating participants in a fun way.

The initiatives can be classified according to impact on the housing stock (major/minor) and the degree of human interaction (high touch/high tech). The combination of these criteria for each initiative is shown in Figure 1. The LIEEP reports reveal that most projects selected initiatives to trial that were high touch and minor compared with major and high tech.

Figure 1 Initiative Classification – Impact and Interaction



Energy efficiency outcomes in this report capture household electricity consumption data that were collated and measured by kilowatt hours (kWh) and improvements across behaviours, knowledge, attitude, competency, stress, comfort and self-efficacy as they relate to energy efficiency.

5. A Consumer-Centric Approach

The key to unlocking behaviour change is understanding the motivators and barriers that influence behaviour change, and a consumer-centric approach to this involves market segmentation. Market segmentation recognises diversity of motivation, opportunities and the ability to be energy efficient, and requires strategies that meet these varying needs. This approach matches the ethos and key learning of many LIEEP projects in that there is no one-size-fits-all approach to changing energy behaviours of low-income consumers. The deep dive into the LIEEP project reports has revealed insights for policy-makers, energy market stakeholders and social service providers in changing the behaviour of low-income energy consumers. These insights have been summarised and communicated within this report to allow stakeholders who may fund or implement future energy efficiency initiatives to absorb the information most relevant to them.

The result of the deep dive into the LIEEP reports has resulted in the development of a three-level approach that represents the insights gained from the reports for influencing behaviour change (see Figure 2):

1. **Customers:** At the heart of the market are the consumers themselves who have needs to be met and behaviours that need to change.
2. **Programs:** Surrounding the customer are the energy efficiency programs that can assist them to change behaviour.
3. **Stakeholders:** At the outer level, there are stakeholders such as community groups, policy-makers, government and industry to provide energy efficiency services and goods that enable customers to achieve value.

The relationship between the three levels is shown in Figure 2. Insights for each level are presented in this report based on the deep dive into the LIEEP reports. At the centre of these insights is an understanding of the customer through market segmentation. Next, this report provides insights about the features of the LIEEP programs for those segments (what worked and what did not). The outer level of insights reflects stakeholder considerations highlighted in the LIEEP reports.

To design effective energy efficiency initiatives and programs, planning should start with the customer at the centre of the program and work outwards.

Figure 2 A Multi-Level Approach to Energy Efficiency Behaviour Change

6. Customer-Level Insights

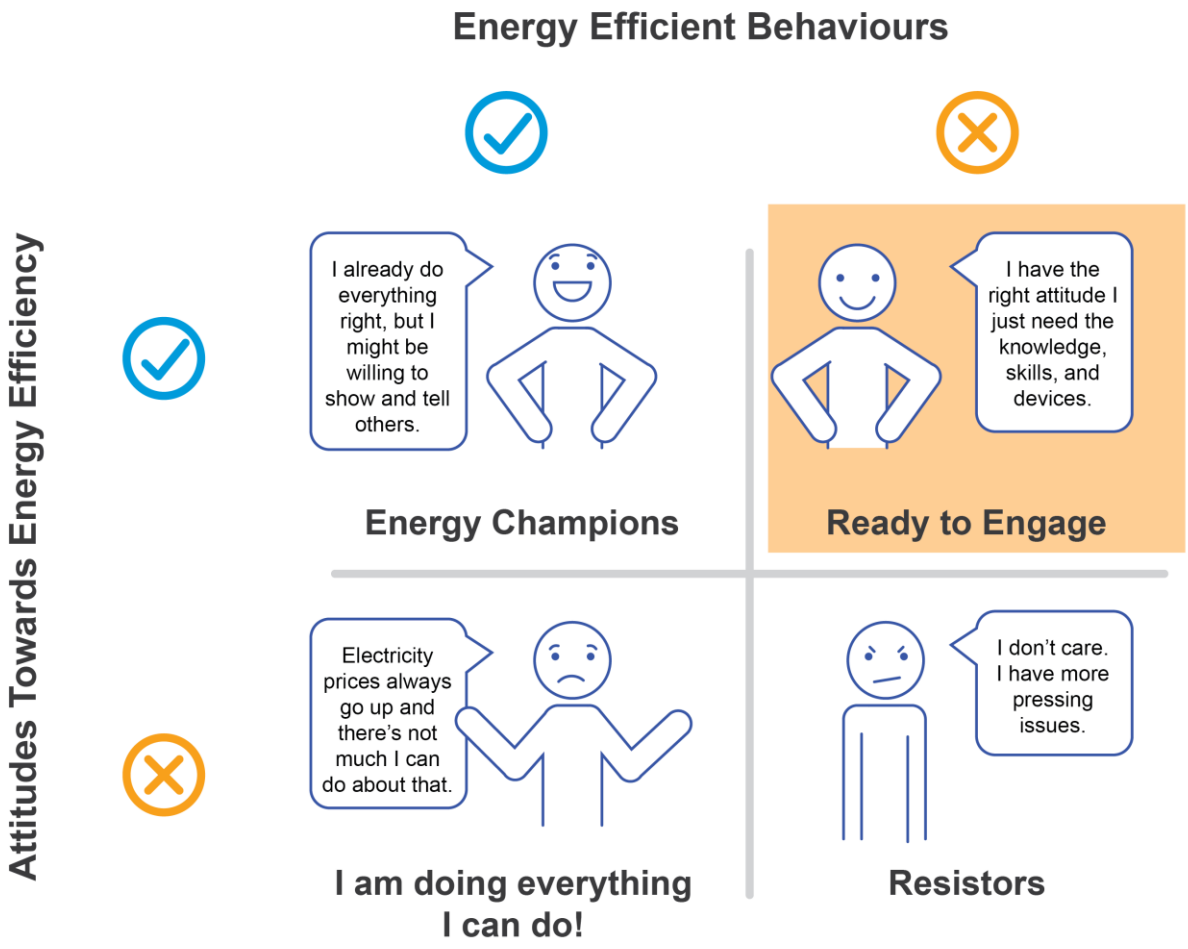
Successful energy efficiency initiatives clearly identify the target market, the nature of their problem and choose the initiative that will address this problem. When this focus is not present there is reduced likelihood that the initiative will have any meaningful impact. The insights resulting from the deep dive into the LIEEP reports reflect a customer-centric approach, whereby customers' motivations, barriers and limitations drove the energy efficiency initiative, rather than retro-fitting an energy efficiency solution onto a consumer without taking into consideration their motivation, opportunity and ability for change.

The second research objective of this project was to identify relevant traits or characteristics of low-income consumers to inform the development of a consumer segmentation framework. This section outlines how future energy efficiency efforts can clearly identify the needs of a particular group of energy consumers (segments) and will assist in designing initiatives to reach them (i.e., recruit, engage, educate and inspire consumers to take action) for the purposes of changing their energy efficiency behaviours to help lower their use and bills.

6.1 Broad Segmentation Framework

The participants in the LIEEP pilots self-selected to join the programs; thus, LIEEP represented people who were likely to be willing to change, and who desire the tools and opportunities to better manage electricity costs. Drawing from the Sheth and Frazier (1982) attitude/behaviour matrix of segmentation, LIEEP participants can be described as mostly falling into the 'Ready to Engage' quadrant of consumers (see Figure 3). It is important to note that LIEEP projects aimed to recruit people from all four segments; however, the self-selection process appears to have resulted in a dominance of the 'Ready to Engage' segment represented in the LIEEP participants. This is evidenced by the higher knowledge levels and positive attitudes baseline measures, in conjunction with the desire to improve energy efficiency behaviours.

Figure 3 Attitude/Behaviour Segmentation of Energy Efficiency



From Figure 3, the remaining three groups of consumers, who reflect different combinations of attitudes and behaviours, were not present in LIEEP pilots. Future programs aimed at improving energy efficiency outcomes for low-income earners could consider targeting these groups of consumers to reach a larger proportion of low-income earners. The three least represented categories (i.e., 'I am Doing Everything I Can Do!'; 'Resistors' and 'Energy Champions') are briefly discussed in this section, and the 'Ready to Engage' segment are detailed in the following section.

In general, the 'I am Doing Everything I Can Do' segment has an understanding of how energy works, but feel as though the energy system is against them, thus leading to negative attitudes towards energy

efficiency. They have been conditioned to accept high energy bills as a way of life and they are already doing everything they can to reduce the cost. Energy is viewed as overly complex. Programs deployed to target this segment of consumers would need to correct misperceptions about energy efficiency tactics – which is an important step in engaging this group. When family and peer networks can demonstrate the benefits of energy efficiency, poor attitudes can be addressed. Building trust within the community will be difficult, particularly for industry- or government-sponsored programs.

Those in the 'Resistors' segment include, among others, those families in 'crisis', whereby energy bills are very unlikely to be a primary consideration. For example, this may be the case in households where there are personal issues occurring that detract attention away from energy use and bills (e.g., domestic violence, recent family death, drug and alcohol abuse or serious health issues). The key factor in targeting this segment is providing families with social support rather than adding to their existing stress (e.g., having to do something about energy use in the home may be too hard for this group in the immediate future). For this segment, energy efficiency should be delivered as part of an overall social service. In doing so, energy efficiency could be taken into consideration, for instance, to ensure electrical goods provided do not cause high energy bills over the life of the product. For example, if people are provided with inefficient refrigerators and heating equipment as part of their settlement support packages when they first arrive in Australia, later when these householders are resettled they often join together to share the cost of a rental house and bring their inefficient equipment with them. This leads to extremely high energy bills. Importantly, LIEEP programs have demonstrated that providing household energy efficiency support can help this segment, and also provides a mechanism to gain trust in 'Resistor' households. Providers who were able to demonstrate care and support were able to build trust in the community, which was an unintended beneficial consequence. This meant that households would seek access to additional support for their family (direct and or extended community) through these providers.

Energy efficiency programs are traditionally targeted at people with little to no knowledge and who, by learning and implementing new energy efficiency information, can substantially improve their energy efficiency. However, for 'Energy Champions', what can be done to continue to support the journey of these households who have already consciously chosen to improve their energy efficiency? This group is likely to battle against the huge amount of information available to try and make informed choices about how to progress their energy journey, if at all. Also, investment in digital assets (e.g., trusted websites) is important to ensure consumers are kept up to date. Trusted websites should be easy to navigate and should be relevant to the audience. These key tactics will help to engage this group, who are more likely to have a preference for self-service.

The analysis indicates that there is no one best base for segmentation, rather there are appropriate combinations of segmentation bases depending on the outcome desired. For instance, where knowledge and self-efficacy is low in a group of consumers, psychographic and demographic variables may be useful. Alternatively, when knowledge and self-efficacy are high, segmenting on behaviours may be more appropriate.

6.2 Segmenting the 'Ready to Engage' Market

LIEEP participants were profiled in this report using four bases of market segmentation. Market segmentation is an initial step in designing a successful program, and involves dividing a larger market into smaller, more manageable groups (segments) on the basis of commonality (McVey & Walsh, 2009). Segmentation is a powerful tool for gaining an in-depth understanding into distinct segments (Wedel & Kamakura, 2012) by determining what types of consumers will be most receptive to a particular product, service or marketing message (Brechin, 2008). Consequently, market segmentation takes the guesswork out of determining what motivates people to buy, and avoids the detrimental one-size-fits-all approach.

Thus, market segmentation provides a quantitative breakdown of the market, identifies attitudes, preferences and the potential buying behaviours and habits of consumers (Brechin, 2008). Overall, segmentation provides high-level categorical classifications of groups of people (Sherman, 2015). When segmenting a market, the aim should be to define a small number of groups so that: (i) all members of a distinct segment are as similar to each other as possible (homogenous), and (ii) each group is as different to each other as possible (heterogeneous).

The variables available across the LIEEP program reports for participants correspond to each of the four segmentation bases. Traditionally, segmentation techniques draw from one or a combination of the four possible segmentation bases: geographic, demographic, psychographic and behavioural indicators (McVey & Walsh, 2009). In this research project, we use all four bases to profile the LIEEP participants:

- geographic variables – climate zone and level of urbanisation
- demographic variables – age group and cohort
- psychographic variables – knowledge, attitudes, competency, stress, thermal comfort and self-efficacy
- behavioural variables – energy use and energy efficiency habits/behaviours.

The results presented here have two important implications. First, that psychographic aspects (which in this instance, could be termed 'co-benefits') may be more important to many households than a reduction in energy use or bills, *per se*. For example, if someone is highly stressed about their bill, then efforts to encourage them to turn off the lights when not in a room may go awry, whereas efforts to help them get onto a payment plan may be greatly appreciated and thus produce a favourable response. This means that addressing the household's other pressures first may be required before implementing direct efforts to affect behaviours and outcomes that reduce energy use and bills. Second, that the physical and social consequences of sub-optimal energy use may be much higher and more extensive than previously understood. Some reports measured general comfort, while others measured thermal comfort. In one case, inside thermal measures revealed an elderly person living in their home with an average temperature of 10°C. This is an alarming situation given that such a temperature is likely to result in numerous poor health outcomes, especially for the elderly (GBS). Accordingly, a directed assessment of Australian households regarding the health consequences of poor energy use is urgent and vital.

Three sub-market segments within the broader 'Ready to Engage' market for energy efficiency have been qualitatively interpreted as arising from the analysis of the cohorts reported in the LIEEP reports. These three segments are based on differences across participants due to their age group, cultural background and self-efficacy. They are termed the 'New to Energy, 'Energy Without Effort' and 'Stressed About Energy' segments (see Table 2 and Figure 4):

1. The **'New to Energy'** segment is largely determined by people's geographic location (extreme climate zones and regional/remote areas) and cultural background (CALD and Indigenous cohorts).

2. The **'Energy Without Effort'** segment is largely determined by people's age group (young adults) and psychographic variables (high confidence, positive attitudes and high need for thermal comfort).

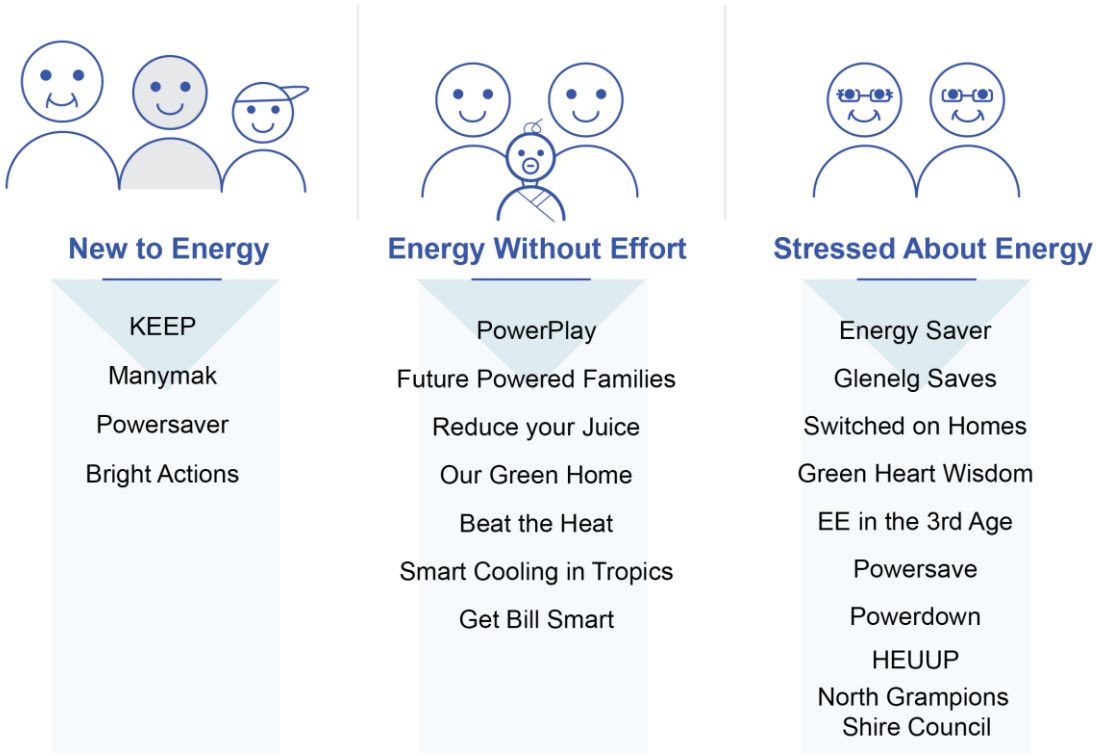
3. The **'Stressed About Energy'** segment is largely determined by people's life cycle stage (mature consumers) and psychographic variables (high tolerance for thermal discomfort, price-sensitive, habitual in their behaviours and have low self-efficacy and competency in relation to managing their energy efficiency).

Table 2 Segmentation of LIEEP Participants

Segmentation descriptor	'New to Energy'	'Energy Without Effort'	'Stressed About Energy'
Geographic	Live in extreme climate zones, and/or regional or rural areas. Access to electricity is different and can be difficult. (e.g. not on National Electricity Market (NEM), pre-purchase electricity through card systems).	Live in Australia (participants could live anywhere in Australia).	Live in Australia (participants could live anywhere in Australia).
Demographic	Culturally diverse or English as a second language, larger family structures representing multiple families in one dwelling. Relationship to energy costs/bill is weak because there are many people within the household consuming energy. Health and social wellbeing outcomes may be more valuable than energy efficiency outcomes for this group.	Younger adults, renters, higher proportion of families. Relationship with energy bill – observant, but must influence the (kids, share house) household in order to reduce electricity consumption.	Mature adults, less people per dwelling, maybe living in oversized household for their needs. Relationship with energy bill – very vigilant.
Psychographic	Energy is a relatively new topic Unsure how energy fits into their lives. Low energy knowledge, self-efficacy and competence. Language and cultural barriers make it difficult for this group to interact with the traditional 'energy system'.	Confident and positive about energy efficiency. High need for thermal comfort Environmentally conscious. Baseline of energy knowledge. Preference is to have minimal interaction with the energy system – preference for digital engagement.	Price-sensitive. Habitual. Low self-efficacy. High threshold for thermal discomfort. Fearful of the system, unlikely to change providers or complain.
Behavioural	Low number of energy efficient behaviours. Slow to uptake energy efficiency behaviours.	Willing to uptake energy efficient behaviours.	Anxious or uncertain about energy efficient behaviours.

The LIEEP projects have been classified according to the three segments based on the profile of the targeted participants. As seen in Figure 4, four projects targeted the 'New to Energy' segment, seven projects targeted the 'Energy Without Effort' segment and eight projects targeted the 'Stressed About Energy' segment.

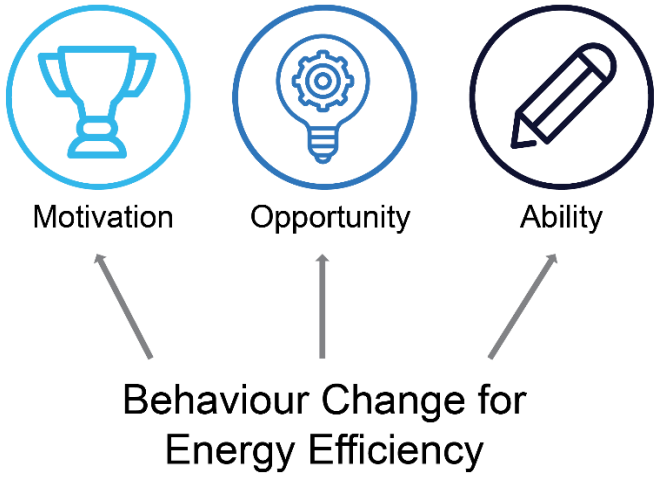
Figure 4 LIEEP Projects per Segment



6.3 How to Reach 'Ready to Engage' Low-Income Groups

There are three approaches to achieve social change: education, regulation/policy and social marketing (Rothschild, 1999). The use of each approach depends on the combination of motivation, opportunity and ability (MOA) of the targeted segment. The MOA approach to behaviour change for energy efficiency would therefore require ensuring consumers are motivated and have the opportunity and ability to be energy efficient (see Figure 5).

Figure 5 Motivating, Creating Opportunity and Ability (MOA) for Energy Efficiency



- Motivation is commonly viewed as a force that directs individuals toward specific goals (Leung & Bai, 2013). Motivation represents such constructs as readiness, willingness, interest and desire to engage in information processing (MacInnis et al., 1991) or a particular behaviour (Morel et al., 1997).
- Opportunity is the extent to which external circumstances prevent or facilitate engagement in a particular behaviour (Morel et al., 1997).
- Ability refers to the extent to which consumers have the skills or capabilities necessary to engage in certain behaviour (Hoyer & MacInnis, 1997; Morel et al., 1997).

Which of the three approaches should be used under what circumstances?

Education is a relevant approach when consumers are motivated to be energy efficient, have the opportunity and ability to engage in energy efficient behaviours and just need the information to get going. The application of education is to 'tell' consumers about a behaviour and assumes that social change is the result of closing the information-deficit gap.

Regulation (via new policy) is the tool to use when consumers have the opportunity and ability to be energy efficient, but are not motivated when urgent change is necessary. The application of legal requirements is to 'make' consumers perform a behaviour and assumes that social change will not occur in the desired time frame voluntarily.

Social marketing (behaviour change programs) is the tool to use when consumers are motivated but lack either the ability or opportunity to be energy efficient. The application of social marketing is to 'help' consumers perform a behaviour and assumes that social change is the result of goods and services that provide more customer value than the competition at the right social price, using the right distribution channels and service delivery, with the right communication. Examples of the application of these three approaches are depicted in Figure 6.

Figure 6 Three Approaches to Social Change

6.4 'New to Energy' Segment MOA

This segment includes sub-groups, such as Aboriginal and Torres Strait Islander communities, within the context of both remote and metropolitan areas and new Australians including CALD cohorts. People in this segment are invariably living in regions that experience more extreme climate zones.

People in this segment often experience numerous structural barriers within the energy system. These include, but are not limited to: accessing the electricity network, having to pre-purchase electricity verses traditional billing, having unhelpful and sometimes disrespectful responses from energy retailers (e.g., KEEP, BA) and other aspects of establishing an electricity account caused by retailers' lack of staff with relevant cultural and language experience or general disinterest in helping. People in this segment also tend to experience high levels of ongoing disadvantage, discrimination and broader health and social issues.

Motivation: When seeking to motivate behaviour change for these energy consumers, careful consideration should be given to the following issues (readiness, willingness, interest and desire to engage) for the segment:

- The complexity of the energy sector means that many in this segment often experience very high bills and remain unsure as to how to lower their energy use, or how to adjust their behaviours to bring about lower financial stress without sacrificing their quality of home life. Instead, many sacrifice their wellbeing by using energy to very low levels in an effort to cope with constantly rising utility bills.
- Due to constantly struggling with the energy sector, levels of distrust and apathy towards providers and government ensue, while stress levels rise. Engagement in support activities, such as LIEEP, tends to take longer as repeatedly having a poor experience nurtures a lack of trust and desire to engage with those who claim they want to help.
- Improvements in health and social and emotional wellbeing (including reductions in financial stress) are motivators for this segment of consumers to engage in energy as a topic (so adopting a 'high-touch' approach providing personalised support will be needed).

The following quotes from the KEEP and BA project reports demonstrate some of the motivational barriers for this cohort in achieving energy efficiency:

> *Many Aboriginal households reported experiencing energy-related barriers including: high consumption levels, associated high bills and difficulty paying them; fear of dealing with their energy providers due to past negative experiences; worry about the constant threat of disconnection; falling further and further behind financially; and caring for other family members which often meant increasing their own energy burden. (KEEP)*
>
> *Some participants were unwilling to sign forms or divulge much information about themselves in general. This has been anecdotally attributed to language skills, and some were reluctant to sign official documents due to mistrust and pre-arrival experiences with governments. (BA)*

Programs aiming to support this segment will need to focus on providing external opportunities and access in order for people to adopt behaviour changes. LIEEP reports reveal that many participants lacked access to culturally appropriate information and systems, or access to energy retailer hardship programs and other social support services. These resources were either not developed by providers, or not made easily accessible for the cohort. The impact of extreme climate or remoteness from metropolitan areas may further

limit access to a wide range of energy efficient appliances and infrastructures. For example, some projects cited barriers of limited internet access, and limited choice when purchasing appliances (e.g., MM). Several projects that targeted this segment of customers provided examples where participants requested additional support from their LIEEP project contact, once they had earned their trust in delivering energy-related support:

> *There were also issues of obtaining consent for electricity consumption data, where the person representing the household at the home visit was not the electricity account holder and therefore unable to provide consent. The project also faced an issue of participant tenure, where many participants had only recently moved into their accommodation or had just changed accommodation. This resulted in a high number of data sets that were not viable. (BA)*
>
> *It was good to have the forum because it allowed a rare opportunity for those feelings [of historical/political/social context in which Yolŋu sits] to actually reach people face to face, people who are usually far away in an alien world. I think this meant that the story got to a few people. Yolŋu needed to say it, and we needed to hear it. (MM)*
>
> *All efforts in improving EE in low-income renter households should acknowledge the structural barriers in place and the subsequent limits on low-income individuals to counter them. There is considerable opportunity to improve the energy efficiency, quality and stability of private rental property in NSW. (PSR)*

Opportunity: When seeking to create behaviour change opportunities for these energy consumers, careful consideration should be given to the following issues for the segment:

- Communication and service offerings should be culturally sensitive and offered in languages other than English. The language and cultural uniqueness of people within this segment have not been addressed by the sector, and has meant that instead of being embraced, these factors have served as barriers to this group, making it difficult for them to interact with the 'energy system'.
- Extreme climate zones (hot and cold) require specific types of household appliances and structures that need to be available and at the right price for behaviour change to occur.
- Participants who live in extreme or rural climate zones need to access alternate, and affordable, sources of electricity (e.g., solar power, wind or hydro, and battery storage technologies).

Ability: Without support, the capacity for people in this group to undertake and/or fund energy efficiency activity is very limited, due to invariably struggling with ongoing energy-related disadvantage, an inability to afford bills – let alone improvements in appliances – and an unfamiliarity in how to mine their way through the complexity of the sector. Improving energy efficiency is often not prioritised as broader bill distress or family issues understandably take precedence. In addition, for some, many people reside in the home (this could be due to a lack of available housing, e.g., MM, KEEP) which means that the householder is likely to have little control over the household energy consumption levels, and yet are left being responsible for the full bill. To improve the ability of this segment to become more energy efficient in their homes, support is needed across many areas, and supporting them in addressing their pressing issues first will be needed.

The segment is best reached through trusted social or community service providers, whereby energy efficiency may form part of a suite of products and services delivered to the target group. These social service or community providers should be able to demonstrate well-formed and trusted relationships with the target segment that will in turn provide access to and support from each of the communities within the segment. Social service or community providers will also be able to guide and support the creation of

information-type products and the appropriateness of program elements (energy efficiency retrofits, energy efficiency products and devices or rewards used for participation).

The first goal of energy efficiency for this segment is to build awareness and knowledge within the household. Improvements in energy efficiency knowledge are more likely to result in longer-term change in energy behaviours and should be the measure of success.

> *Many Yolŋu are not aware of the link between power usage and costs. Accordingly, they have many appliances turned on at one time and leave them on for prolonged periods, whether they use them or not. However, many Yolŋu retain skills in traditional ways of using power/fire and water and in some cases, prefer them. Working out ways to work with rather than against Yolŋu traditional knowledge could be one option to increase energy efficiency and empower people. (MM)*
>
> *Application forms were difficult to complete and required detailed information about income and expenses. This was a barrier particularly in cases where the participant had low literacy/numeracy skills and used a language other than English. (BA)*

When seeking to improve the ability for behaviour change to occur for these energy consumers careful consideration should be given to the following issues (skills or capabilities necessary to engage in certain behaviour) for the segment:

- energy knowledge, self-efficacy and competency can be improved using community leaders as key influencers, in alignment with cultural norms
- leveraging family members to create awareness of the health implications of energy consumption – thermal comfort is particularly important in extreme climates
- face-to-face interactions in informal social settings should be used to educate and raise awareness and encourage trial and reinforcement of behaviours.

6.5 'Energy Without Effort' Segment MOA

This segment of consumers consists mostly of young adults (millennials and young families), confident consumers who are pre-disposed to energy efficiency and have a high need for comfort.

They demonstrate high potential for improvements in energy efficiency. This group feels confident and positive about energy efficiency, and demonstrate a high level of environmental consciousness. However, they also demonstrate a high need for energy intensive comfort and may find some of their habits surrounding this difficult to overcome or change.

The segment similarly contains high levels of renters as well as a high proportion of young families. Whilst there is a baseline of energy knowledge, this group leads very busy lives which means that they have higher energy bills due to unintended wastage. This shows a disconnect between their 'environmental' attitude and energy use behaviours. It also means they must influence all members of the household (e.g., kids or share house flatmates) in order to reduce this wastage and their energy bills.

New parents commonly do not have the time or the motivation to access energy efficiency information as learning parenting skills tends to dominate time and priorities. FPF intended to support these parents by delivering simple and quick energy efficiency messages and information in a context that is relevant to new parents. For example, maintaining heater temperatures between 18 and 20 degrees will ensure that the home is heated to a comfortable level, while the risk of Sudden Infant Death Syndrome is reduced by minimising exposure to stress, and energy bills are reduced. (FPF)

Sustainable Focus have identified during the tenant interviews that many have indicated that 'they already knew' most of the energy efficiency suggestions recommended to them. This indicates the importance of a project focusing around motivation and removal of barriers. (BTH)

Motivation: When seeking to motivate behaviour change for these energy consumers, careful consideration should be given to consumers' readiness, willingness, interest and desire to engage:

- engagement needs to focus on turning existing knowledge into action, rather than building knowledge, because this segment has a higher base line of energy knowledge
- engagement needs to focus on convenience and fun rather than communicating the benefits of energy efficiency as this segment are already on board
- this segment has a strong appetite for digital engagement methods.

LIEEP reports reveal that this group experienced the highest reduction in electricity usage and, due to being so technologically savvy, demonstrates that they would be ideal to target for future large-scale programs, where cost efficiencies may be derived through scale. This segment of consumers is more likely to prefer minimal face-to-face interaction with the energy system and seek 'high-tech' information and tips through websites and other digital communications. This provides an opportunity for low-cost digital engagement to reduce the cost of delivery for this segment. The execution of this will need to be well considered and targeted to meet the needs of this segment.

Taking part in a digital program for energy efficiency is likely to be unchartered waters for most people, however RYJ participants engaged naturally with the program online. Despite the program's unique combination of games, rewards, community and communications, engagement was high with 78% of all participants who completed the initial survey going on to complete the entire program. (RYJ)

With participant's spending so much time online, and the nature of energy efficiency being quite low involvement, it makes sense to incorporate the digital intervention into channels where participants spend their time as they will not go out of their way to find the program. Developing the program to easily fit in with their lifestyle and be consumed in many small interactions was an effective way of reaching participants and helping them change. (RYJ)

A number of LIEEP projects reported on the substantial barriers for tenants. A few pilots aimed to address the split incentive (where the landlord makes the investment decision, but the tenant pays the energy bills). Additional assistance will be needed to support low-income households within this segment. BTH signed up 200 households, with landlords agreeing that the cost–benefit ratio was a major motivating factor; participation in the project resulted in 72% agreeing that they were more likely to implement actions to help tenants save energy. However, the often-complex issues that need to be resolved to facilitate this type of improvement are considerable, and a number of LIEEP projects reported underestimating the effort required. A number of projects also revealed a lack of willingness or interest in the landlords in general in supporting their tenants regarding energy efficiency. Even with the cost of the appliance installed covered,

many would still not agree or respond to approval requests. Further, some tenants feared that their request would be misconstrued as a complaint and, as a result, they could be evicted. These fears often hindered tenants from being able to actively pursue improved outcomes with their landlords.

Opportunity: When seeking to create behaviour change opportunities for these energy consumers, careful consideration should be given to the following external circumstances preventing or facilitating engagement:

- The segment has family commitments, meaning they live busy lives, so engagement activity needs to be convenient (e.g., workshops are difficult to attend if they coincide with family commitments). Hence, access to opportunities needs to be convenient and requires minimal time commitment.
- This group has low patience for complex and time-consuming sign-up processes. Proactive approaches, such as an automated or on-demand digital assistance, that anticipate needs and deliver information and services without prompting are needed.
- This group has a high need for comfort (e.g., they have babies and young children) so ensuring this segment has access to affordable appliances that are energy efficient is important.
- High levels of rental accommodation limit the capability to undertake energy efficiency upgrades of fixed appliances within the home. Programs need to engage landlords to achieve a win-win outcome and offer low-cost solutions such as interest-free loans. So, while the willingness to improve energy efficiency is present, capacity issues will need to be addressed first.

This group has baseline knowledge around energy consumption and basic efficiency. However, they will need to be prompted through effective tools to help remind them to behave differently and to support the ability of household leaders to influence and implement new energy efficiency behaviours within their household.

> *Despite limited spare time, householders with younger children have the ability to reduce their energy use if provided with tailored information and adequate tools. (FPF)*
>
> *The behavioural learning approach for RYJ is a combination of instrumental and experiential learning done in a discrete way (stealthy learning) whereby participants do and experience (virtual world of game), reflect and analyse, conceptualise and then apply and experiment (real world), see following model. (RYJ)*

Ability: When seeking to improve these consumers' ability to change behaviour, careful consideration should be given to the following issues (the skills or capabilities necessary to engage) for the segment:

- Many people in this segment believe they are doing everything they can or have limited control, particularly renters. Increasing their ability requires positive rewards for short-term behaviours that demonstrate control, which is likely to bring about improvements in energy efficiency practices despite the external barriers they face.
- Often people in this segment can be in share houses or are unable to commit to significant planning and searching for information on energy efficiency. Household decision-making needs to be focused on a central goal, with all members working together, so the tools that will assist this group will enable conversation in a convenient manner without effort.

6.6 'Stressed About Energy' Segment MOA

This segment generally consists of mature-aged consumers who, due to being on the pension and coming from an era of frugality, are highly pre-disposed to 'reducing waste', are more price-sensitive than others but tend to lack confidence and knowledge about new or specific energy technologies. They often feel stressed about energy decision-making and bill payments, and have a higher threshold for withstanding thermal discomfort.

Reaching this segment requires a more 'boots-on-the-ground' approach. LIEEP projects targeting this segment reported recruiting participants through trusted social services and community providers such as the 'Home and Community Care' (HACC) network. This type of 'high-touch' reach will be resource-intensive as this segment requires ongoing, high levels of personalised assistance. This type of approach is reflective of meeting the needs of the segment.

A consistent theme emerging from the LIEEP reports was that energy efficiency was perceived through the lens of thrift and not being wasteful of resources. For example:

> *Thrifty practices are understood as reducing energy consumption, to enable expenditure elsewhere in the household budget. Some older low-income households think of themselves as being actively engaged in energy efficiency through not wasting. Hence, this is a cohort of people who should be engaged as knowledgeable about energy use, and for whom not wasting is a priority. If policy positioned them as lacking knowledge, this might work against engagement in energy efficiency programs. Thrifty household practices may result in older low-income households concealing everyday heating/cooling practices from close family and friends resulting in them living with extreme temperature, moving around their homes in the dark at night to save energy by switching lights off of a night, and hanging onto energy inefficient appliances under the assumption it is the morally right thing to do. (EE3A)*
>
> *Among the test groups, the low intervention group experienced the biggest change in motivation to be energy efficient. (SOH)*
>
> *Survey data indicates that the biggest motivation for joining the GHW program was to reduce their energy bill, expressed by 42.3% of participants, with the next motivation being to improve home energy efficiency (14%). (GHW)*
>
> *Spending more time with his family was a core motivation for the householder and this action was perhaps one step closer to enabling that. (ES)*

Motivation: When seeking to motivate behaviour change for these energy consumers, careful consideration should be given to the following issues (readiness, willingness, interest and desire to engage) for the segment:

- the use of 'people like me' (other older consumers) who have successfully achieved energy efficiency could be leveraged to inspire this segment
- linking energy efficiency conversations with social interactions that are of value to this segment will create the motivation to engage
- this segment can be cynical and fearful of the people they do not know, especially energy providers, so using credible and trustworthy spokespeople to communicate and engage them is critical.

Low-income mature-aged consumers still often live in the large family homes where they raised their children, leaving unused spaces that consume energy unnecessarily. They are typically frugal and resist replacing appliances and do not recognise the lifetime cost of retaining an inefficient appliance.

Australia's aging population means that this will be a growing segment, although as the population ages they may or may not adopt similar thrifty practices. There is significant opportunity for energy efficiency improvements and the resulting co-benefits, including improved health and comfort for this segment. Working in collaboration with existing and trusted health and community support providers is a proven way to reach this target group to provide the additional, personalised support necessary to change existing energy habits and low self-efficacy.

The opportunity provided by the project to contribute to their communities was a strong motivation for participation. (GS)

Home-video insights provided an opportunity for participants to tell and show researchers how they make, or seek to make, each room in their home 'feel' right. By adding video, it was possible to document not only participant narratives of their practices and sensory experiences, but also what it is like to live in and continually renew their houses as homes. (EE3A)

The delivery of energy efficiency information by SMS is an opportunity to continue to reach low-income households, while extending the reach of the program to the wider community. SOH suggests SMS would be a welcome addition from utilities or as an education campaign from any sector. (SOH)

The ability for sharing learnings between participants, when someone had missed a tip, was amazing. (GS)

Opportunity: When seeking to create behaviour change opportunities for these energy consumers careful consideration should be given to the following issues (external circumstances prevent or facilitate engagement) for the segment:

- since people in this segment view energy efficiency through the lens of thrift, they will need access to goods and services that are 'value for money' and payment plans that are affordable (e.g., no-interest loans)
- higher levels of home ownership may also indicate they are living in a larger house for their needs; assisting this group to access goods and services to either downsize or block unused areas of the house may be helpful as another means to reduce their energy bills
- reaching these consumers requires access to services providing energy audits, replacing energy-inefficient appliances and providing information
- there seems significant potential in upskilling community workers who already have access to this segment to either provide energy efficiency advice, or refer the household to a lower-cost method of providing personalised care.

Dispelling energy myths and misinformation will be important barriers to overcome when supporting this group. For example, that using a small heater is cheaper than using a main heater (e.g., a local blow or radiant heater was often used until the person learned how much energy they consume) or that saving energy means a loss of thermal comfort, and thus a sacrifice. They are very price sensitive and therefore will be motivated by financial savings to investigate ways to save money. This is encouraging, in that long-formed energy habits may be able to be changed through well-executed programs. Typically, the low-income mature consumer lives in an older home that is less likely to be energy efficiency compared with

modern homes and, being older, may lack the ability to repair or install housing fixtures and are less familiar with digital technologies that could help manage their electricity use.

With higher levels of home ownership in older Australians there is also scope for energy efficiency upgrades on major energy intensive appliances, such as heating, cooling, hot water systems and refrigerators that this group hold onto through their sense of thrift. This group will still require financial assistance to perform this; however, it may be an easier administrative and compliance process to achieve this outcome compared with the other segments, where the split-incentive barrier is more prevalent.

> *The aim of the community training activities was to achieve an upgrading of skills for householders to increase community connectedness and empowerment through using digital media tools, techniques and information provision in ways that older people access information. (EE3A)*
>
> *Some people had the computer experience and skills to use the IHDs whilst others did not, even with support from ELOs. (ES)*
>
> *Increased skills and knowledge, through participation in the 'real life' experience, of trained HACC staff to engage HACC clients and others in the importance of improving home energy efficiency. (GS)*

Ability: When seeking to improve the ability for behaviour change for these energy consumers careful consideration should be given to the following issues (the skills or capabilities necessary to engage) for the segment:

- this segment has a high threshold for thermal discomfort – reframing comfort as a health issue rather than a cost issue will help 'recalibrate' the comfort thresholds
- in order to ensure these consumers are using energy safely – not over-rationing to save money – there is a need to confront what can be long-held beliefs; myth-busting needs to occur in a non-confrontational manner, which respects their life experience yet presents the facts in a compelling manner
- these consumers respond to information that comes through their networks of family and friends – encouraging people to trial energy efficiency appliances and tools in a known environment was more effective, this could involve 'piggy-backing' onto existing social activities and groups, encouraging them to share the 'little wins'.

7. Program-Level Insights

This section synthesises the analysis of the LIEEP projects across all five stages of the LIEEP delivery framework to identity five critical success factors – those features of the LIEEP that helped low-income households reduce their energy usage. These critical success factors explain areas of commonality across the programs that were effective in achieving the energy efficiency outcomes of LIEEP. After the critical success factors are presented, this section provides insights for the planning, implementation and evaluation of future programs aimed at assisting low-income households to achieve energy efficiency. The LIEEP programs were analysed to identify a unifying framework for program delivery and, then, using that framework, the effectiveness for each of the market segments was analysed. The identification of 'what worked' for each segment across the program delivery framework is then presented. For full details of the analysis refer to sections 13–19.

7.1 Critical Success Factors

The following critical success factors (see Figure 7) are necessary for the successful implementation of future energy efficiency projects which support low-income households.

Figure 7 Critical Success Factors

1. **Contextualise and tailor projects to fit the lifestyles and values of the target market**

Designing projects that 'speak' to specific market segments is a critical success factor in the delivery of energy efficiency projects to low-income households. Within the marketing discipline, approaches to targeting consumers have gradually evolved from a mass market one-size-fits-all approach, to a segmentation approach that is consumer-centred and seeks to uniquely cater to the needs of specific groups of consumers. By doing so, projects should seek to be flexible and willing to adapt to participant needs. A consumer orientation should focus on and fully understand the people it seeks to reach. The approach emphasises understanding consumers' real needs, and satisfying them. For example, accommodating cultural requirements by developing appropriate non-verbal and/or verbal forms of communication (this would be particularly helpful for the 'New to Energy' segment, where English may not be the primary language spoken) is important for the removal of practical barriers. Conversely, the 'Energy Without Effort' segment primarily requires a high-tech, more digitalised approach, which is also convenient and fits into the everyday lives of that group of consumers. When projects are consumer-centric, the importance of designing the project to fit within the lifestyle and values of the target market results in less effort required by participants and therefore greater uptake. Resistance to programs such as LIEEP can be high when the burden of change impacts the lifestyle and values of participants. Where programs can be contextualised, they offer meaning and value that enhances the consumer's existing habits, which can then incentivise the consumer to change other aspects of their life that are related to energy efficiency.

2. Develop trusting relationships to build legitimacy

The importance of establishing and developing relationships, combined with the use of existing network relationships, was a consistent theme across LIEEP reports. The findings indicate that building trust between people, including the project consortium, market segments and external organisations, is an essential component for successfully engaging with participants. It is important to note that establishing trustful relationships between organisations and segments takes more time than expected. Future research should encourage project linkage with community-based organisations and/or other trusted entities from the project's outset so that meaningful relationships can be nurtured. For example, targeting the 'New to Energy' segment will require the use of trusted community service organisations that demonstrate well-formed and trusted ongoing relationships with this target group. Similarly, the 'Stressed About Energy' segment requires the use of trusted, established organisations, like the local council, who are well placed to support efforts to reduce levels of stress and worry about energy efficiency decision-making. Supporting these linkages requires dedicated funding that should be considered, particularly during the initial stages of project design.

3. Draw from an evidence base

Project design and implementation should build on past insights to ensure truly innovative and evidence-based decisions are made:

- drawing on past research assists with planning and identifying potential shortfalls ahead of time
- conducting formative research helps identify segment needs and focuses researchers on designing projects around these specific needs
- additionally, early engagement with potential participants can identify levels of acceptability and feasibility before launching the project, as well as building relationships and trust.

This is a particularly important point for government, which is more likely to fund third parties to deliver these programs. Funding should allow for the development of that foundational research, including to build in the insights of programs such as LIEEP. Moreover, formative research creates understanding about what are the most effective recruitment and retention strategies, as well as designing effective evaluation measures. Formative research helps to determine the appropriateness of an initiative and avoids taking on the one-size-fits-all approach. Allowing for flexibility in project design is also important, so the project can be developed from a 'ground-up' approach. Thus, balancing scientific rigour with practical relevance is important at every stage of the program-delivery framework.

4. Balance project needs with participant needs

While any project must meet its overall objectives in a timely manner, and within budget, it is important that project teams acknowledge that additional support may need to be provided in order to engage participants. Finding the right balance between fulfilling project and participant needs requires careful planning and consideration in the early stages of project design. For example, to engage the 'New to Energy' segment additional time, money and people should be allocated towards fulfilling participant needs in this cohort. For instance, additional support may be required to assist participants with deciphering their energy bills, and/or helping them communicate with energy retailers. To gain greater levels of engagement, project teams should therefore consider the needs and concerns of the market segment and balance these with project needs and objectives. Participant needs and interests, which can be complex, should be prioritised over more functional project considerations. It is important to ensure that this balance is maintained throughout the life of the project, and that participants' needs, concerns and interests are not lost in the drive to produce project outputs.

5. Resource projects appropriately across the entire delivery process

Investment in energy efficiency programs that target low-income households are of strategic importance. Adequate financial (i.e., monetary investment) and human (i.e., time and people) resourcing is important for a successful and well-managed project. Adequate financial investment across all stages of project development is crucial for ensuring successful delivery. Time is often underestimated during the initial stages of project development. For example, building relationships with external organisations requires significant investments in time. Additionally, developing trusted relationships with the households also requires a substantial amount of time, particularly when these relationships are ongoing and are over a long period of time. Appropriate resourcing in people to ensure the right skills and capabilities composition within project teams is important for success. For example, the skills required in project teams would ideally include:

- an individual with project management skills who has personal accountability and overall responsibility for the outcomes of the project (i.e., the project manager)
- an appropriately trained and experienced individual whose capabilities can assist with internal and external communication
- an appropriately trained and experienced individual (or individuals) within a trusted organisation who has the ability to connect with the targeted market segments on a personal level
- an individual who has experience working on behaviour change projects
- a researcher who is academically trained to ensure data capture and analysis is rigorous and feeds into future work
- an individual with behavioural change insights to help guide the project's design.

It is important to ensure adequate investment in resourcing for education and training of project teams from the outset to ensure that the team has a shared understanding of the project's aim, overall goals and intended outcomes. Thus, adequate investment across money, time and people will ensure that the project is clear, well-managed and achieves its desired outcomes.

The three market segments, as qualitatively interpreted from analysis, provide a basis for future energy efficiency projects targeting low-income households. The key recommendations for targeting each cohort are discussed next.

7.2 Reaching the 'New to Energy' Segment

The following factors are critical for reaching the 'New to Energy' segment of low-income households (see Figure 8). Sections 14–20 outline in more detail the requirements of this segment.

Figure 8 Key Factors for Reaching the 'New to Energy' Customer Segment

1. **Use established community links to build legitimacy**

Community organisations with deeply embedded relationships with those in the 'New to Energy' segment can serve as powerful intermediaries and advocates of the project as they provide social license and encourage trust between the segment and project proponents. This segment can be challenging to reach due to a history of experiences where trust has been compromised. Hence, the segment is best reached through trusted community-based organisations, whereby energy efficiency may form part of a range of products and services delivered to the target group. These community-based organisations should be able to demonstrate trusted relationships with the target group, which will in turn provide access to and support from each of the communities within the segment. Successfully targeting this segment requires the effective engagement of community organisations working 'on the ground' in communities. Projects that 'speak' to social outcomes from a community-based perspective will likely encourage greater participation.

2. **Contextualise any information to the participant's education level and cultural lens**

Delivering information at the same cultural level of participants ensures optimal understanding of program aims and goals. Contextualising information through the segment's cultural lens allows information to be more meaningful, and avoids the ethnocentric misstep of imposing one's cultural values/insights onto another. It is thus crucial for future projects to build on cultural knowledge and understanding by taking into account existing cultural values, knowledge and beliefs to ensure project relevance for this segment. Future projects are advised to provide tactile, hands-on opportunities for experiential learning, to improve participants' self-efficacy.

3. **Focus on capacity building of the community not the individual**

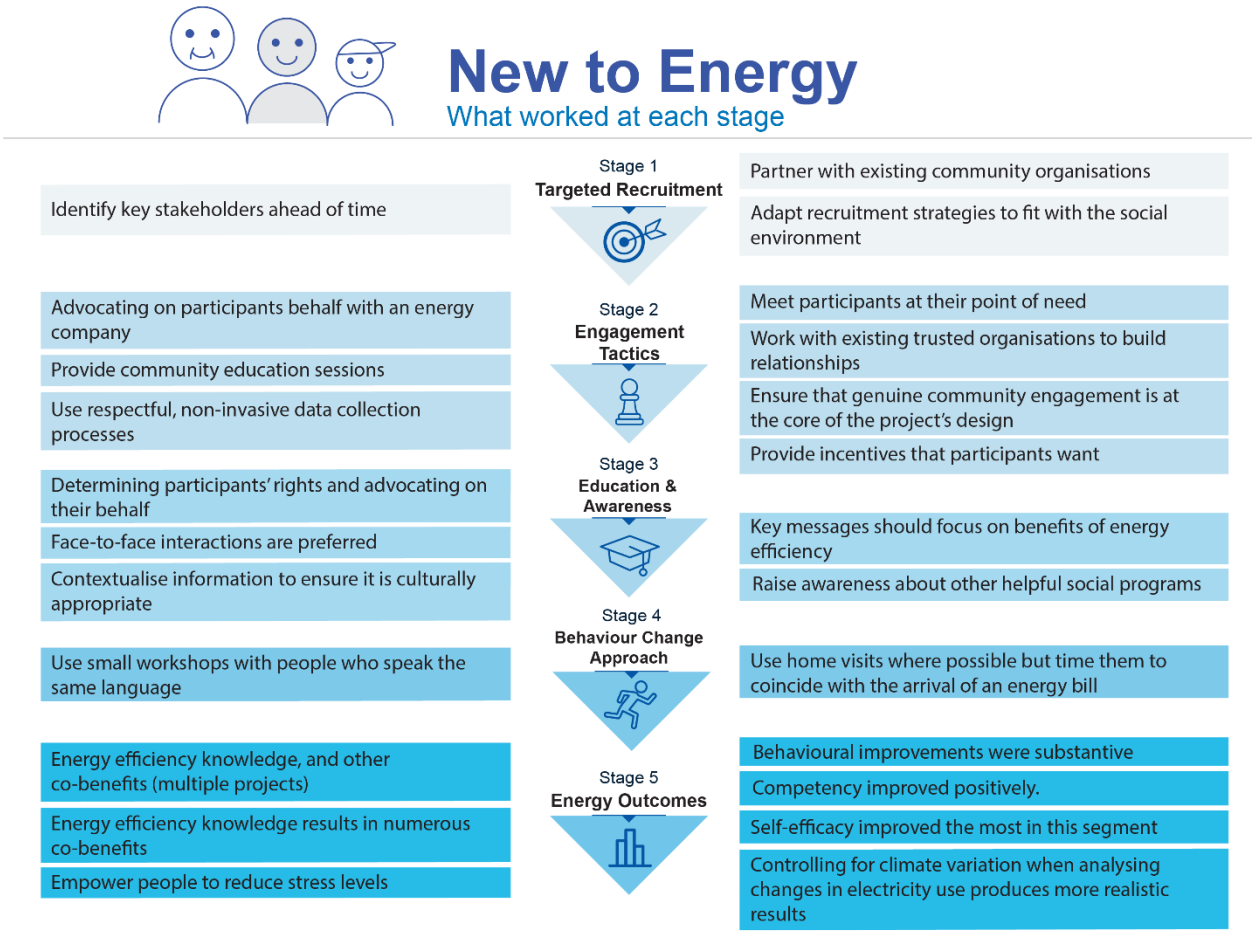
Levels of knowledge about energy efficiency are likely to be limited but varied in the 'New to Energy' segment. It is therefore important to commit sufficient resources to build the capacity of those households and improve the community's baseline knowledge about energy efficiency. The LIEEP findings indicate that community education training programs (i.e., around topics such as the impact of home energy efficiency on health and wellbeing) were important in ensuring successful engagement and improvements in self-efficacy. Projects that support and deliver community-based benefits will see greater levels of

engagement with this market segment. For example, a community-based focus can lead to important social inclusion outcomes, such as inducing a sense of belonging amongst individuals within that community and empowerment as a result. For example, an individual may have learned useful information about being more energy efficient or tips to lower bills, and be in a position to share this within their community, thus building community knowledge and individual social standing. It can also increase empowerment of the individual to negotiate better outcomes with their energy providers, and guide others on how to do the same. Building knowledge within the community, such as through training community members to deliver energy efficiency advice, may also extend the value of the project beyond the end of its funding; those community members continue to serve as touchpoints for advice, providing guidance on how to secure government and industry assistance.

4. Position energy efficiency as an important life skill for the improvement of wellbeing

For the 'New to Energy' segment, it is important to position energy efficiency as an important life skill for improving overall health and wellbeing. For this group of consumers, the greater benefits of energy efficiency are typically not only reducing energy costs, but improving their confidence, knowledge and capacity to operate in the market. Education has an important role to play in improving the uptake of energy efficiency behaviour in this cohort, with the end goal of building awareness and knowledge, which will most likely result in longer-term change in energy behaviours and co-benefits. Programs targeted specifically at improvements in energy reduction alone are unlikely to yield successful outcomes. In terms of the LIEEP program delivery framework, the features that were effective for the New to Energy segment are shown in Figure 9.

Figure 9 Effective Program Delivery Factors for the 'New to Energy' Segment



7.3 Reaching the 'Energy Without Effort' Segment

The following factors are critical for reaching the 'Energy Without Effort' market segment in energy efficiency programs (see Figure 10). Sections 14–20 outline in more detail the requirements of this segment.

Figure 10 Key Factors for Reaching the 'Energy Without Effort' Customer Segment

1. Employ digital platforms for program delivery

Technology plays a number of roles, from being the behaviour trigger to providing a service and facilitating communication. The 'Energy Without Effort' segment has a strong preference for all things digital. As such, programs targeted to this segment should leverage technology for communication across recruitment, engagment, for developing education and awarness, and behaviour change. Digital platforms can overcome issues with delivering scalability, allow engagement with large audiences and facilitate transitions from local to a national or international arena. When connecting with 'Energy Without Effort' cohorts, it is important to 'speak' to these consumers in their own (digital) language. Increasingly, these cohorts of consumers demand visual communication. Further, the immediacy that technology offers through apps, for example, is a useful tool that can bring into alignment the usage choice and the outcome of the decision. Overall, the use of digital platforms for this segment of consumers will ensure program rollouts will be more successful.

2. Ensure engagement is both convenient and responsive

This customer segment needs engagement to be immediate and responsive. Such information could include information about their energy usage, feedback on initiatives trialled or associated rewards. Digital channels provide the ability to deliver fast, immediate responses to questions, and to set the expectation that the program will be agile and responsive. This need for instant communication and gratification sees the 'Energy Without Effort' segment as being perpetually impatient. As technology evolves, and internet speeds increase, this segment will be even less willing to wait for information and feedback; consequently, this segment accepts things quickly. Consumers within this segment lead very busy lives, and therefore communication across the delivery of the program should be both convenient, allowing participants to connect at any point, and responsive, by ensuring that communication and feedback is immediate. This should be provided in real time.

3. Connect participants with each other

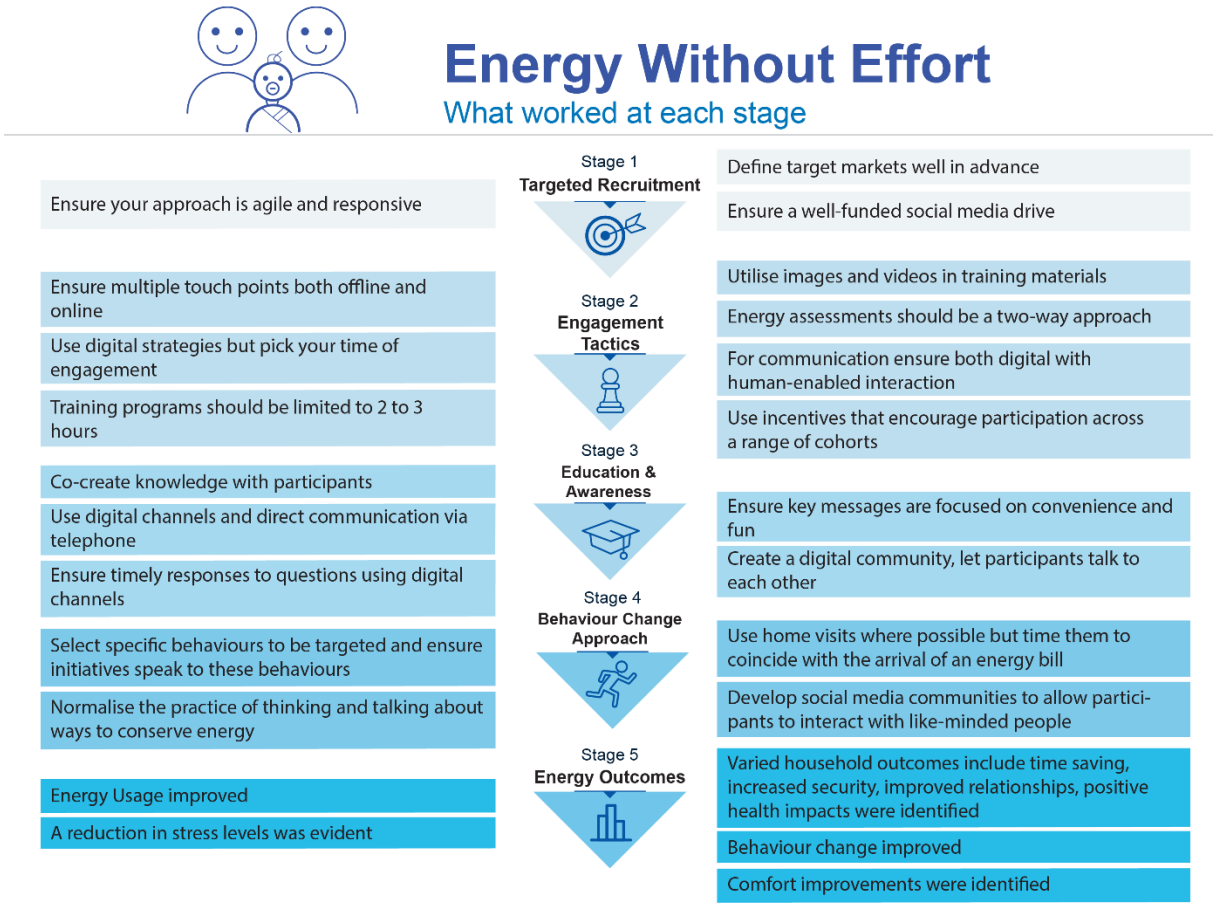
This segment tends to prefer digital social connections – 'high-tech' as opposed to 'high-touch' – and, thus, bringing 'Energy Without Effort' cohorts together digitally to talk about energy efficiency (in effect building a trusted community online) is an important consideration when targeting them. Social media can facilitate the development of social networks and allow like-minded strangers to share ideas about energy efficiency. This segment are active news and information seekers, and are more likely to turn to social media for diverse opinions and viewpoints. People in this segment are not passive participators; instead, they are social – they are more engaged, more vocal and more visual. They view, pin, post and tweet regularly; thus, creating opportunities (through, for instance, social media platforms) for this segment to connect is paramount.

4. Position energy efficiency as fun and interesting

Energy efficiency does not have to be boring, so why make it so? The findings indicate that while this segment is motivated towards energy efficiency they also want to have a bit of fun at the same time. The 'Energy Without Effort' segment has the baseline of knowledge around energy consumption and efficiency; however, they need to be engaged through effective tools to support the ability of household leaders to influence and implement new energy efficiency behaviours within their household. Energy efficiency should be positioned based on 'convenience' and 'fun'. Digital engagement through apps and games has the ability to meet this dual need.

In terms of the LIEEP program delivery framework, the features that were effective for the 'Energy Without Effort' segment are shown in Figure 11.

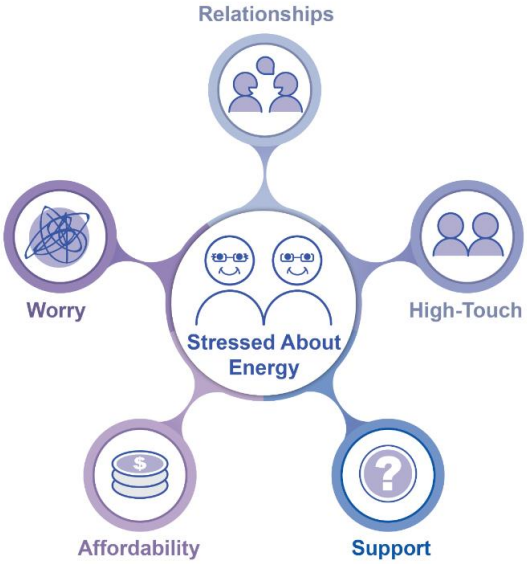
Figure 11 Effective Program Delivery Factors for the 'Energy Without Effort' Segment



7.4 Reaching the 'Stressed About Energy' Segment

The following factors are critical for reaching the 'Stressed About Energy' segment in energy efficiency programs (see Figure 12). Sections 14–20 outline in more detail the requirements of this segment.

Figure 12 Key Factors for Reaching the 'Stressed About Energy' Customer Segment



1. **Invest in building ongoing relationships with the participants**

Developing rapport with the 'Stressed About Energy' segment is vitally important. This market segment prefers 'high-touch' communication. The findings indicate that socialisation and building trust with an unknown person is a key consideration for participants to engage in a project. Future programs should therefore take into consideration the time it takes to develop these kinds of ongoing relationships with participants.

2. **Communication should be primarily face-to-face and in-home**

The 'Stressed About Energy' segment is predominantly high-touch, which requires more of a 'boots-on-the-ground' approach. To make participants feel comfortable, face-to-face, in-home discussions should be implemented, as opposed to workshops and digital forms of communication. In-home, face-to-face communication allows for real-time connection with participants, allowing for visual representation of energy efficiency programs and a demonstration of how minor retrofits work. These in-home visits also provide participants with the opportunity to ask personalised questions, thus feedback is immediate. Face-to-face, in-home visits will require greater investment and resourcing; however, they will be most convenient for this cohort.

3. **Provide graduated levels of support**

Information should be kept simple and concise. Over-loading this cohort with too much information can overwhelm them and produce disengagement. The findings indicate that achieving energy efficiency is more successful when the project focuses on a few key behaviours, as opposed to encouraging participants to consider every possible option and adopt every possible alternative. Filtering information directly to participants in digestible pieces, rather than all at once, is likely to be more effective, as this segment can very easily become distressed if receiving too much new information at once.

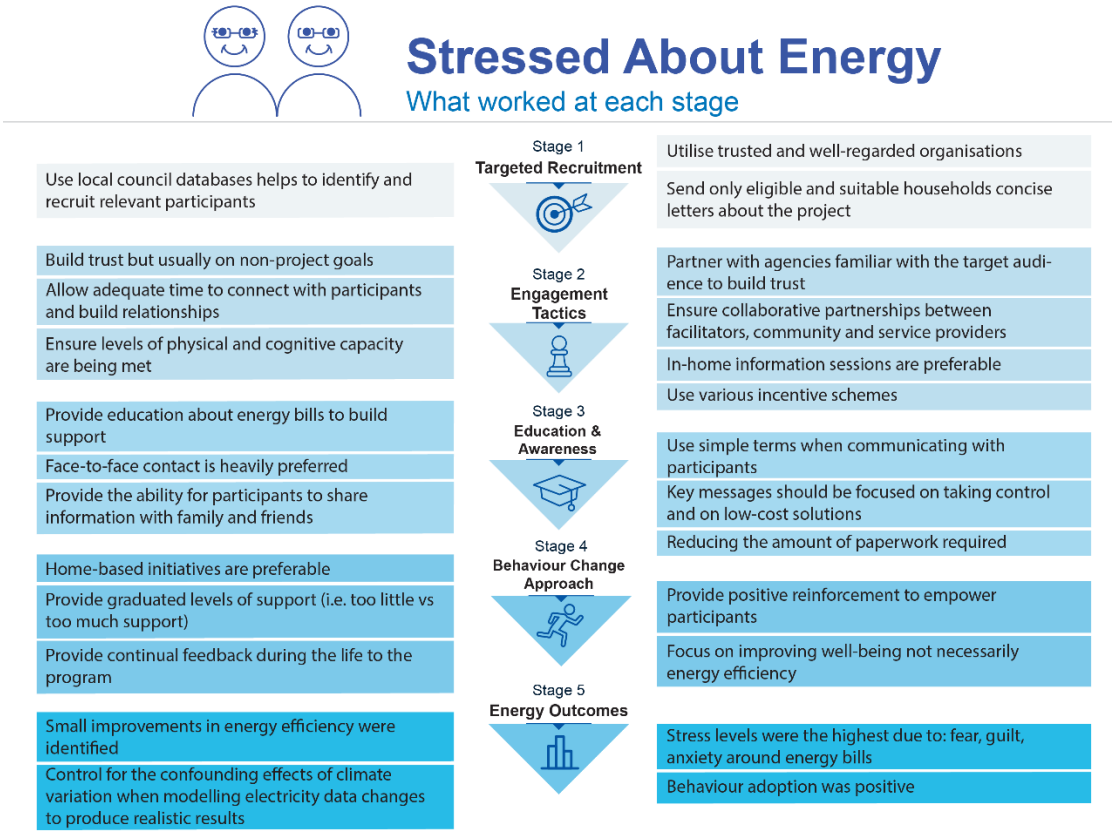
4. Position energy efficiency as an affordable solution to build confidence

The 'Stressed About Energy' cohort are generally price conscious and budget focused. This sensitivity towards price means energy efficiency is viewed through the lens of frugality and thrift and not being wasteful of resources. It is important to position energy efficiency as a low-cost solution. It is also important to pay attention to building confidence in this cohort, so participants are aware that their energy usage can be controlled and that their behaviours can make an impact, particularly on reducing energy bills or increasing thermal comfort. The process of making decisions in general has been found to improve people's happiness and allows them to feel more in control (Korb, 2015), so building confidence in this cohort is key to successful engagement.

5. Draw on established trusted organisations to overcome worry

This segment exhibited high levels of stress and worry about energy decision-making in general and, specifically, about their ability to pay their electricity bills. Local councils and other 'trusted', established organisations can facilitate key introductions between project proponents and potential participants. As this segment demonstrates low levels of energy self-efficacy, energy myths and misinformation will be important barriers to overcome in reducing the levels of stress and worry in this cohort. Working in collaboration with existing and trusted health and social support providers is an important way to reach this target group. The use of trusted stakeholders can prove to be mutually beneficial, as the project team may gain access to a priority group while local councils or other trusted organisations have the opportunity to assist their community beyond the everyday remit. In terms of the LIEEP program delivery framework, the features that were effective for the 'Stressed About Energy' segment are shown in Figure 13.

Figure 13 Effective Program Delivery Factors for the 'Stressed About Energy' Segment



8. Stakeholder-Level Insights

This section contains overall insights for stakeholders such as industry, policymakers, community and government who fund or plan energy efficiency programs. A program delivery framework has been developed out of the analysis to understand how the LIEEP programs achieved the outcomes and to drive outcomes in future programs for low-income households. This framework consists of five stages: recruitment, engagement, education, behaviour change approach and outcomes. This framework is then used to understand how stakeholders such as industry, policy-makers, community and government can design initiatives and programs in energy efficiency that work. There are seven (7) insights that arise from analysis of the LIEEP program reports (see Figure 14).

Figure 14 Seven Insights for designing Effective Energy Efficiency Initiatives

8.1 Evidence-Based Design

Policy-makers designing energy efficiency initiatives for low-income households should ensure programs are underpinned by a solid evidence base. A successful feature of the LIEEP pilots was the Commonwealth Government's requirement that consortia include a research partner with relevant expertise. That requirement facilitated access to the significant body of work and research available to underpin many of LIEEP programs. By working from an evidence base it will help the program to avoid or reduce the mistakes and unintended consequences from poorly designed project components. Drawing upon scholarship, theory and experience can assist programs to be well designed and draw upon key drivers to provide insight in project activities and initiatives. Acquiring a deep knowledge of the target market through undertaking formative research will also help policy-makers design positive programs and initiatives. Understanding barriers, drivers and limitations of a difficult-to-reach audience such as low-income energy consumers is critical for success.

8.2 A Customer-Centric Approach

In designing energy efficiency programs for low-income energy consumers, it is critical that a consumer-centric approach is carefully considered and executed. It is important to tailor all program aspects to ensure the low-income consumer can be reached, engaged, recruited and supported to achieve energy efficiency improvements. These methods need to be conducted in a way that is relevant to them and sensitive to their cultural and social needs. In particular, communication needs to be relevant for the audience to ensure that energy efficiency is framed in a way that makes sense to them, and thus not be full of technical or overly detailed writing materials. Simple key messages are an effective way of communication; however, each sub-group has its own unique needs and preferences and so information provided to them should be tailored for each sub-group.

Consumer engagement tactics also reflect the need to take a consumer-centric approach. For example, in-home visits are highly valued by some segments, whilst other segments find them intrusive and not convenient for their busy lives. The use of digital engagement channels will work well for some audiences; however, older people would prefer to meet with someone face to face, while Indigenous and CALD people would prefer to meet with someone they trust (location may or may not be the home). The key issue for designing energy efficiency programs is that there are no silver bullet solutions. The findings in this report provide guidance on how to effectively reach each group of consumers – one way for all low-income households is unlikely to be effective or successful. Tailored programs based on evidence of the segment are more likely to deliver highly valued outcomes for the participants.

8.3 Data Collection and Administration

Collecting data is both critical and problematic for most projects and LIEEP was no exception. While LIEEP encouraged a diversity of approaches, this also created the outcome that it would be difficult to compare the results across programs and, in some cases, the results were not comparable (we have made note of this throughout the report where this occurred). Exacerbating the issue was the sheer quantity of data that were required to be collected by consortia, and the subsequent management and analysis of the large data pool. For future projects, it would be useful to spend more time on designing the data collection and analysis system appropriate to the project. Changes to the data requirements after the project had started added to the complexity. Sufficient time for project design needs to occur at both the funder and recipient levels and flexibility, rather than an increase in requirements, is paramount during the course of any project. Further, data that are collected should be used, and thus relevant and pertinent to the purpose of the project. In LIEEP, numerous data aspects were required, but not reported upon in either individual or meta-analysis reports. This should be avoided at all costs.

Unforeseen participant variables, breadth of data required and changes to data collection requirements can all serve to inhibit efficient and effective data handling. An important part of future design would therefore be to enable projects to adapt to unforeseen circumstances, and provide them with some flexibility. It is recommended that projects employ staff who are involved across both project delivery and data handling as a way of optimising data integrity, collection and analysis.

When the requirements for completion of complicated paperwork are onerous this can inhibit participant engagement and create an array of data collection and analysis problems. For example, the major retrofits required numerous forms to be completed to government regulation and, in some cases, this took multiple visits and numerous hours. This then encroaches on the time available by the project team and the participant for collecting program data. Simplification of compliance paperwork (such as obtaining informed consent to participate or obtaining energy consumption data) is critical to recruit and engage participants. While these aspects are important, they need to be made simple for the householder (e.g., compiled into one simple signature requirement rather than reams of paper needing numerous signatures, as was the case in LIEEP). There are many ways to meet ethics requirements that are simple, without requiring multiple forms for each individual requirement. For example, MM transformed the consent form into a brief paragraph that was spoken and recorded people's informed consent digitally, instead of overwhelming them with multiple forms and signature requests.

In the early stage of program design, careful consideration should be given to obtaining energy consumption data from energy retailers, energy distributors or directly from monitoring each household's usage. The willingness of retail and wholesale energy providers to pass on consumption data can vary and interfere with project timelines. For example, in some cases, it can take months to obtain energy consumption data for a household from an energy provider and, upon receiving it, the format may be unclear and not useful for analysis without major transformation. Also, it may be accidentally provided on a household not requested. Further, obtaining National Metering Identifier (NMI) data can be problematic, as was the case with many LIEEP projects, and yet this number is needed to obtain consumption data from providers. It is recommended that energy providers adjust their billing information and data set capture to ensure the data they collect is highly accessible and useable by others (upon consent of the household).

A significant obstacle for future projects – and one without a clear solution – was hit by a number of LIEEP pilots. Projects found it difficult to obtain useful data sets from energy retailers – the reason most often cited was that retailers had low interest levels in the program, and LIEEP proponents did not have the capacity to require or incentivise their engagement. Other pilots found it difficult to obtain NMI data, or uncovered inaccuracies (one memorable case study in the BEST report (2016) found that one customer's NMI had been wrongly recorded, which meant that customer was receiving another's bill. BEST's home energy assessor was able to repair that, representing an annual saving of $985).

8.4 Framework Specific to Energy Efficiency Projects

Our review of the LIEEP projects derived an energy specific framework which may assist policy-makers to design and administer more effective energy programs in future. The framework is illustrated and detailed in section 13 (LIEEP Program Delivery Framework) and so will be only briefly discussed here. In general, the framework contains five broad stages: Targeted Recruitment, Engagement Tactics, Education and Awareness Methods, Behaviour Change Approach and Energy Outcomes. Providing the structure to promote deeper thinking in the processes, resources and skills required to execute each step will improve program designs. Communication is a relevant function at every stage and has been highlighted in the reports as a critical success factor.

This framework is of particular relevance to industry, which is quite often strong in one area of delivery but may overlook other steps in the process, resulting in a negative impact on the results/outcomes of energy efficiency projects and poorer outcomes for low-income households.

8.5 Governance Across the Project

The consortium model that underpinned LIEEP is recommended for future projects, as this allows for numerous partners from diverse backgrounds to work together, which will better enable projects to draw upon greater depth and harness a breadth of knowledge and disciplinary approaches, practices and resources, which will help achieve improved project outcomes. In LIEEP, the consortium model was highly praised, where project partners found that collaborative governance approaches involving horizontal or pseudo-horizontal leadership models allowed a level of multi-disciplinary activity. Thus, collaborative governance means ease of delivery and, in some cases, greater participant engagement.

Clear delineation of partner roles is highlighted as an important factor in effective governance strategies. Projects without role clarity risk facing difficulties in managing initiative delivery, perceived influence imbalance, contacting participants and data handling. Further, it is crucial that projects involving Aboriginal and/or CALD participants involve Aboriginal/CALD staff and/or consortium partners in order to design culturally appropriate projects that are also implemented in a culturally respectful manner. In LIEEP, it became evident that employing staff of a similar background and culture to deliver services to the home was the most recommended approach. However, involving these partners after the grant had been approved often meant that budget allocation was routinely under-estimated, especially with regards to data collection and analysis.

For projects involving the collection of data (e.g., for evaluation purposes), it is recommended that they engage the services of a research partner to assist with: project design; data collection; and data handling, analysis and reporting. In LIEEP, many reported on the advantages they experienced from working closely with their respective research partners. Research partners will also help with estimating budgets more accurately, which is vital as it is easy to under-estimate the costs associated with data collection and analysis.

These insights suggest that using a mix of consortia, including a research partner, to design and implement projects is likely to improve the project's success, especially when each consortia member is clear about their role. With a good mix of consortia members and being well-managed, projects are set to navigate through any barriers that may occur, and thus heighten the experience and benefits experienced by participants.

8.6 Technology to Underpin Program Initiatives

Technology can be used in many ways in the delivery of energy efficiency programs, ranging from the service that underpins the program, monitoring electricity use progress or as a communication channel. Technology can facilitate a choice of options and scalability of projects and outcomes. Contrary to popular belief, low-income consumers are able to access information (including energy efficiency information) through mobile devices and this provides a useful foundation on which to build a program. Like the rest of the population, those consumers will continue to access the internet predominately through mobile devices, therefore how information and communications are deployed to consumers has and will continue to change. One of the key challenges for energy efficiency projects moving forward will be cutting through the volume of information and competing noise to get a consumer's attention.

Social media is another innovative way of creating and cultivating relationships, particularly the ability to identify and target difficult-to-reach groups, thus providing low-cost recruitment tactics that can deliver sign-up at scale. Social media platforms offer ways to keep people interested and engaged in programs over the long term. LIEEP demonstrated that gamification as an ongoing engagement tool to support broader communications strategies is another innovative way to engage consumers and encourage them to adopt more energy efficiency behaviours.

8.7 Behaviour Change as a Focus

Successful energy efficiency programs will not only focus on energy consumption but also focus on behaviour change (behaviour change is more than just increasing awareness and providing energy education). Social marketing is about achieving social goals, such as better health, energy efficiency, water conservation and safety, in ways that provide value for the consumer. Unlike education and law, social marketing focuses on helping consumers generate the ability and access opportunities to perform a particular behaviour, for example energy efficiency, rather than simply providing education or enforcement (see Figure 6 Three Approaches to Social Change). Instead, social marketing focuses on creating value for the consumer so that they actually want to change the nominated behaviour.

Social marketing is a customer-centric approach by necessity; without understanding the nature of markets and individual consumers we cannot expect to accurately design initiatives to reach them, and communicate in an engaging way. Marketing in general has been gradually evolving from a mass market approach with a product orientation, to a segmentation approach with a market orientation, and now to a more customer-centric approach, where single customers can be catered for (Sheth et al., 2000). This approach is gaining traction in the electricity market, with calls for increased consumer trust-building activities (see, for example, the Electricity Network Transformation Roadmap: Key Concepts report, 2016).

9. Method and Analysis

9.1 Data Analysis Method

The 20 final LIEEP reports were reviewed with key information extracted which provided the basis for further analysis. As a pilot program LIEEP projects were meant to try different things with different people, and so the nature of each project was unique. This meant high variations in approaches, initiatives trialled, processes, data collected and how the projects reported upon each component. Not all reports included, for example, energy consumption data, behaviour change data, thermal readings, and so on. Therefore, in each of the following sections, only the projects which measured the variable are analysed. One project was unable to collect sufficient quantitative data across all aspects, and so their qualitative findings have been used to draw meaning and add to the discussion (NGSC). The 20 reports, collectively, represent approximately 4000 pages that needed to be reviewed to conduct the deep dive. Accordingly, it was essential to design a rigorous process to ensure key elements were not overlooked.

A detailed excel spreadsheet was developed, capturing the key findings and learnings as articulated in the reports for each LIEEP project. The large spreadsheet forms the base from which a range of matrices were developed, each of which is presented in a table in this report, satisfying the first deliverable of Power Shift Project One. To optimise the accuracy and relevance of the spreadsheet content developed, the following process was followed:

Step 1: Determination of Details to be Captured
A team from GEER met and determined the main aspects we hoped to extract, and thus compare, across the reports. This formed the base of the matrix (columns in a spreadsheet). It was also emphasised that each report should inform this matrix and thus allow the matrix to grow and evolve as each LIEEP project was reviewed. This meant that the content of the spreadsheet was driven from both an *a priori* and inductive approach.

Step 2: Extractions of Key Findings
Two research teams were formed and each received half the LIEEP reports (10 per team). Each team fully read and reviewed each report. Relevant data were extracted and entered into the spreadsheet. Sometimes these data were numeric (e.g., kWh used) and sometimes alpha (e.g., type of initiative). Comments were added to each field where appropriate (e.g., recruitment strategy that was used for only part of the cohort, or nuances to help inform our understanding of the alpha or numeric field entry).

Step 3: Self-Editing
Once each research team completed entering the relevant data from their group of reports, they then reviewed their extractions and thus double-checked their own entries for accuracy and relevance. This step was important because by the time each team completed their review of 10 reports they were more informed and alert to finding information than when they started. Accordingly, each team re-checked the fields they captured for each of the reports, paying particular attention to the first few they reviewed. Minor adjustments were made where new information was found or edited.

Step 4: Cross-Checking to Ensure Accuracy
Each research team then swapped reports and repeated the process. They fully read and reviewed the other group of reports and then cross-checked what was entered into the spreadsheet by the previous group. Where any discrepancies or differences lay, discussions between the two research teams took place and agreements reached. On other occasions, reports had to be re-reviewed to find information not previously extracted or to double-check for accuracy. It is believed that by taking these steps,

including the cross-checking, rigorous data capture was ensured as it optimised the consistency and accuracy of the spreadsheet content.

The final spreadsheet thus captures the points of interest from LIEEP reports and allows for a synthesis across reports to be extracted. These main points include cohorts targeted, recruitment strategies, initiatives trialled, outcomes achieved and key learnings. The results of this synthesis are presented in the next section. Some findings are presented per project and some per initiative, whichever was deemed most appropriate for representing the result.

In analysing the LIEEP participants, this report uses both descriptive statistical analysis and content analysis (Neuendorf, 2016) for the purpose of reviewing the reports collectively. Content analysis is a widely-used research technique for the systemisation of summarising and analysing text and numbers (Duriau et al., 2007). In doing so, underlying meanings and ideas are revealed through analysing patterns in elements of the text, such as words or phrases, but also in numbers (Yang, Akers, Klose, Yang, 2008).

Content analysis is used both quantitatively and qualitatively in this report. Manual content analysis techniques were used in conjunction with data analysis tools in Microsoft Excel to analyse the reports. In this way, high-level findings and concepts are presented, but are also supported with qualitative findings (i.e., quotes). In conjunction with these analysis tools, academic literature is also drawn upon to ensure robustness of the findings. Combined, these methods ensure that the findings from the LIEEP reports provide depth and richness in understanding, whilst delivering actionable insights. This report seeks to provide an in-depth profile of LIEEP participants and group them into a useable segmentation framework.

Data quality refers to the perception of measurement of the adequacy of datum or data sets (Chiang & Miller, 2008). Data quality is often measured to determine whether data can be used for reliable interpretation and analysis. It is important to highlight that in this research project missing data were evident across all LIEEP projects. This was to be expected given that the primary task of each LIEEP project was to be unique and innovative, and consistency among projects and measures was not paramount. While this creates difficulty when conducting comparative analysis there remains a wealth of information in the various LIEEP reports that can be extracted. The following proportion of reports cite findings on changes in the following variables:

- Energy efficiency improvements: 84%
- Behaviour improvements: 79%
- Knowledge improvements: 53%
- Attitude improvements: 26%
- Competency improvements: 37%
- Stress improvements: 47%
- Comfort improvements: 47%
- Self-efficacy improvements: 63%

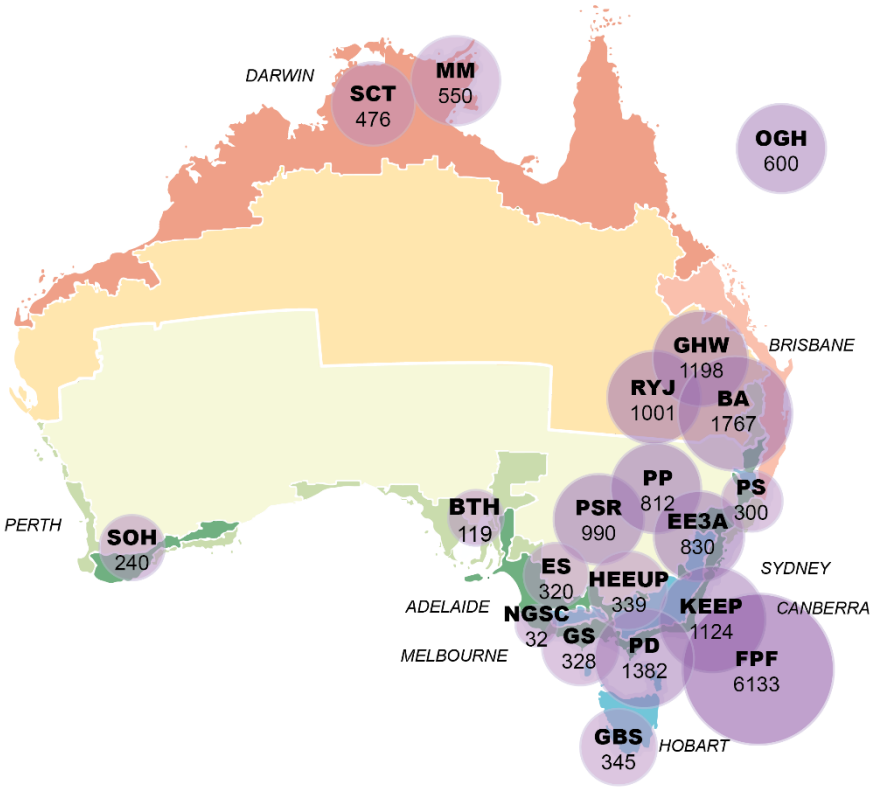
The variable most consistently reported on was electricity usage change. For other variables, while a general concept might be included in the data for a program, the underlying meaning varies across reports. For instance, some reports measured general comfort, while others measured thermal comfort. Additionally, different measurement instruments were used to collect data on the same variable which prevents direct comparability and raises concerns related to statistical reliability and validity. This also applied to electricity usage. For example, it was sometimes collected using smart meters, which can record usage in 15-minute intervals, or interval meters that needed to be read manually, or self-reported monthly or quarterly bill amounts provided by participants. Notwithstanding these limitations, in this report we were able to draw meaningful conclusions from the data sources (LIEEP reports).

10. Characteristics of LIEEP Projects

10.1 LIEEP Locations and Populations Targeted

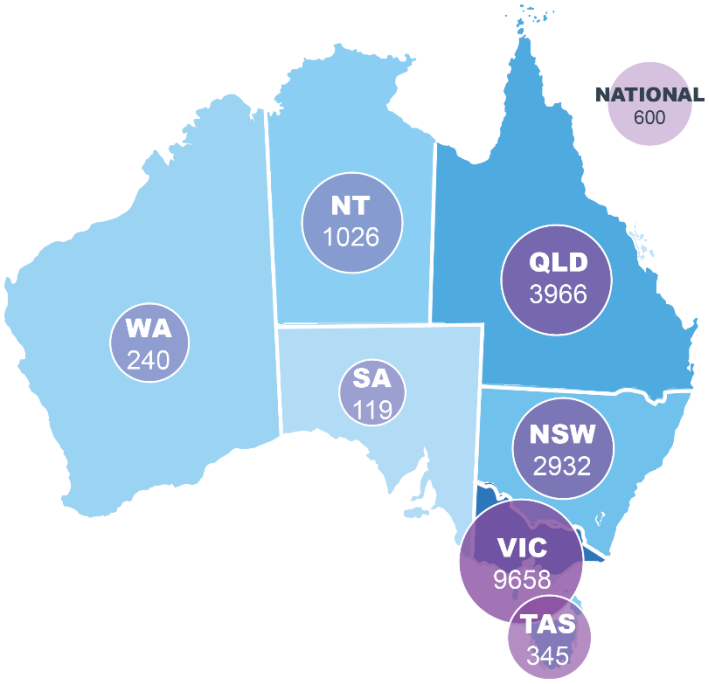
LIEEP took place across all states and territories in Australia, except for the ACT (see Figure 15). Combined, 20 projects targeted 32,498 households, and reported on 18,886. The dominance of project locations largely reflects the dominance of population locations: the eastern seaboard of Australia, except for Victoria which dominated with seven projects. Except for one project that targeted people nationally, LIEEP projects were generally state/territory- or region-based, which largely reflected the location of the consortia members.

Figure 15 Locations and Number of LIEEP Participants



The number of participants accounted for within reports totalled 18,886, representing 58% of LIEEP participants. These figures, together with the number of projects per state/territory are presented in Figure 16. Victorian households dominate LIEEP, representing 51% of all participants. No participants were targeted from the ACT. Surprisingly, NSW was under-represented relevant to the total NSW population compared with other regions, despite four projects operating in this state. The variance here is important because, in most cases, the findings of any analysis will be skewed according to the sample sizes.

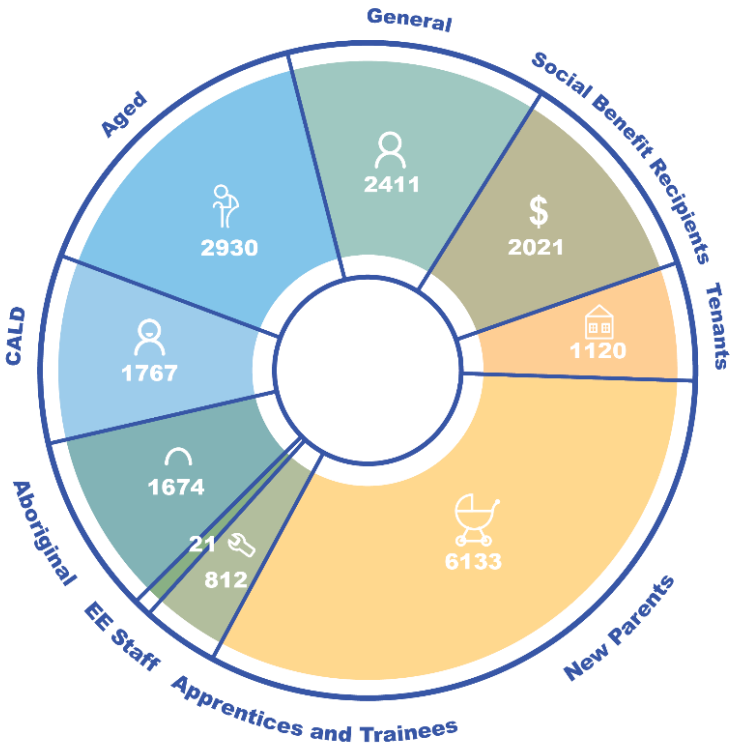
Figure 16 Number of LIEEP Participants per State/Territory



LIEEP was diverse in reaching different groups of people in different parts of Australia. For example, the cohorts receiving energy efficiency support represented both the young and old, Indigenous and non-Indigenous, house-owners and tenants, and those born in Australia and new to Australia. The proportions of these populations who were targeted by each LIEEP project are presented in Figure 17. It is evident that eight distinct cohorts were targeted, with the ninth cohort defined as 'general'. By far the largest group reached (by just one project) was 'new parents', with 6133 participants. The aged and those receiving social benefits were the next largest group of participants, and apprentices and trainees formed the smallest group, with 812 participants. It is important to note here that these numbers reflect the targeted cohort as described in LIEEP reports rather than the actual participant profile. For example, there were many more tenants than the 1120 identified in two LIEEP reports, but a different characteristic was used to identify them into a cohort in those reports. Thus, an aged person, unemployed, apprentice or Aboriginal person may also have been a tenant, indicating that these cohorts are not mutually exclusive.

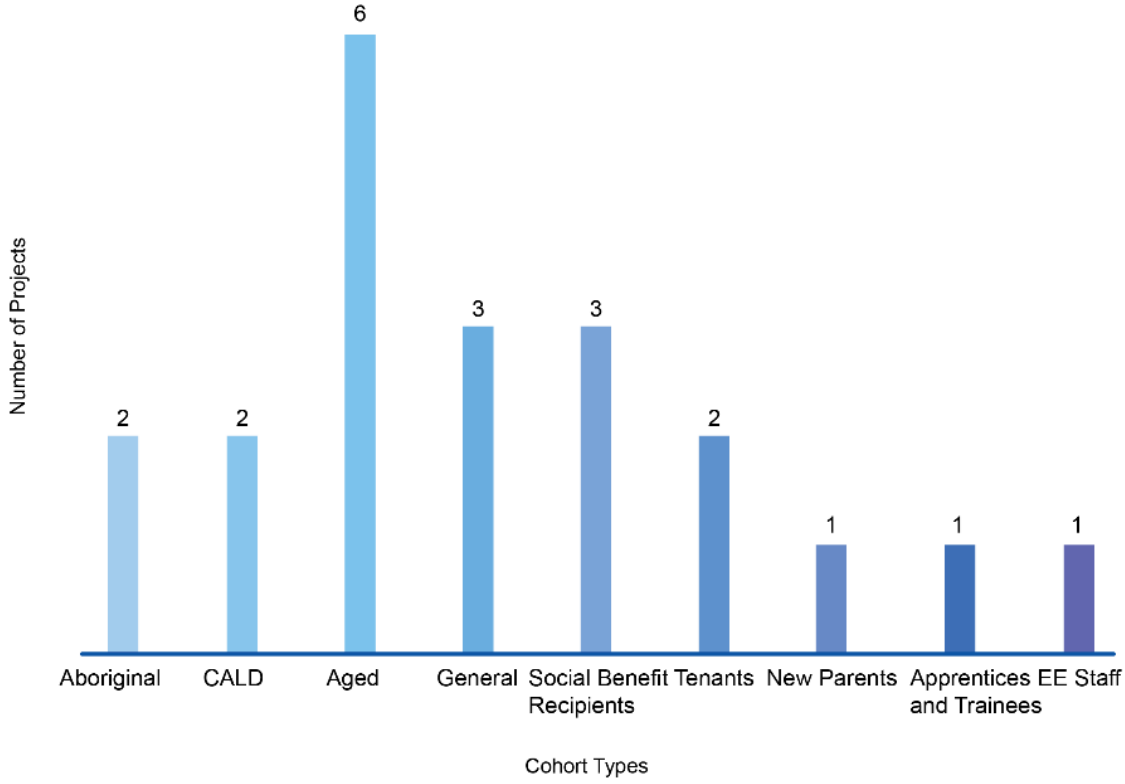
Nevertheless, it is clear that LIEEP recruited diverse populations into the project. Additionally, two LIEEP projects specifically targeted 1674 Aboriginal households (though other projects also included some Aboriginal people, though not specifically targeted), reflecting 9% of LIEEP participants. This proportion is higher than the Australian population proportion of Indigenous people of around 3% (ABS 2011) (this includes Torres Strait Islanders and, although this is a distinct group, for the purposes of this report, 'Aboriginal people' is used to capture both). However, this proportion reflects a slightly lower proportion of Aboriginal people relative to all Australian low-income homes, which is around 10% (ABS, 2011). Thus, the proportion of Aboriginal people included as participants in LIEEP is a reasonably close reflection of the overall population proportion in the low-income category, and reflects that this group experiences hardship in higher proportions than many others.

Figure 17 Number of Participants in LIEEP per Type of Cohort



The diversity of LIEEP projects in terms of cohorts targeted is further evident when reviewing the number of projects that aimed to reach each specific cohort (see Figure 18). One report targeted Staff in addition.

Figure 18 Number of Projects Targeting Each Cohort Type



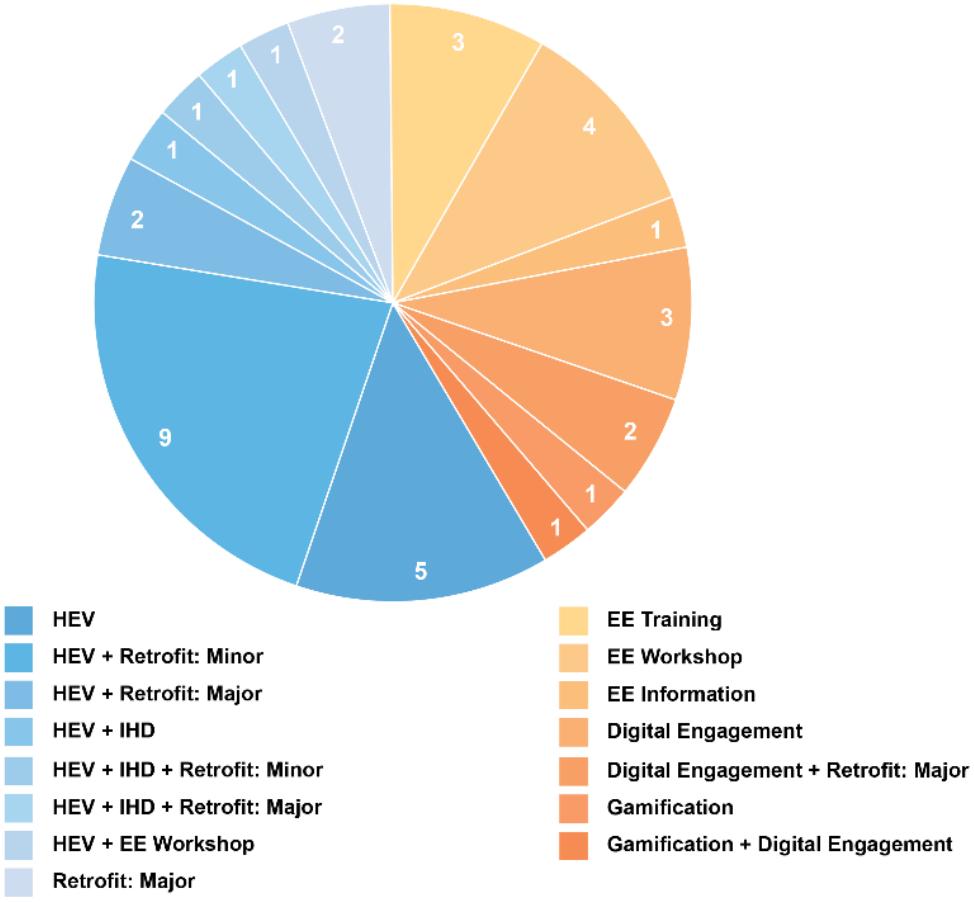
10.2 Initiatives Trialled

Each of the LIEEP projects trialled either one (eight projects) or several (11 projects) initiatives to help influence lower energy usage and/or lower energy bills for a targeted cohort of residential households. These initiatives can be grouped as follows:

- home energy visits (HEV)
- major retrofits
- minor retrofits
- in-home energy monitor displays (IHD)
- energy efficiency information provision (brochures, pamphlets, workshops, training)
- gamification
- digital energy communications (digital engagement)
- combination of two or more of the above.

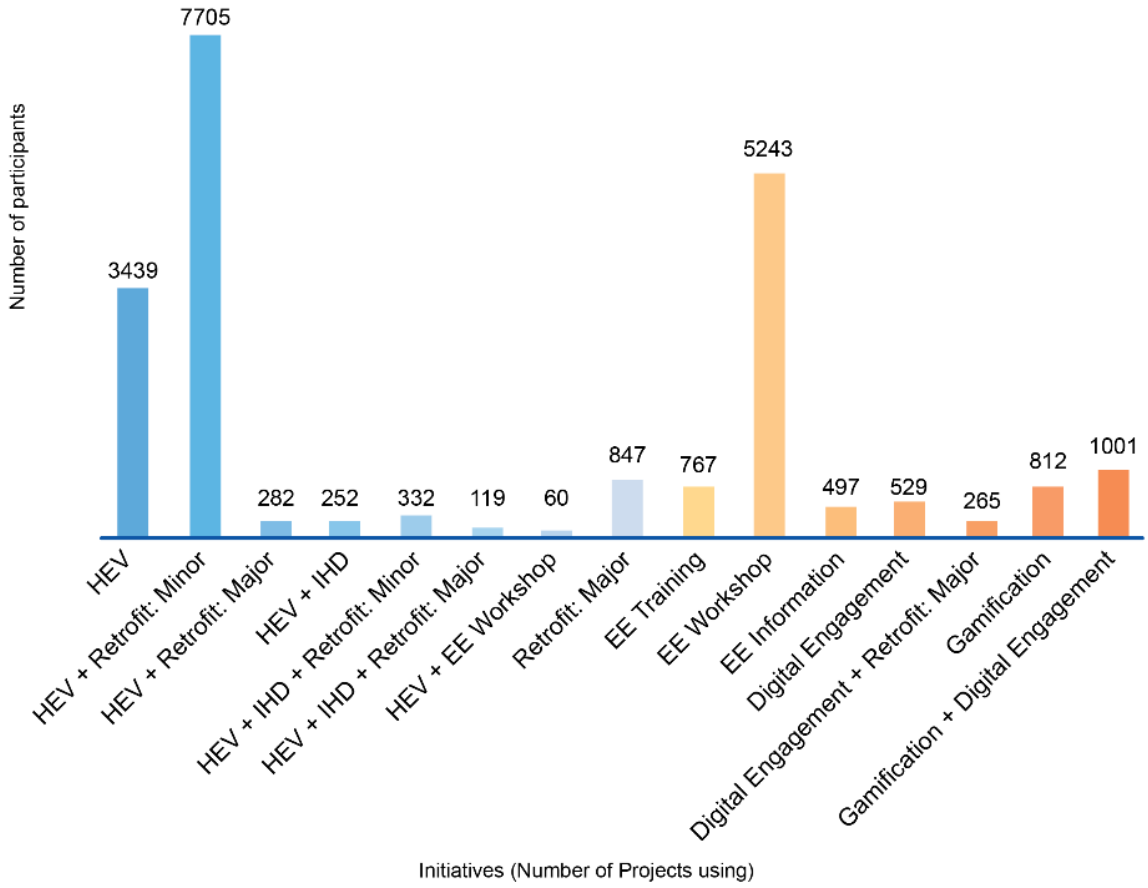
The number of projects using each of these initiatives is presented in Figure 19. It is evident that the most frequently trialled initiative was the HEV (nine projects used this method), which may have been coupled with either a major or minor retrofit, IHD or energy efficiency workshop (15 projects used one or more of these blends). Energy efficiency workshops alone were the next most frequent initiative trialled (six projects). It is interesting to note here that a high number of consortia decided on trialling a highly personalised social engagement strategy to support low-income households (HEV). This consistency among projects is surprising, given they did not know what each other was designing, and were reaching quite diverse groups. This common thread indicates that the insight of community, not-for-profit, industry and research partners, all with experience in reaching low-income households, felt this was the best method to use. This may be due to a bias in their lens (their work requires a home visit) or it may be insight-driven (experience shines the light).

Figure 19 Types of Initiatives Trialled and Frequency of Use in LIEEP Projects



The next point of interest is the number of participants who received each initiative. These figures are presented in Figure 20. The most frequent initiative was received by 7287 households, which was a HEV with minor retrofit, representing almost 40% of all LIEEP participants. Next, 5263 households, or 29% of LIEEP participants, received an energy efficiency workshop. The third stand-out initiative was a HEV alone (22%). Although only two projects used Gamification as the initiative to influence home energy usage and bills, Gamification was received by almost 10% of LIEEP participants. Smaller-sized cohorts received the other array of initiatives trialled.

Figure 20 Number of LIEEP Participants per Initiative Trialled



The following table shows the cohorts who received each initiative, with one project also targeting a small amount of staff in addition to their cohort (see Table 3). The cohort receiving the largest range of initiatives were the aged (10 initiatives) with apprentices/trainees and staff receiving a single initiative (each from a single project). Those who were reported to receive a HEV-type trial were the Aboriginal cohort and staff cohort.

Table 3 LIEEP Cohort Participants and the Initiatives Each Received

Cohort/Initiative (no. of projects)	Aboriginal (2)	Aged (6)	CALD (2)	General (3)	Apprentices and Trainees (1)	New Parents (1)	Tenants (2)	Welfare Recipients (3)	Staff (1)
HEV	✓	✓	✓					✓	
HEV + Retrofit: Minor	✓	✓	✓	✓		✓		✓	✓
HEV + Retrofit Major	✓	✓							
HEV + IHD	✓								
HEV + IHD + Retrofit							✓		
IHD				✓					
HEV + EE Workshop		✓							
Retrofit: Major		✓						✓	
EE Training		✓		✓		✓			
EE Workshop		✓	✓			✓		✓	
Digital Engagement		✓							
Digital Engagement + Retrofit		✓							
Digital Engagement + Gamification							✓		
EE Information		✓							
Gamification					✓		✓		
Total Initiatives	4	10	3	3	1	3	3	4	1
Total Participants	1674	2930	1767	2411	812	6133	1120	2021	21

The next section provides an overview of the outcomes of each initiative trialled in terms of electricity use and behavioural changes.

10.3 Outcomes per Initiative Trialled

All projects collected electricity consumption data – only a few collected gas consumption data. To allow for comparability, only the electricity consumption data and subsequent changes as reported in LIEEP reports are captured here. It is thus noted that some initiatives probably resulted in residential reduction of gas usage as well as electricity usage, and thus the outcomes reported here are likely to under-estimate the experienced advantages for each household receiving the initiative, particularly in the colder states (e.g., VIC, SA, TAS and southern NSW). Further, due to time constraints, projects were unable to collect sufficient post-initiative electricity consumption data relative to: i) the number of homes receiving the initiative, or ii) the number of pre-initiative electricity consumption data collected. For example, while there were a total of 32,498 LIEEP participants, with 18,886 represented by the time of reporting, a much smaller proportion were represented by energy-use data. This means that for any one project there is energy use pre and post the initiative trialled for only a fraction of the participants for that project. Of the total LIEEP participants, the changes in consumption are reported for only 5,108 (16%). This means that the outcomes reported here reflect only a small proportion of the outcomes that may have been experienced by all LIEEP participants. It further indicates that collecting sufficient post-initiative (follow-up) data was problematic for most projects, perhaps reflecting insufficient time to collect, or access, this information.

The success of each initiative trialled can be partially captured by the reduction in energy usage in the home. Most projects (17 of 20) reported on the collected energy usage measured before and after the initiative was implemented or delivered, and thus adopted some form of repeated-measures design. It should be noted here that three projects were not included in this analysis: two projects provided energy consumption information in the report but this was not useable to make relative comparisons or reflected an overly small sample from which results were not significant, while another project produced extreme results that were considered an outlier and thus removed from this analysis. A variety of research designs were used with some projects utilising a control group while others relied upon a wait-listed or stepped-wedge design.

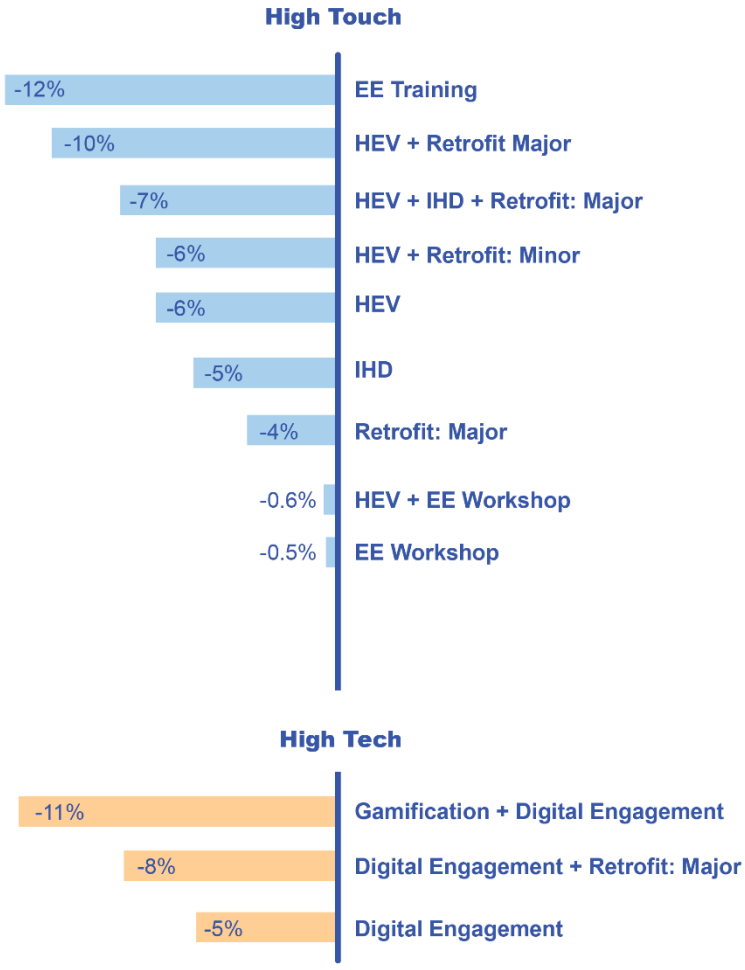
The changes in electricity consumption as revealed in LIEEP reports are presented in two ways: firstly, by the project and for each initiative they trialled; and, secondly, by initiative only. The first allows for a quick understanding of the result per project, while the second allows for an understanding as to which initiative worked best. The following table provides the first outcome (see Table 4). For nine initiatives, the changes in electricity use were not reported upon (indicated by a dash in the table). The range in results are from an increase in energy use of 8% after receiving the initiative, to a decrease in energy use of 12%. This suggests that some initiatives may be more successful than others. Hence, grouping all results just by the initiative seemed warranted.

Table 4 Project Initiatives Trialled and the Changes in Household Electricity Consumption

Project	Initiative	Electricity Use (Ave Daily Change) %
KEEP	HEV+ Retrofit: Minor	-4
	HEV + IHD + Retrofit: Minor	+8
	HEV x 2 + Retrofit: Minor	-
PS	HEV + Tailored EE Recommendations	-
PD	HEV + Retrofit: Minor	-6
	EE Workshop	-1
MM	HEV x 2-4	+2
	HEV + IHD	-
	HEV + Retrofit: Major	-10
	HEV + Retrofit: Minor	-2
ES	Retrofit: Major	-4
	HEV	-1
	HEV + Retrofit: Major	0
PSR	HEV x 2 + Retrofit: Minor	-3
GS	Multiple HEVs + Retrofit: Minor	-3
	Multiple HEVs + Retrofit: Minor	-5
BA	HEV	+4
	EE Workshop	-
	EE Workshop (NILS)	-
	EE Workshop (Immigrant Orientation)	-
SOH	Digital Engagement (SMS)	+1
	Digital Engagement (Personal SMS)	0
	Digital Engagement (Personal SMS) + Retrofit: Major	-8
GHW	HEV	-3
	EE Workshop	+2
	HEV + EE Workshop	+1
	HEV (EE Workshop Materials)	-6
	EE Workshop Materials	+3
FPF	EE Workshop	-
	EE Training (Energy Workers)	-12
	HEV + EE Training (Energy Workers) + Retrofit: Minor	-4
GBS	HEV + Retrofit: Minor	0
	EE Training (Energy Workers)	-3
	HEV + EE Training (Energy Workers) + Retrofit: Minor	-4
EE3A	Digital Engagement + Retrofits: Major	+1
	EE Training (Community)	-
BTH	HEV + Retrofit: Major	-7
OGH	Digital Engagement	-5
RYJ	Digital Engagement + Gamification	-11
SCT	HEV + Retrofit: Minor	-2

The overall reduction in electricity usage for households for each initiative is shown in Figure 21. These initiatives are classified into two approaches: firstly, that of high touch, which represents personal and face-to-face initiatives; and, secondly, high tech focusing on digital initiatives. Of the 20 LIEEP projects reviewed, 18 provided valid measures of energy use before and after the initiative that was trialled. The initiatives that achieved the greatest reduction in electricity consumption are EE training (one project, -12%), gamification with digital engagement (one project, -11%) and HEV with major retrofits (two projects: -10%) The latter is understandable given that the major retrofits typically involved a significant energy efficiency upgrade, such as insulation or a new hot-water system.

Figure 21 Daily Household Electricity Use per Initiative



It is worth noting here that an average change in electricity consumption per initiative, as presented in Figure 21, slightly distorts the findings. For example, when a few projects trialled an initiative and the findings are quite diverse (e.g., the energy efficiency training initiative produced results of -12% and +3%) the average result masks that for one project, with the outcome being quite impactful. This variance reflects that consideration must be constantly made in analysing and interpreting the data. Furthermore, the number of participants included in the analysis compared with the larger cohort reached using the initiative was, in most cases, 10% or less. This suggests that more data, especially post-initiative data, needs to be collected in future to produce more reliable results for initiatives other than the HEVs.

Overall, the most prevalent initiative trialled was a HEV, sometimes coupled with either a minor or major retrofit. Due to its prevalence, the results for these initiatives will be more reliable than the results for initiatives trialled by one or two projects. Hence, the average reported 0% to -6% reduction in electricity consumption for a HEV, and the -2% to -6% reduction in electricity consumption for a HEV coupled with a minor retrofit are the most reliable figures that can be captured from LIEEP. This can be further clarified by comparing the range in electricity reductions experienced by households for each initiative with the minimum and maximum reductions in energy use and number of projects trialling the initiative (see Table 5).

Table 5 Electricity Reduction Range by Initiative with Number of Projects Trialling the Initiative

Initiative	Minimum Ave Change in Daily Electricity Use (%)	Maximum Ave Change in Daily Electricity Use (%)	Range of Responses Reported	No. of Projects
HEV	2.21	-5.82	8.03	7
HEV + Retrofit: Minor	-0.4	-6	5.6	11
HEV + Retrofit Major	-0.41	-9.6	9.19	2
HEV + IHD	-	-	-	2
HEV + IHD + Retrofit: Minor	8	8	0	1
HEV + IHD + Retrofit: Major	-7	-7	0	1
IHD	-5.4	-5.4	0	1
HEV + EE Workshop	0.59	0.59	0	1
Retrofit: Major	-3.9	-3.9	0	2
EE Training	2.9	-12.36	15.26	3
EE Workshop	1.94	-0.52	2.46	6
Digital Engagement	0.91	-5.40	6.31	1
Digital Engagement + Retrofit	1	-8.3	9.3	3
EE Information	2.79	2.79	0	2
Gamification + Digital Engagement	-10.95	-10.95	0	1

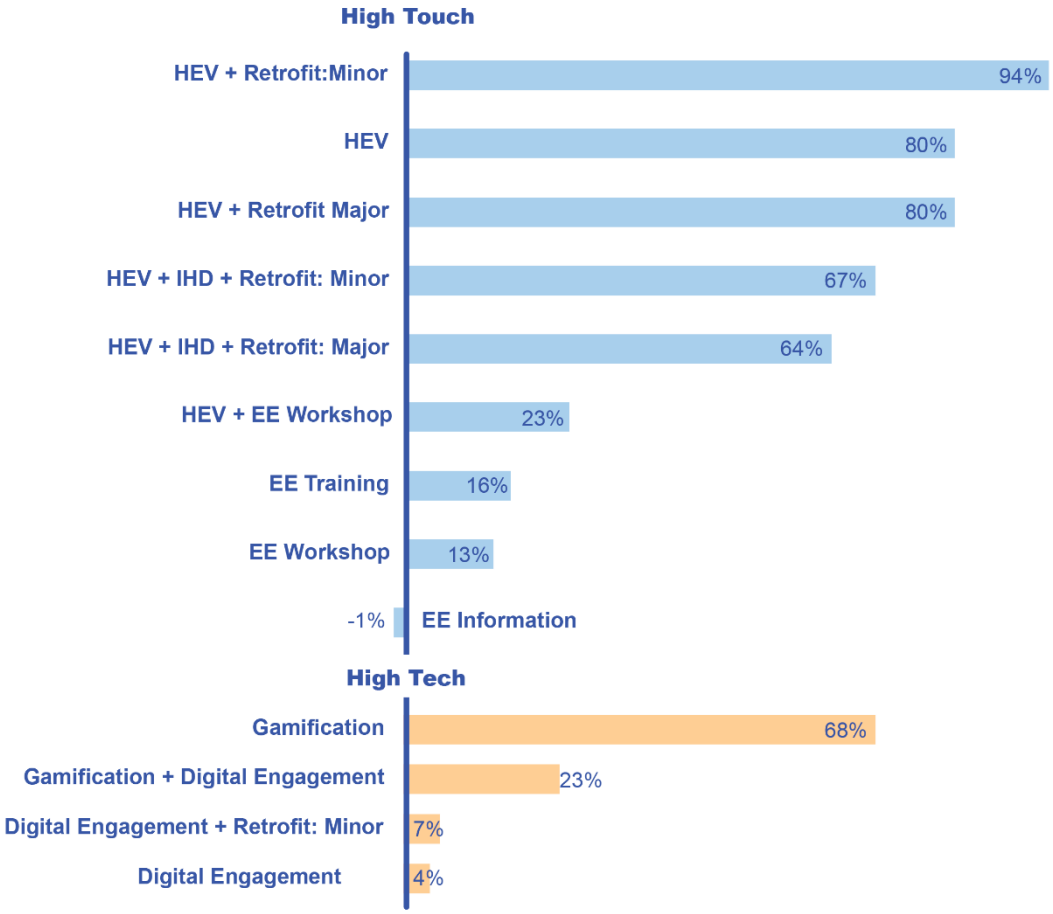
From this table, the largest range in consumption reduction is found with the initiative ‘energy efficiency training’ (15.26) suggesting that, for the three projects that implemented this initiative, a highly variable result was found. Ideally, when a range is low and represents more projects the result is more reliable. This is seemingly the case with energy efficiency workshops, where the range is low (2.46) and incorporates six projects (highlighted in pale green). However, reliability and favourable outcomes in terms of reduced electricity consumption are key. For energy efficiency workshops the strongest result produced a less than 1% reduction in electricity use (highlighted in red). Accordingly, the HEV with minor retrofit shows a modest range (5.6), reflects the most projects (11) and has a favourable outcome of up to -6% reduction in electricity consumption. This is the most reliable result in LIEEP (highlighted in green). Other initiatives, such as a HEV with major retrofit and gamification with digital engagement show the potential to produce better results (-9.6% and -10.95% respectively) than the HEV with minor retrofit; however, too few projects used these initiatives, thus making the results less reliable. Future projects should consider a broader adoption of these initiatives to determine whether the favourable results found in LIEEP can be replicated (e.g., trialled using more people and more diverse cohorts).

Some anomalies are also apparent with the results produced in LIEEP reports. For example, when a HEV or HEV with major retrofit was paired with an IHD, electricity consumption increased even though electricity consumption decreased with the same initiatives not coupled with an IHD. Although only one project trialled each initiative combination, it is difficult to understand the result. It is unlikely that an IHD would significantly increase electricity use, especially to a point that offset the benefits of the HEV and major retrofit. Another anomaly is that energy efficiency workshops and information sessions increased

electricity consumption, whereas energy efficiency training decreased it. Further research on larger samples are needed to determine the validity of these results.

The other substantive measure of the effectiveness of initiatives trialled to improve household energy efficiency was captured by measuring changes in the energy efficiency behaviours of households. The premise was that by engaging in new or more frequent behaviours that effectively reduce energy use, that households would experience a *drop in* bills and consumption. Of the 20 LIEEP reports reviewed, 14 report measuring energy efficiency behaviours of the household before and after the initiative trialled. The results of this review are presented in Figure 22, showing behavioural changes for each initiative trialled. Within the high-touch approach, the three initiatives associated with the largest behavioural changes were the HEV and minor retrofit (eight projects, 94%), HEV (three projects, 80%) and HEV and major retrofit (one project, 80%). With the high-tech approach, gamification (one project, 68%), and gamification and digital engagement (one project, 23%), were associated with the highest reported change in behaviour.

Figure 22 Percentage Change in Household Energy Efficiency Behaviours



The changes reported reveal a substantive increase in household adoption of energy efficiency behaviours for many initiatives trialled. Slightly different from the electricity consumption changes, we now see that a HEV with retrofit and paired with an IHD produced very high levels of behaviour change (64-67%), and a HEV with major retrofit produced the highest behavioural change result of 80%. Significantly, both digital engagement + gamification (68%) and other forms of HEV combinations (32-

80%) produced the strongest results. Interestingly, energy efficiency training, previously reporting the greatest reduction in electricity consumption, reports a comparatively low change in the adoption of energy efficiency behaviours for the household (11%). It is difficult to understand this disparity in results.

However, similar to the electricity consumption data, it should be noted that these figures are based on averages, so it is important to consider the range of responses per initiative. The different combinations of HEVs produced behavioural changes ranging from 6% to 94%. Digital engagement alone (or with retrofits) produced behavioural changes ranging from -6% to 7%, whereas gamification alone or gamification with digital engagement produced behaviour changes of 68% and 23% respectively (one project each).

Although most projects found an improvement, the high level of variability may be partly explained by the way 'behaviour change' was measured, rather than being an accurate reflection of the efficacy of the initiative trialled. For example, some used a survey with more than 10 items, each reflecting a behaviour associated with improved energy efficiency and a 5- or 7-point Likert response scale, while some used a single question with a dichotomous response scale. Consistency across the way variables are measured is needed in future to confirm LIEEP findings.

Overall, most LIEEP projects found that the initiatives trialled reduced the average daily electricity consumption of low-income households by 2–12%. Further, given that these are average figures, it means that some households received much greater savings on electricity and undetected savings on gas, while others experienced increases in electricity consumption. For those falling into the latter group, it could be assumed that the initiative trialled with them was unsuccessful. However, a new and important phenomenon arose during the course of LIEEP which centres on energy productivity and quality of home life. The LIEEP reports contain numerous anecdotal stories reflecting some of the reasons why energy use may have increased or remained stable in some households despite receiving energy efficiency support which was designed to reduce their consumption (and bills). For example, some householders had a sentimental attachment to energy-hungry appliances and were loath to relinquish or replace them (e.g., PS, aged cohort). Another example is that, for some households, energy use was already lower than ideal in an effort to reduce their bills that further reductions were difficult to achieve. However, various initiatives (e.g., HEV, energy efficiency workshops) empowered the household to use energy more productively and increased their confidence in managing their energy. For these homes, energy use may have increased slightly, but their quality of home life improved immensely (e.g., KEEP, Aboriginal cohort; GBS, aged cohort). This important information puts the results into a new light. It highlights the importance of understanding, measuring and addressing other home-life factors related to energy use which are covered in a later section of this report.

By learning more about energy use and efficiency, it is evident that households adopted new behaviours with the aim of reducing their bill. Overall, the adoption of energy efficiency behaviours increased between 6–94%, with combinations of HEVs and gamifications producing the most significant results. However, as stated above, many households adjusted their behaviour so that they could use energy more effectively in the home, for example obtain an improved level of comfort. This could partially explain the large variance in outcomes of electricity consumption and behavioural changes.

Lastly, there are some behaviours that are difficult to report on and to thus determine the impact on overall project findings. For example, in a community-based setting, as for some projects, electricity use is shared among the community to such an extent that if one household runs out of power (their power-card is at zero) they will use their neighbour's power via a long extension cord (MM). In these cases, individual household electricity use, as captured for LIEEP, will provide a distorted view of household benefits from the LIEEP initiative trialled.

In conclusion, LIEEP projects report varied outcomes when it comes to electricity use and household frequency of energy efficiency behaviours as a result of each initiative trialled. An erroneous conclusion would be to assume that the initiatives trialled did not work as effectively as hoped, or that energy use reduction is the best indicator of the project's success.

11. Characteristics of LIEEP Participants

11.1 Participant Reach

The number of people reached by LIEEP as reported in the final reports may mask the actual number of people who directly participated or experienced benefits from the 20 programs. Reports reflect total participant numbers of 18,886. However, this figure represents 'households' and is not representative of the total number of people who were directly or indirectly involved in the program. Thus, actual involvement of people was far greater than the number of households, indicating LIEEP reached many more people than we might, at first, consider. While the total number of people reached through LIEEP is not easily discernible, we were able to extrapolate an estimation. Presented in Table 6 is the total number of participants who were directly or indirectly reached by LIEEP. These participants represent the sum of households by the number of occupants within each household.

Some reports listed the number of people per household, which provided sufficient information to calculate the total reach. Thus, some assumptions were made where missing data were present. These assumptions are also reported in Table 6.

Assumptions, for example, include figures which underestimate the total number of participants influenced. Where participant rates could not be identified, the number of households was reported. In Table 5, the number of participants targeted is reported, along with the number of participants recorded, average people per household, total reach and any assumptions or issues that were noted in calculation of the total reach. The total reach was calculated by using the occupant categories (e.g., 1-person household, 2-persons household or 3-persons household) provided by the reports, multiplied by the number of participants per category.

Table 6 Number of Household Project Participants and Total Participant Reach

Project	Number of Participants Targeted	Number of Participants Reported	Average People Per Household	Total Reach	Assumptions
KEEP	4,500	1,124	2.14	2,400	Data were reported in occupant categories, i.e. 1-2, 3-4; as such, 1-2 was defined as 1.5, 3-4 as 3.5, for the purposes of calculation.
PS	900	300	2.03	610	Occupant rates were asked in survey but these results were not shown in report.
HEEUP	1,000	339	4.88	1,653	Reach reported.
NGSC	60	32	1.38	50	Occupancy rates were reported.
PD	2,250	1,382	1.66	2,300	Assumes the two initiatives were completed by different households. Only the percentages of single and two-person household were given, as such, where they did not add up to 100% the left-over percentage was assumed to be for households with 3 or more people.
MM	620	550	10.28	5,654	Reach reported.
ES	320	320	-	320	Results were not displayed in report.
PSR	1,240	990	-	990	Results were not displayed in report.
GS	330	328	-	327	Results were not displayed in report.
PP	960	812	-	812	Results were not displayed in report.
BA	6,000	1,767	3.72	6,573	6573 figure represents occupants from the initiative delivered to 1767 homes.
SOH	2,158	240	-	240	Results were not displayed in report.
GHW	3,100	1,198	2.16	2,593	Number of people in household by treatment is reported. 123 did not answer, so number could be higher.

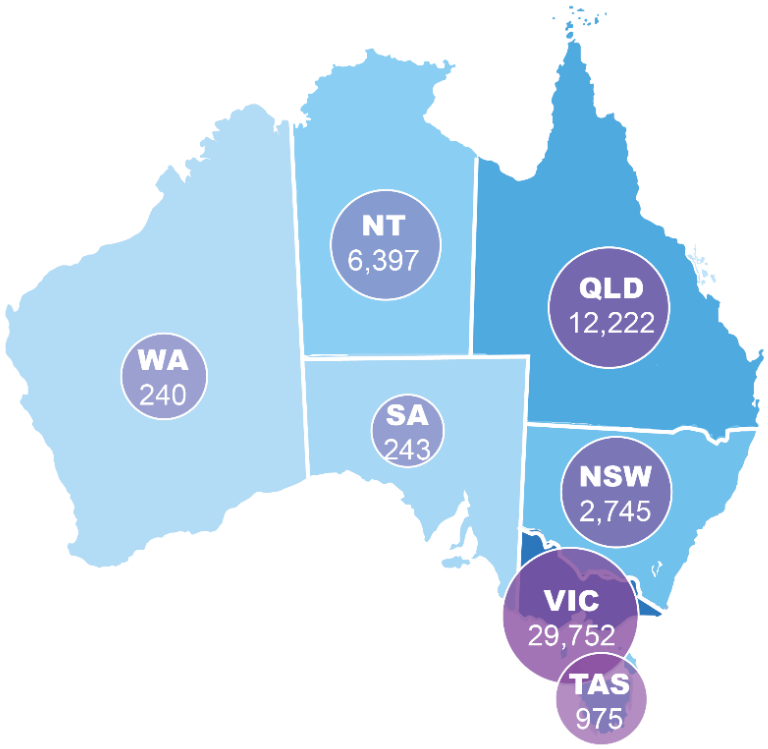
Project	Number of Participants Targeted	Number of Participants Reported	Average People Per Household	Total Reach	Assumptions
FPF	5,000	6,133	4.09	25,102	Assumes different initiative groups were not the same household. Household size averages were used for calculations.
GBS	480	345	2.83	975	Household size was asked and reported by 402 participants.
EE3A	900	830	1.65	1153	A total was calculated visually using an occupancy rate graph. Only 201 people participated in the survey.
BTH	200	119	2.04	243	Household composition without actual amounts was reported, so couple with children was assumed to be a 3-person household.
OGH	1,000	600	2.00	1,198	This will be underestimated as singles includes all households with only one adult, regardless of number of children, and families were assumed to be a 3-person household.
RYJ	1,000	1,001	3.05	3,056	Single initiative, 227 households who didn't fill out the survey were counted as 1-person households.
SCT	480	476	1.56	743	Calculated from 305 survey participants.
Mean	1,707	992	2.52	2,954	
Total	32,498	18,886	-	56,992	

Note: Total reach participants reports × average people per household. (-) refers to missing data that were not noted in the report or could not be readily discerned.

The total reach of LIEEP programs by state is visualised in

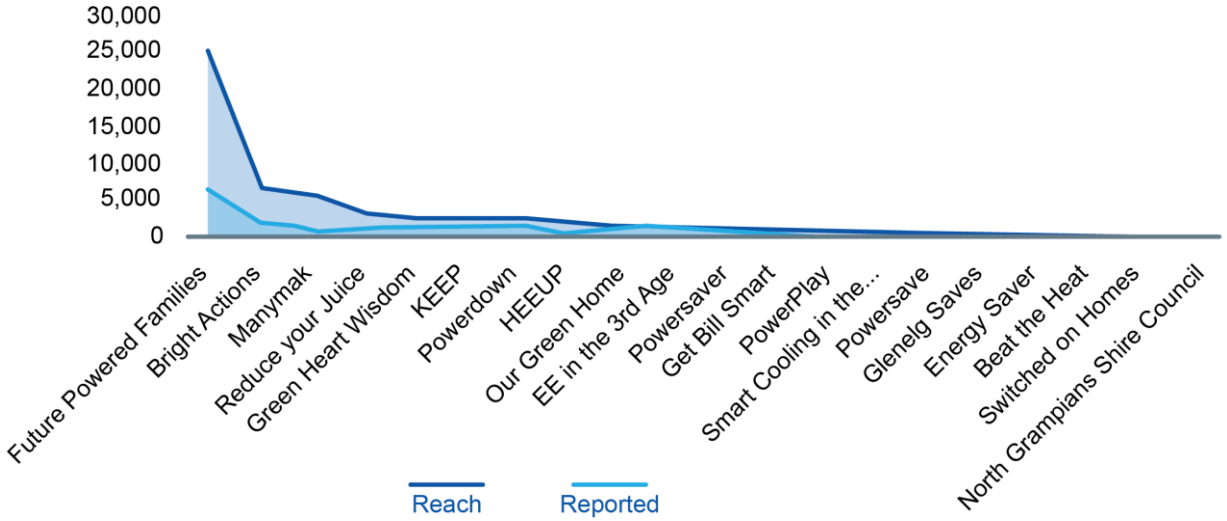
Figure *23*. Analysis of the data indicates that the highest reach of LIEEP projects was in Victoria, with a total participant reach of 29,752. Queensland indicted the second highest reach total, with 12,222 participants being affected by LIEEP projects. The Northern Territory indicates the third highest figure, with a total reach of 6,397. New South Wales, followed by Tasmania, South Australia and Western Australia also indicated increased total reach figures.

Figure 23 Estimated Participant Reach of LIEEP Programs



A visual representation of the total participant reach by project is presented in Figure 24, along with the number of participants targeted, and reported. The findings indicate that the FPF project had the highest total reach, followed by the BA and the MM projects.

Figure 24 Total Participant Reach by Project



11.2 Barriers Facing Participants

Each project reported on several barriers that participants faced when trying to adopt energy efficiency practices (see Table 7). To conduct the analysis for this report, two researchers independently coded the barriers they identified in each LIEEP report and then, together, reviewed any differences in findings. Where differences in the coding procedures were apparent, further discussion was facilitated by the researchers to come to a final conclusion. Overall, 18 barriers were identified in total with the five most common shaded in the last row. The barriers were a combination of the observations of project proponents regarding the low-income cohort they were targeting and some empirical evidence.

Top Five Barriers to Energy Efficiency Improvements:

1. High perceived cost
2. Knowledge gaps
3. Lack of trust
4. Poor split incentives
5. Low literacy

Table 7 Barriers to Adopting Energy Efficiency Practices

Project	Higher perceived costs	Knowledge gaps	Lack of trust	Poor/split incentives	Low literacy	Landlord/ tenant objection	Lack of interest	Time	Eligibility	Other people/tenants	Negative attitudes	Mobility/heath	Internet availability	Digital literacy (low)	Access	Comfort	Stress	Connectivity
KEEP	✓	✓	✓		✓		✓				✓				✓		✓	
PS	✓		✓		✓		✓		✓			✓						
HEEUP	✓	✓	✓	✓		✓												
PD	✓	✓		✓	✓	✓			✓	✓								
MM	✓	✓		✓	✓	✓			✓				✓	✓				
ES	✓	✓	✓	✓	✓	✓			✓									
PSR	✓	✓		✓	✓			✓		✓	✓							
GS	✓	✓	✓	✓				✓		✓	✓							
PP	✓	✓	✓				✓						✓					
BA	✓	✓			✓		✓	✓							✓			
SOH	✓	✓			✓		✓	✓						✓				
GHW	✓		✓				✓	✓	✓			✓			✓	✓		
FPF	✓	✓	✓	✓	✓	✓		✓	✓	✓								
GBS	✓	✓	✓					✓	✓									✓
EE3A	✓	✓	✓								✓					✓		
BTH	✓	✓		✓		✓												
OGH	✓	✓		✓		✓							✓	✓				
RYJ	✓	✓		✓		✓	✓											

Project	Higher perceived costs	Knowledge gaps	Lack of trust	Poor/split incentives	Low literacy	Landlord/ tenant objection	Lack of interest	Time	Eligibility	Other people/tenants	Negative attitudes	Mobility/heath	Internet availability	Digital literacy (low)	Access	Comfort	Stress	Connectivity
SCT	✓	✓					✓			✓		✓				✓		
Frequency	**19**	**17**	**10**	**10**	**9**	**8**	**8**	**7**	**7**	**5**	**4**	**3**	**3**	**3**	**3**	**3**	**1**	**1**

While no two programs identified the exact same combinations of barriers, some barriers were more commonly identified than others. For instance, the barrier of cost was common to all LIEEP projects. Cost was operationalised as the cost of purchasing energy efficiency appliances, as well as the risk of not receiving a positive return on investment within a reasonable timeframe. The cost barrier was sometimes amplified by participants' low income levels which made large upfront purchases very difficult. The following two quotes by the SOH and BTH projects demonstrate this finding:

> *…the cost of energy efficient appliances is too great. (SOH)*
>
> *We would consider solar both for electricity and hot water if it was financially beneficial. (BTH)*

Additionally, as found by the GHW project, some older residents felt they would not live long enough to see the financial benefits, for example:

> *…they believed they 'wouldn't live long enough to benefit' from the appliance or in-home modifications. (GHW)*

The second most common barrier was knowledge gaps and lack of information. Sometimes simple information was all that was needed to change energy efficiency practices, but due to the lack of information about these specific behaviours households remained in the dark. Notably, a lack of information also pertained to a lack of information relating to residential energy efficiency opportunities and the projects themselves. For instance, the following quotes highlight this problem:

> *Householders may face barriers to energy efficiency improvement, including limited knowledge of residential energy efficiency opportunities. (ES)*
>
> *…you don't know what else to do. (SOH)*
>
> *…low-income and other marginalised households are commonly unaware of programs or assistance for which they are eligible. (FPF)*

The third and fourth most common barriers were each identified in 10 LIEEP reports and include 'a lack of trust' and the 'split incentive' between landlords and tenants. Trust is about the participant's belief that the program was legitimately trying to save them money and that there was no ulterior motive. Trust is related to various elements, such as letting people into their home, giving access to researchers and

tradespeople, and privacy in relation to monitoring electricity usage. This can be seen in the following quotes:

> *The text messages are unclear – he brushes it off thinking it's fake and random. (PP)*
>
> *…they felt distrustful of the offer. (GHW)*
>
> *Many people involved in this project have low literacy levels and to be asked to sign so many formal documents was problematic particularly as many were uncertain and suspicious about the possibility that there were hidden costs. (GBS)*

Split incentives are where a landlord incurs the cost of an energy efficiency upgrade, or shares the cost of the upgrade with the tenant, but the benefits flow through to the tenant through lower electricity costs. This can lead to tensions if the landlord does not support upgrades (finance and/or approval to install). In these cases, adopting energy efficiency practices for the tenant becomes too difficult and no changes are implemented. The following extracts from three projects illustrates these difficulties:

> *…participants of all groups reported that it was difficult to communicate with landlords. Participants expressed dissatisfaction with their limited capacity to make energy saving changes and hesitation in regard to creating conflict with landlords. Renters' apprehension was particularly evident when participants refused VEET products if landlord permission was required. Future projects could provide training on communicating with landlords. However, it should be noted that other organisations (*e.g. *the Alternative Technology Association) have found renters in general struggle to get basic household repairs done and are very reluctant to approach landlords about anything 'extra' like energy issues. Newly arrived renters with limited English, especially in tight rental markets like Melbourne, are even less likely to be willing to 'rock the boat'. (FPF)*
>
> *I'm not going to do all those things when it's someone else's place. [The problem is] getting landlord buy-in. (BTH)*
>
> *Householders may face barriers to energy efficiency improvement…they often live in homes where they need approval from landlords/property managers to undertake works on the home. (ES)*

The least common barriers were stress, connectivity, internet availability and low digital literacy. Where numerous paperwork was required to be filled out some participants became anxious and stressed. Internet availability and digital literacy play a role when digital approaches are being used, but due to the variety of approaches used across LIEEP projects these were less frequently reported.

The frequency of barriers was examined according to age grouping, cohorts and urbanisation levels. For each of these segmentation bases there was no difference in the barriers experienced.

11.3 Motivators Encouraging Participants

Motivators to achieving positive energy efficiency are displayed in Table 8. Motivators create a willingness to adopt and maintain energy efficiency practices and can also be used to overcome barriers. To identify motivators, the same analysis technique was adopted as that used for identifying barriers. Two researchers separately coded the motivators they identified in each LIEEP report and then, together, deliberated on any opposing results and came to an agreement. From this analysis, 13 motivators were identified (see Table 8) with the five most common shaded in the last row. The motivators were a combination of recipient observations and some empirical evidence.

Top Five Motivators for Energy Efficiency Improvements:

1. Awareness and education
2. Lower perceived costs
3. Incentives, rebates and concessions
4. Comfort
5. Improved health and lower stress

Table 8 Motivators to Adopting Energy Efficiency Practices

Project	Awareness and education	Lower perceived costs	Incentives/rebate/ concessions	Comfort	Improved health/ lower Stress	Access to experts	Culturally approachable	Control/ responsibility	Help others	Environmental responsibility	Positive attitudes/ emotions	Safety	Time saving
KEEP	✓	✓	✓	✓	✓	✓	✓	✓					
PS	✓	✓	✓	✓	✓		✓	✓					
HEEUP	✓	✓	✓			✓				✓			
PD	✓	✓		✓									
MM	✓	✓	✓			✓	✓						
ES	✓	✓	✓	✓	✓	✓	✓						
PSR	✓	✓	✓			✓	✓						
GS	✓	✓	✓	✓		✓			✓	✓			
PP	✓	✓	✓		✓			✓	✓			✓	✓
BA	✓	✓	✓	✓	✓		✓						
SOH	✓							✓	✓				
GHW	✓		✓	✓						✓			
FPF	✓	✓					✓						
GBS	✓		✓		✓	✓	✓						
EE3A	✓	✓		✓		✓		✓			✓		
BTH	✓			✓	✓						✓	✓	✓
OGH	✓	✓							✓		✓		
RYJ	✓	✓	✓	✓	✓			✓	✓		✓		
SCT	✓	✓		✓	✓					✓			
Frequency	**19**	**15**	**12**	**11**	**9**	**8**	**8**	**6**	**5**	**4**	**4**	**2**	**2**

The most common motivator for energy efficiency was awareness and education. People had a desire to seek information related to energy efficiency. Older residents who had high levels of knowledge about how to manage their energy use in the home were also interested in the topic as it could relate to their children's and grand-children's education. The following quotes demonstrate this finding:

> *…community members are likely to be more receptive to energy efficiency messages when they are promoted with an awareness of local priorities and outlines the advantages of leveraging community-based organisations … (GBS)*
>
> *Their level of interest outweighed the odd case of cynicism and while they accepted the need to continue with their practices, their overwhelming interest in the topic related to the education of their children in sensible and economic practices. (EE3A)*

The second most common motivator was reducing costs associated with energy usage. The following quotes illustrate this:

> *...his family is doing less by being more energy efficient. (PP)*
>
> *Avoided energy costs by replacing an AC with the more efficient model resulted in an average saving of approximately $88 of avoided electrical energy costs per summer. (BTH)*

The third most common motivator was incentives, rebates or concessions. These extrinsic rewards were used at different stages and in different amounts across projects. The following quotes highlight the use of incentives:

> *People seemed more receptive to energy efficiency information as it not only came with a financial incentive [grocery vouchers] but also from a trusted source within the local community. (GBS)*
>
> *A clear benefit of the retrofit component of the project was that improvements were made to the participants' homes and wellbeing that they either had no knowledge about or were simply too difficult and/or costly to implement. (EE3A)*
>
> *The project explored barriers associated with split incentives for landlords and tenants whereby the installation occurred at no direct cost to the landlord in exchange for a non-financial contribution in the form of a 'rent freeze' for the property. (BTH)*

An alternative view on incentives was presented by SOH:

> *The community, in particular senior citizens, participated for altruistic reasons. Many households perceived that they did not need help but wanted to be part of a trial to help more disadvantaged community members. For this reason, gift card incentives for signing up were not self-reported to be highly motivating. (SOH project)*

The least common motivators identified from the data were safety, time saving and positive attitudes and emotions. Whilst these motivators might occur as a result of participating in LIEEP programs they were not the most common reasons that motivated participants. The following quotes provide examples of these motivators:

> *I now don't need to worry about starting a fire with my bar heater. (BTH)*
>
> *…increased security as LED lights can be left on at night at lower cost. (PP)*

Figure 25 presents the top five motivators and barriers to energy efficient behaviour change.

Figure 25 Top Five Motivators and Barriers to Energy Efficiency Behaviour Change

12. Segmentation Analysis

This section details the analysis undertaken to develop the segmentation framework and discusses how each of the segments were identified, as presented earlier. This analysis was based on content analysis of the project reports as there was no access to the raw data of participant households.

There are four bases for segmenting a market: geographic, demographic, psychographic and behavioural indicators. Initial analysis of the participant data in the project reports was performed using all four bases individually.

12.1 What Worked: Geographic Perspective

Market segmentation was first explored on the basis of urbanisation level. Urbanisation level includes: 'metro only', 'metro/regional', 'metro/regional/rural', 'regional only' and 'remote only'. Changes in energy efficiency by cohort type across a range of variables, such as 'behaviour', 'knowledge', 'attitude', 'competency', 'stress', 'comfort' and 'self-efficacy', were examined. The results in Table 9 indicate changes in energy efficiency according to the level of urbanisation.

Table 9 Changes in Energy Efficiency by Level of Urbanisation and Psychographic Variables

Urbanisation level	Energy Efficiency Use	Behaviour	Knowledge	Attitude	Competency	Stress	Comfort	Self-Efficacy
Metro Only	-6.41%	43.54%	33.00%	16.00%	11.84%	-28.11%	12.25%	47.60%
Metro/Regional	-7.21%	31.37%	31.87%	7.94%	24.45%	-12.00%	13.82%	17.73%
Metro/Regional/ Rural	-3.94%	73.50%	74.00%		77.00%	-40.87%	14.45%	150.00%
Regional Only	-5.00%	39.50%	13.00%		42.30%		20.00%	15.33%
Remote Only	-9.60%							

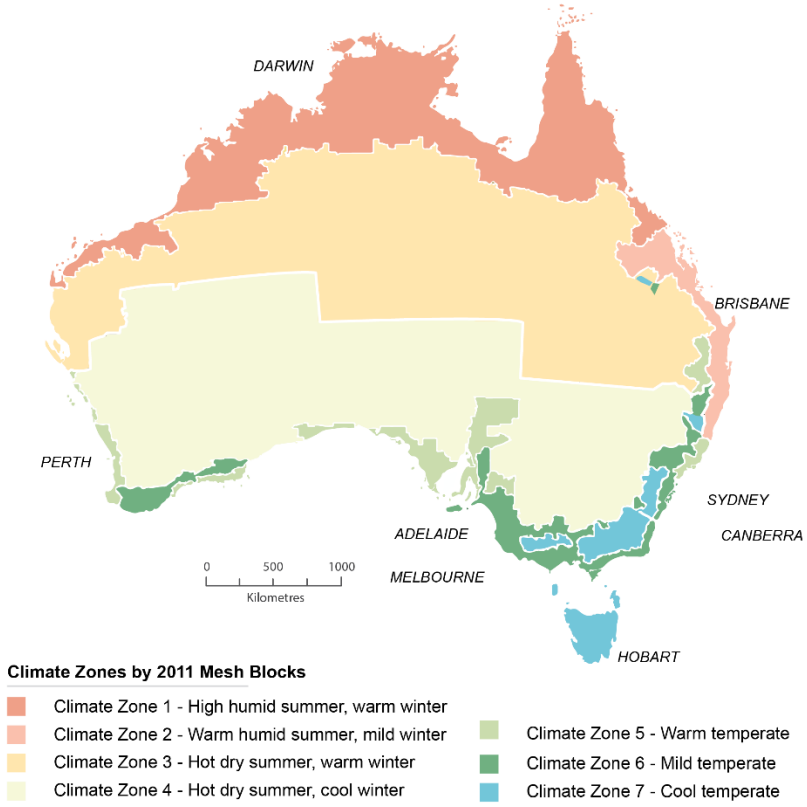
Note: Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change.

The key findings from Table 9 include:

- behaviour and knowledge change in the metro/regional/rural areas combined was highest, with results indicating a change at 70% and 74% respectively
- attitude change was highest from a metro perspective, with results indicating a change at 16%
- competency change in the metro/regional/rural areas combined was highest (77%)
- stress level findings indicate the highest reduction in stress levels across metro/regional/rural areas combined (-40.87%)
- comfort changes were highest in the regional only category, with results indicating a change at 20%
- self-efficacy change figures show that metro/regional/rural areas combined indicate the highest change at 150%
- the findings indicate that projects that encompassed multiple urbanisation levels seemed to perform better than projects with a core focus on one area
- 'remote only' projects present difficultly in terms of gaining access to accurate measures, hence the lack of results.

The data were categorised into climate zones (see Figure 26) according to where LIEEP programs were conducted. Each individual climate zone where projects occurred was noted. The program that covered the most zones (1 to 7) was the single national-specific (general cohort) project (i.e. OGH).

Figure 26 Australian Climate Zones



Source: Australian Bureau of Statistics (2012a).

The data in Table 10 indicate changes in energy efficiency according to climate zone. However, as the data were collected at the project level not the climate-zone level, where a project was conducted across different zones, the results per zone cannot be identified. There are mixed results which are inconclusive about the effect of climate on behaviour change and energy use; therefore, analysis cannot be provided on psychographic variables due to the high level of missing data.

Table 10 Summary of Climate-Zone Data

Projects	Climate Zones	Energy Efficiency Use	Behaviour	Knowledge	Attitude	Competency	Stress	Comfort	Self-Efficacy
GHW	2	-5.82%	23.08%	33.00%	16.00%	11.84%	-28.11%	12.25%	15.19%
GS PP	4	-5.00%	39.50%	13.00%		42.30%		20.00%	5.00%
BTH PS	5	-7.00%	64.00%					20.00%	58.00%
GBS	7	-3.70%	15.70%	61.90%			-29.60%		
SCT MM	1 & 3	-6.01%	80.00%	74.00%			-55.00%		
OGH	1 to 7	-5.41%							

Projects	Climate Zones	Energy Efficiency Use	Behaviour	Knowledge	Attitude	Competency	Stress	Comfort	Self-Efficacy
BA RYJ	2, 3, & 5	-3.41%	23.00%	26.51%	9.08%	9.81%	-7.00%	10.00%	18.31%
SOH	3, 4, 5, & 6	-8.30%	5.60%				-12.40%	9.00%	13.51%
PSR EE3A	4, 5, 6, & 7	1.13%	50.50%	34.65%	6.34%	20.00%	-7.00%		29.00%
KEEP FPF PD HEEUP ES	4, 6, & 7	-10.24%	43.16%	7.02%	10.00%	62.50%	-14.24%	16.90%	59.09%

Note: Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change. (-) refers to missing data that were not noted in the report or could not be readily discerned.

The key findings from Table 10 include:

- improvements in behaviour, knowledge and stress in hotter climates (zones 1 and 3) were highest, with results indicating a change of 80%, 74% and -55% respectively
- attitude change was highest in warm climates (zone 2) of 16%
- competency improvements in milder climates (zones 4, 6 and 7) were the highest, with results indicating a change of 63%
- the highest improvements in self-efficacy were seen in cooler climates (zones 4, 6 and 7) of 59%.

12.2 What Worked: Demographic Perspective

Data from the LIEEP projects were collated to identify where energy efficiency behaviours were most prevalent. Three demographic factors were used to collate this information: cohort, age group and education level. The changes experienced per cohort regarding energy efficiency use, behaviours and psychographic variables are presented in Table 11.

Table 11 Changes in Energy Efficiency by Cohort and Psychographic Variables

Cohort	Energy Efficiency Use	Behaviour	Knowledge	Attitude	Competency	Stress	Comfort	Self-Efficacy
Aged	-4.01%	25.90%	16.65%	3.67%	8.00%	-7.20%	5.50%	11.26%
Apprentices		68.00%	14.00%		42.30%		38.00%	1.00%
CALD	4.13%	94.00%	48.00%	9.00%	32.00%	-7.00%	10.00%	27.60%
General	-3.84%	47.85%	67.95%			-42.30%		
Aboriginal	-6.80%	67.00%			77.00%	-26.73%	14.45%	150.00%
New Parents	-12.36%	16.37%		10.00%		-14.00%	25.84%	16.56%
Social Benefits Recipients	-12.27%	16.17%	20.01%	16.00%	29.92%	-28.11%	14.22%	20.63%
Tenants	-7.00%	64.00%						80.00%
Young Renters	-10.95%	23.00%	5.02%	9.08%	9.81%	-7.00%		10.42%

Note: Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change. (-) refers to missing data that were not noted in the report or could not be readily discerned.

The key findings from Table 11 include:

- **Reduction in energy use:**
  - The greatest reduction in energy use was experienced by new parents (-12.36%), social benefits recipients (-12.27%) and young renters (-10.95%). Young renters could include shared houses where not everyone has a similar motivation towards energy efficiency initially. Furthermore, because energy bills are most commonly paid for by all shared house members, participants who may not have a motivation towards reducing the energy bill initially are now contributing to a reduction in usage.
  - The lowest change in energy use was identified in the CALD group, where usage increased (+4.13%), followed by general (-3.84%), then aged (-4.01%).

- **Increased adoption of energy efficiency behaviour:**
  - Behaviour change in the CALD cohort was the highest (94%). The increase in energy efficient behaviour within the CALD cohort could be due to the fact that many CALD participants originated from developing and/or war-torn countries, where the use of electricity was limited. Potentially, CALD participants had very little in the way of experience with the use of electricity, and therefore energy efficiency. Dramatic changes in behaviour could reflect a leap in learning about the field and how to use appliances more optimally. However, this cohort also revealed lower changes in energy consumption. One explanation for this disparity is that it reflects increased comfort (greater productivity).
  - Tenants, apprentices and Aboriginal cohorts experienced behaviour change at levels between 64–68%.
  - New parents were reported as adopting fewer behavioural changes than others of 16%. This may be due to the lifestyle requirements of child-rearing conflicting with the ability to implement changes in behaviour.
  - Social benefit recipients also adopted fewer behavioural changes, with an increase of 16%.

- **Increase in knowledge:**
  - An increase in knowledge was highest in the general cohort category (68%).
  - CALD participants indicated a 48% increase in knowledge.
  - The lowest increase in knowledge was evident with young renters, with results indicating a change of 5%. This cohort was reported to have a high baseline of knowledge, which perhaps left little room for improvement from initiatives trialled.

- **Improved attitude:**
  - Generally, data availability for measuring attitudes was poor, with most programs not collecting this information. Compared with other outcomes, attitude change was fairly low.
  - Social benefit recipients were reported to experience the highest change in attitude (16%).
  - Aged cohorts experienced the lowest in terms of attitude change, with results indicating a change of 4%.

- **Higher competency:**
  - The highest level of improvements in competency were experienced by Aboriginal people, with reported changes of 77%.
  - Moderate improvements in competency were experienced by apprentices (42%), CALD participants (32%) and social benefit recipients (30%).

- The lowest improvement in competency was experienced by aged cohorts (8%).

- **Reduced stress:**
  - The cohort experiencing the most stress reduction was the general participant cohort, with a reduction in stress levels of -42%. The next highest reductions in stress were experienced by Aboriginal people (-27%) and social benefits recipients (-28%).
  - The lowest reduction in stress was evident with young renters, CALD and the aged (-7% to -72%).
  - Stress and anxiety for mature-aged participants was a common theme identified by projects targeting this cohort, that contributed to stress about energy, with one project finding that *'…talking about the way energy is used to maintain a home has led to discussions about guilt, anxiety and fear. To reduce anxiety and fear of receiving a higher energy bill [participants] may simply switch off heating to reduce fuel bills rather than increasing energy efficiency. However, this too can be stressful*' (EE3A pp. 99-100). Anxiety about costs propelled mature participants to adopt the 'energy saving' practice of turning everything off; this would often have detrimental effects on their personal comfort and increase their stress due to financial concerns (EE3A). It is worth noting that a reduction in stress level does not necessarily reflect 'low' stress levels.

- **Greater comfort:**
  - Comfort improvements experienced by the apprentice cohort were the highest (38%).
  - Moderate comfort improvements were experienced with the new parent cohort (26%).
  - Aged cohorts seemed to experience the lowest in terms of comfort improvements, with results indicating a change at -5%. It would appear that the aged cohort has the highest propensity to accept discomfort, perhaps to ameliorate financial stress, as discussed above.

- **Improved self-efficacy:**
  - For changes in self-efficacy, the highest improvement was experienced by the Aboriginal cohort (150%). This radical improvement is likely due to the projects targeting this cohort spending considerable time discussing bills, providers, payment options and plans, and providing advocacy with energy providers on their behalf.
  - Apprentices experienced the lowest in self-efficacy improvements, with results indicating a change of 1%. This could reflect the situation that apprentices usually lived in share houses where they were neither the home owner nor the electricity bill payer, so their ability to experience higher levels of self-efficacy was limited.

The data in

Table 12 show results for three different age categories. Due to the inconsistencies in age categories utilised by each LIEEP report and availability of data, the three age categories selected are deliberately wide in range. These age categories are broadly defined as 'young adults' (18 to 34 years old), 'established adults' (40 to 60 years old), and 'mature adults' (60 to 90 years old). A lot of programs did not mention the particular age group that was targeted, so their results could not be included in this table.

Table 12 Changes in Energy Efficiency by Age Group and Psychographic Variables

Age Groups	Energy Efficiency Use	Behaviour	Knowledge	Attitude	Competency	Stress	Comfort	Self-Efficacy
Young Adults	-8.98%	51.67%	9.51%	9.08%	26.06%	-7.00%	38.00%	30.47%
Established Adults	-3.85%	41.35%	61.90%		77.00%	-28.17%	14.45%	150.00%
Mature Adults	-7.18%	34.16%	33.83%	9.84%	22.61%	-24.38%	10.56%	13.13%

Note: Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change. (-) refers to missing data that were not noted in the report or could not be readily discerned.

The key findings from

Table 12 include:

- Behaviour, attitude change and comfort changes for young adults was highest, with results indicating a change at 51.67%, 9.08% and 38.00% respectively.
- Knowledge change, competency, reductions in stress and changes in self-efficacy for established adults were the highest, with results indicating a change at 61.90%, 77.00%, -28.17%, and 150% respectively.
- Mature adults have moderate levels of change compared to the other age categories.

With regard to education, Table 13 indicates that for those participants with tertiary education the variables with the largest improvement were energy usage (-15.20%) and competency (48%). For participants who completed high school year 12 (HSY12), behaviour and comfort were their highest improvement variables. Participants who completed high school year 10 (HSY10) displayed the greatest improvement in attitudes and stress reduction. Those with no formal education showed an increase in energy usage, and had the highest improvements in the areas of knowledge.

Table 13 Changes in Energy Efficiency by Education Level and Psychographic Variables

Education levels	Energy Efficiency Use	Behaviour	Knowledge	Attitude	Competency	Stress	Comfort	Self-Efficacy
No Formal education	4.13%		48.00%				10.00%	26.20%
HSY10	-5.50%	24.61%	28.48%	16.00%	11.84%	-28.86%	8.22%	28.72%
HSY12	-4.91%	41.77%	28.58%	6.38%	34.28%	-25.28%	20.48%	43.73%
Tertiary	-15.20%				48.00%			

Note: HSY refers to High School Year of completion. Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change. (-) refers to missing data that were not noted in the report or could not be readily discerned.

The analysis of demographic variables indicate that education is the demographic factor that yields the greatest improvements in energy efficiency use. Behaviour change was the highest for the CALD cohort, indicating the demographic feature of cultural background is important. Demographic variables matter if the goal is improvements in energy use, energy efficiency behaviours, comfort and stress management related to energy efficiency. Specifically, younger adults had greater improvements in

energy use, energy efficiency behaviour and comfort, while mature adults had greater improvements in stress management. Younger adults exhibit the highest level of energy usage improvement.

12.3 What Worked: Psychographic Perspective

Psychographic data represent the thoughts, options or attitudes of a person. The data in Table 14 display attitude change toward energy efficiency and the overall LIEEP outcome in energy efficiency.

Table 14 Summary of Psychographic Level Data

Cohort	Project	Attitudes to Energy Efficiency	LIEEP Energy Usage Reductions
Social Benefit Recipients	GHW	16.00%	-5.82%
New Parents	FPF	10.00%	-12.36%
Young Renters	RYJ	9.08%	-10.95%
CALD	PSR	9.00%	-
Aged	EE3A	3.67%	1.13%
Tenants	BTH	-	-7.00%
Aboriginal	KEEP	-	-4.00%
Social Benefit Recipients	PS	-	-
CALD	Bright Actions	-	4.13%
Aged	SOH	-	-8.30%
Aged	GS	-	-5.00%
Social Benefit Recipients	PD	-	-6.00%
Apprentices & Trainees	PP	-	-
Social Benefit Recipients	HEEUP	-	-25.00%
General	SCT	-	-2.42%
General	GBS	-	-3.70%
Aged	ES	-	-3.86%
General	OGH	-	-5.41%
Aboriginal	MM	-	-9.60%

Note: Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change. (-) refers to missing data that were not noted in the report or could not be readily discerned.

Four of the five LIEEP projects that reported improvements in attitudes also reported improvements in energy efficiency, which would indicate that there is a case for suggesting that changes in attitudes may drive reductions in energy usage. The fact that few projects measured participant attitudes could reflect that: i) they were already asking householders a lot of questions (sufficient number of measures) and were loath to add to the list and thus not further increase the burden to householders for participating, ii) the attitudinal measure that was to be used arrived 'too late' to be used or measured, or iii) many questions were required of each LIEEP participant and that project managers may have believed that adding more questions would have been perceived as overly onerous for the participants.

12.4 What Worked: Behavioural Perspective

Behavioural data represent the physical actions and habits taken by participants. Measures at time periods before and after the data in Table 15 shows behaviour changes, and overall LIEEP outcome in energy usage reductions.

Table 15 Summary of Behavioural-Level Data

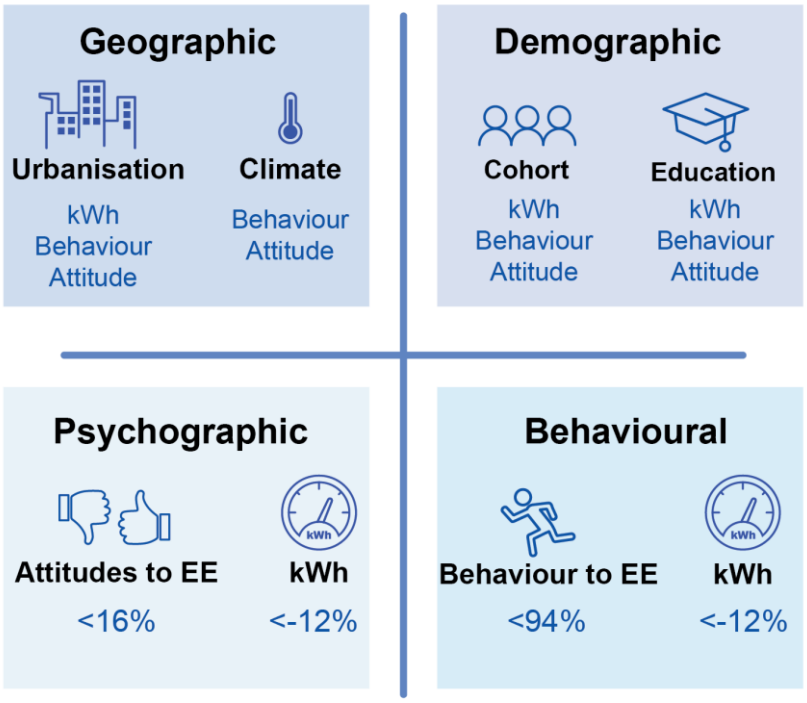
Cohort	Program	LIEEP Energy Usage Reduction	Behaviour to Energy Efficiency
New Parents	FPF	-12.36%	16.37%
Young Renters	RYJ	-10.95%	23.00%
Indigenous	MM	-9.60%	
Aged	SOH	-8.30%	5.60%
Tenants	BTH	-7.00%	64.00%
Social Benefit Recipients	PD	-6.00%	9.25%
Social Benefit Recipients	GHW	-5.82%	23.08%
General	OGH	-5.41%	
Aged	GS	-5.00%	11.00%
Indigenous	KEEP	-4.00%	67.00%
Aged	ES	-3.86%	80.00%
General	GBS	-3.70%	15.70%
General	SCT	-2.42%	80.00%
Aged	EE3A	1.13%	7.00%
CALD	BA	4.13%	
Social Benefit Recipients	PS		
CALD	PSR		94.00%
Apprentices & Trainees	PP		68.00%

Note: Shading scale: The deepest shade of blue represents the highest change, medium blue shades represent moderate change, while grey to light blue shades represent the lowest change. (-) refers to missing data that were not noted in the report or could not be readily discerned.

12.5 Summary of What Worked

When analysing the LIEEP reports on the four bases of segmentation separately, the geographic characteristics of urbanisation and climate, and the demographic characteristics of cohorts and education, appear to influence energy use, behaviours and attitudes (see Figure 27). Looking at the outcomes of the programs, psychographic characteristics appear to improve attitudes and energy use (but not behaviours), while behavioural characteristics appear to increase positive behaviours and reduce energy use.

Figure 27 Summary of What Worked Using Individual Bases of Segmentation

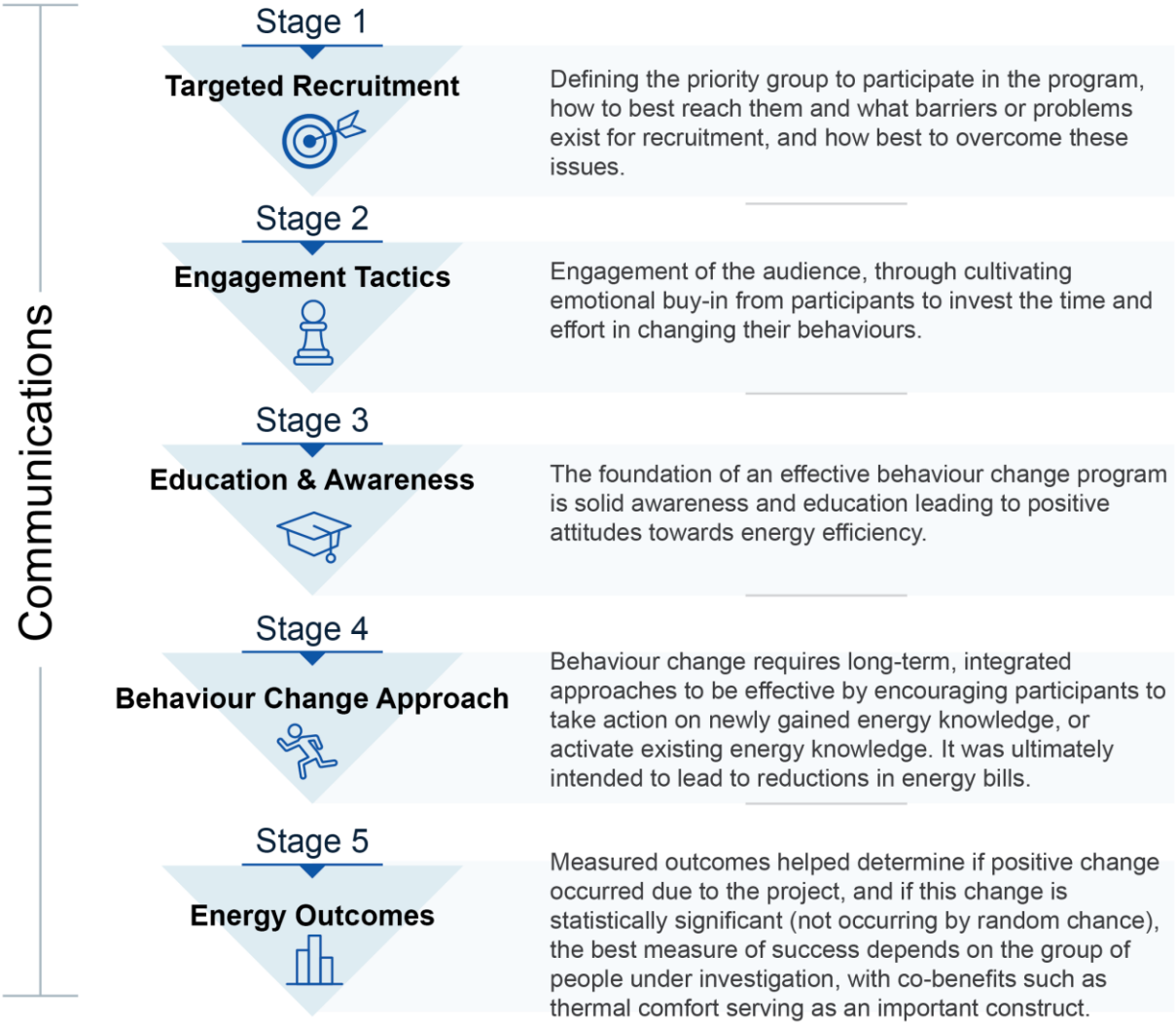


The next section (section 13) combines these four bases to develop the segmentation framework of low-income earners.

13. LIEEP Program Delivery Framework

The deep dive into the LIEEP reports reveals that the LIEEP consortia delivered their programs in five broad stages: Targeted Recruitment, Engagement Tactics, Education and Awareness Methods, Behaviour Change Approach and Energy Outcomes (see Figure 28). This five-stage framework facilitated analysis of success factors for each of the three market segments. Communication is a process that occurs at each stage and has been highlighted in the reports as a critical success factor and is thus included at the end of the discussion of the framework.

Figure 28 LIEEP Program Delivery Framework



14. Stage One: Targeted Recruitment

Targeted recruitment involves defining the priority group to participate in the program and how to best reach them, what barriers or problems exist for recruitment, and how best to overcome these issues. Each of the projects targeted a different group of low-income households and, in doing so, each LIEEP project undertook some form of energy efficiency activity to a clearly defined low-income segment.

The key common aspects in the targeted recruitment stage required each project to: i) define specific low-income groups' attributes to allow participation and or exclusion, ii) reach the specific target market to build awareness of the program and relative benefits, and iii) gain commitment from the target market to participate.

The first major issue for LIEEP projects was the operationalisation of eligibility criteria and how best to apply it fairly and precisely. The next issue was the way in which to communicate with potential participants; this communication focused on raising awareness or interest within the specific group. Using the three segments developed earlier, the targeted recruitment strategies and tactics were grouped according to whether they were deemed successful, had mixed results or were unsuccessful, as claimed within each report. This grouping is illustrated in Table 16.

Table 16 Targeted Recruitment by Segment

	New to Energy	Energy Without Effort	Stressed About Energy
Success	Use existing community organisation services (KEEP, MM, PS, BA). Adapt the recruitment strategy to fit with any changes in the social or economic environment (BA). Inform strategies from experienced partners (MM). Identify all possible stakeholders ahead of time (multiple projects).	Have an agile and responsive approach (RYJ). Segment sub-segments on energy-related variables (RYJ). Define specific target markets well in advance (RYJ). Well-funded social media drive (PP).	Use local council databases to help to identify and recruit relevant participants (ES). Use an already trusted and well-regarded organisation's client list (within the Privacy Act framework) (ES). Send only eligible and suitable households concise letters about the project, follow these up with a phone call or face-to-face discussions, and recruit if they agree to participate (ES).
Mixed Results	Using community leaders to recruit has both advantages and disadvantages (BA).	'Spend anywhere' vouchers drive up recruitment but may not lead to engagement (PP). Digital engagement using social media can mean non-registered participants remain active online (PP).	Incentives may be viewed negatively as a form of welfare (SOH). External organisations might be willing to promote the program but due to privacy concerns will not refer individual households (SOH).
Unsuccessful	Too much of a narrow focus can lead to problems when developments in the macro environment occur (BA). Try to get them to come to you over going to them (BA).	Narrowly defined industry-specific segments present many risks (PP). Assume young adults fit the stereotype (PP). Multiple steps in the sign-up process (PP). Unfocused segmentation strategy and trying to be everything to everyone (multiple projects).	Underestimate recruitment time with overly optimistic timelines (ES). Lack of required registration documents and privacy statements leads to disengagement (SOH) Recruitment agencies may not result in meaningful referrals (SOH). Flyer drops and media releases were not effective (SOH).

Note: For the abbreviations contained in the table please refer to the 'Abbreviations for LIEEP Programs'.

14.1 'New to Energy' Segment

This segment was largely determined by geographic location (extreme climate zones and regional/remote areas) and cultural background (CALD and Indigenous cohorts). These characteristics meant that this segment was easier to identify through clear geographic, ethnic or cultural characteristics.

Projects reported that gaining access to these communities was a common barrier that needed to be overcome in order to reach this group. In some instances, this was due to geographic remoteness (MM), while in other instances it was difficult to reach insulated communities unless there was a shared cultural link (KEEP); that is, Aboriginal team members recruiting people from within their own communities (KEEP, MM) or using long-standing, trusted relationships (BA, PSR), invariably by working with social service providers. Cultural commonality allowed trust to be formed prior to project benefits being explained.

Energy provision can be an unfamiliar area or topic for this group, therefore the process of explaining the benefits and gaining commitment to participate took a little more time for this cohort compared with others. Teams reported the importance of meeting participants at their 'point of need', which may have involved helping the householder to solve various social problems (health, housing, unpaid bills) prior to being able to gain their commitment to participate in the energy efficiency program.

The onerous compliance elements of formally gaining commitment from individual participants was quite daunting for this group. Needing participants to sign a wad of paperwork, such as privacy statements, ethics clearances and gaining access to energy consumption data, was complex and confusing. Some participants wanted to be very clear about what they were signing up for – which was partly due to their historic negative experiences of dealing with people in positions of authority, be it government services, interactions with energy providers or leaders within the CALD group. Some projects reported that this experience also fuelled participants' suspicions about the incentives to participate and other support services offered through the project. This meant that they questioned the 'benefits' they were to receive, which often required more intense time and effort by projects to alleviate their concerns.

The most common method for gaining access in these communities was snowballing (a household referred by another household or community organisation), followed by holding community information sessions that were delivered in a method that was sensitive to, and relevant for, each type of community (e.g., open air, on the home's veranda, town hall meetings, community events) and drawing upon local community organisations. LIEEP reports reveal that these were considered 'trusted' sources, which was an extremely important factor when trying to reach people who are experiencing vulnerability and, in some cases, ongoing disadvantage. It was no surprise that more traditional, broad-based recruitment methods such as print media and advertising were used infrequently. However, the lead-time required to mobilise support teams, build trust and momentum in communities and the resource intensity involved in the recruitment process was higher than anticipated.

Using community leaders for recruitment purposes can be challenging. For example, one project found that since most community leaders were male, and energy efficiency in the home is perceived as 'women's business', there was a disconnect between the audience and who they were targeting (BA). As a result, households were often signed up for a home visit by the husband on behalf of the wife even when she did not commit to receiving the service. Additionally, many community leaders were working fulltime in other roles and already managing many pressing issues for their community, with energy efficiency not high on their priority (BA).

14.2 'Energy Without Effort' Segment

This segment is largely comprised of young adults, young families, apprentices or tenants. Within this segment, the definition of who could participate in projects was challenging and, in turn, created complexity during the recruitment process. Projects that could demonstrate a 'trusted' relationship with the different target groups was also an important consideration, but less so than the other segments in terms of an access barrier. Another interesting observation was that several projects reported using alternative recruitment methods and channels than those originally intended. This required projects to find alternate sources of 'trusted' referral for their target group and adopt multiple recruitment methods.

LIEEP projects that targeted participants within this segment had to develop specific criteria or conditions for participation. These criteria were developed during the grant application process to articulate the intended target market, or with the intent of being specific to ensure project benefits were directed at those low-income households most in need of support. Projects found that being overly descriptive at this early stage added unintended barriers and complexity to recruitment processes later when projects were operationalised.

There were also instances where consortia members who had pre-existing relationships or links to large groups of a specific audience were not able to materialise the expected number of participants as they had first proposed. This may have been caused by a number of issues outside of their control such as: changes to funding to core operations, the criteria for participation being too specific and project proponents not fully understanding who can and cannot participate, or not understanding the effort required to sign-up participants to meet compliance obligations. This meant that projects needed to seek alternate sources of referral and lead generation, meaning additional time was required to reach recruitment targets. It also had implications in that additional resources, including people, materials and funds, needed to be diverted to the recruitment process, and thus away from the delivery of the core energy efficiency service. Therefore, targeting strategies to identify potential participants was a key issue for success.

Narrowly defined segments raise the risk of extreme recruitment problems, especially when changes in the macro environment occur. For instance, a national decline in apprenticeships and the end of a mining construction boom resulted in the consortium seeing a dramatic drop in their direct relationships with apprentices, and required outside relationships to be used for recruitment (PP).

Similar to the previous segment, a number of reports identified that an overly complex and multiple step sign-up process was found to be a barrier to recruitment of this segment. Too much paper work, the need to share private information and the invasiveness of some data collection methods were reported as a barrier to engagement. For instance, young adults were not necessarily the bill payers (PP) and so had to have the person who paid the energy bill in their household provide their NMI, complete the Essential Energy consent form, and the government privacy consent form for release of their energy consumption data to the project. This identified another issue: the LIEEP 'household' compared with the LIEEP 'participant' invariably differs. All of household engagement will be more resource-intensive, and thus costly, than individual engagement.

14.3 'Stressed About Energy' Segment

This segment largely includes mature-aged consumers who revealed, during the LIEEP project, that they have a willingness to tolerate high thermal discomfort, are price-sensitive, habitual in their behaviours and have low self-efficacy and competency in relation to managing their energy efficiency. Projects reported that Community Service Providers played a key role in identifying and recruiting participants. Furthermore, word-of-mouth referral or snowballing was also a common method. Some projects delivered community meetings and workshops as a way to create awareness and build trust

with the target group. However, poor attendance at these events seemed to be a challenge and indicate that more personalised methods might work more effectively. A number of broad-based marketing tactics were reported, including printed flyers, posters and letter box drops with varying levels of success (SOH, PD).

Projects targeting this segment reported that barriers to participation included general apathy towards energy efficiency (despite being stressed about their bills), suspicion around why the government was running the program, and fear and concerns that participation would result in cutting pensions or benefits. Interestingly, many in this segment viewed replacing a 'working' appliance for a new energy efficient one as a 'waste' rather than as an incentive to participate or lower their bills. This segment demonstrated a conservative approach to committing to participation, which in part was shaped from their previous negative experiences with energy providers and the fear of being 'taken advantage of'. The result was that for some projects, additional resources were required to meet with participants to explain the benefits of the program and how carefully delineating the process worked to overcome these barriers.

14.4 Key Insights for Targeted Recruitment

This section summarises the key factors that led to effective recruitment from a project management (consortia) perspective. These are drawn from the project reports and the analysis in this section.

The ability to adapt

LIEEP projects demonstrated the ability to adapt to, and overcome, barriers to participation to ensure they met their recruitment objectives. The ability to learn quickly from unsuccessful recruitment methods, or to find new sources of referral when the primary plan did not work out, was an important ingredient for success.

Balancing delivery of core service with recruitment efforts

Projects reported that the process of recruiting participants took significantly more time in the field than expected, causing delays to achieving recruitment obligations, requiring additional resources, or for resources to be diverted away from core program activity in order to deliver social assistance. Delays in meeting recruitment obligations caused concerns for the consortia around delays in project milestone payments or fears of not being paid.

Appropriate resourcing

The intent of rigorous compliance requirements centres on protecting research participants. However, the process of capturing participant consent created unintended barriers to their participation. Compliance requirements included consent to participate, ethical clearances, consent to share energy consumption data and consent to share personal information with consortium partners, with each form requiring a signature from participants. A simplification of this process is warranted, which maintains the rights and protection of the participant without doing so in an onerous fashion.

Taking into account ethical considerations

Recruitment of control and treatment groups added complexity and difficulty to some projects, and provided further ethical challenges. When delivering a social program the impact of randomly excluding participants can have unintended consequences including: alienating vulnerable participants, damaging the reputation of social service providers within tight-knit communities, other community member

participants hearing that their friends/neighbours received ‘more’ than they did risked damaging the trust between that participant and the project service delivery people.

15. Stage Two: Engagement Tactics

Engagement of the audience is the process of gaining the emotional buy-in of participants so they are willing to invest the time and effort necessary to participate. This could involve changing their behaviours where they already have energy knowledge, investing cognitive effort in building energy knowledge (where it is not already present) and then engaging in behaviour changes, and/or having minor or major retrofits installed in the home and learning how to use them. In the context of LIEEP projects, engagement tactics were normally used directly after recruitment and continued to be used throughout the project. However, the frequency and tactics deployed for engagement varied between projects. For example, projects delivered engagement activities on a one-off basis, for a discrete period of time or on a continuous basis. They also occurred at an individual, household and/or community level.

Having a well-defined and specific audience to work with had a very positive benefit for the LIEEP projects in terms of executing engagement tactics. When compared with traditional, large-scale energy efficiency programs, messaging and tactics are typically targeted at a much broader audience, making it more difficult to deliver tailored and more customer-centric engagement. In undertaking engagement activities, it was critical to understand the drivers, barriers and limitations for each segment. A key recurring theme emerging across reports was that a one-size-fits-all approach does not work because key motivations were different for each segment. This was echoed in the core insights provided earlier in this report.

The timing of engagement activity is also an important consideration in order to achieve better buy-in from participants. For example, the best timing may be when the person/family first arrives in Australia (CALD), when they move to a new house (young people/young families), or when their care changes (elderly). Projects also needed to work in harmony with the target segment's other life priorities (bills, employment, health and housing) to capture participant attention and their commitment to take action. This is not unique to energy efficiency as it remains a common challenge for many social improvement programs.

Engagement of low-income households centred on building trust with the participant. Trust cannot be assumed as the starting place, as many reports communicated that participants began with some level of mistrust in 'government' programs or intentions (e.g., KEEP). Rather, trust must be earned with each individual participant or community. Having a deep understanding of the target group and how they may frame or interpret information and program activities is a key ingredient for success. Community service providers were well placed to provide this trust-link for several projects. Utilising these existing networks, as discussed above, is important to recruitment activities, and equally important in the engagement process to ensure the design of information, tools and project activities are fit for purpose and culturally appropriate.

A lack of deep knowledge of the target market can lead to missteps that break down trust or may result in unintended consequences. For example, by assuming a group of people are homogenous in their attitudes or beliefs we may alienate some while providing great service to others. As projects were rolled-out into the field, several reports referred to building feedback loops into service delivery to enable them to refine and improve delivery. This was usually executed through the development of a two-way conversation with the target market. This was facilitated in a variety of methods, including very structured ways, such as running a pilot prior to larger-scale roll out, developing champions or using a community engagement activity. More informal ways, such as conducting community meetings or using peer-to-peer conversations in both physical and electronic formats were also used.

Another key aspect of engagement is ensuring that household decision-makers are targeted, engaged and supported to enable and influence change on a broader scale. Individual influence may be more difficult in some households or community structures than others. For example, in the 'New to Energy'

segment, larger, multi-family household structures are common, compared with the 'Stressed About Energy' segment, which includes older Australians, where households were generally smaller in number. Therefore, the influence of an individual will vary depending on the household structure, where more support may be required for decision-makers in larger-sized families or households.

Subsequently, this may have a greater impact on improving energy efficiency outcomes for the whole home. Overall, a summary of engagement tactics by segment, yielding successful, unsuccessful and mixed results is provided in Table 17.

Table 17 Engagement Tactics by Segment

	New to Energy	Energy Without Effort	Stressed About Energy
Successful	Advocate on their behalf with an energy company and providing community education sessions (KEEP). Meet them at crisis point (meet their point of need), not a project point (value pay off earlier) (multiple projects). Work with organisations and people with existing trusted relationships to ensure cultural fit (multiple projects). Provide incentives that participants want, not what project leaders assume they need (consumer-oriented focus) (KEEP). Respectful, non-invasive data collection processes and tools focused on maintaining trust and engagement (KEEP). Empowerment of groups: Ensure that genuine community engagement is at the core of resource planning and decision making from the outset (MM).	Multiple touchpoints including offline and online (RYJ). Digital – pick your time of engagement (RYJ). Training programs limited to 2 to 3 hours. To capture the diverse learning styles of participants, utilise written, visual (PowerPoint) and auditory (videos) materials in trainings (FPF). Energy assessments should be a two-way approach (SCT). Hybrid communication approach. Balancing digital with human-enabled interaction (RYJ). Incentives that encourage participation across a range of cohorts (i.e., from landlords to tenants) (GBS).	Build trust but usually on non-project goals. Invest in relationships. Allow adequate time to connect with participants and build relationship (GHW). Ensure eligibility criteria and that levels of physical and cognitive capacity are being met (ES). Partner with agencies familiar with the target market to build engagement and trust. Ensure communication is tailored to the needs of the audience (GHW). Ensure collaborative partnerships between program facilitators, the target community, and service providers with ties to the target community, are fostered for optimal recruitment to energy efficiency programs (GHW). In-home information sessions are preferable (PD). Use various incentive schemes (HEEUP).
Mixed Results	Home visits are varied in their effectiveness. For example, some noted the home visits were helpful and informative, others felt uncomfortable about having someone in their home (KEEP). Use of incentives saw varied results in terms of engagement. For example, landlords can face significant costs initially, while households may not face this issue (KEEP). For some, incentives have negative associations (MM) – community over individual incentives were preferred.	Energy savings workshops yielded varied results. They were resource-intensive and some families were displeased with the timing and location of the workshops. Where possible, consider two or more short workshops focused on energy behaviours and activities (FPF). Once-off workshops do not enable rapport (FPF). Home assessments report a varied number of difficulties, but also worked in some situations (FPF).	Energy efficiency workshops results are varied (PD). Use of technology. Technology should be used for logistics and process related tasks but not for conveying important energy efficiency information to participants (HEEUP). Partner with not-for-profits (HEEUP).

	New to Energy	Energy Without Effort	Stressed About Energy
Unsuccessful	Saying 'we are from the government' can be a hindrance (multiple projects). Take care in using parochial terms such as intervention, monitor, government (multiple projects). Avoid data collection requirements that are intrusive to someone's home or privacy (KEEP).	Engage individuals (not households) who have little influence over their household (PP). Incentives for both tenants and landlords did not work to achieve adoption of EE products (RYJ, BTH) Too much paper work requiring private details. Distrust is present with personal data being shared with the government (multiple projects).	Mature-aged participants will not necessarily be patient if paper work is onerous (multiple projects). Public information sessions and public workshops seem to work well (PD). Advertising campaigns including Facebook promotions (PD).

Note: For the abbreviations contained in the table please refer to the 'Abbreviations for LIEEP Programs'.

15.1 'New to Energy' Segment

When reaching this segment, projects needed to meet participants at their point of need, not a project point of need; that is, project objectives and drivers needed to be put in second place, in order to build trust and to engage the audience. Several qualitative data points pointed to the value payoff of this approach, with strong trust and support captured in the communities leading to word-of-mouth referrals, positive shifts in attitude and positive engagement outcomes. For example, advocating on behalf of participants with an energy company (to join hardship programs or resolve issues such as pending disconnection) was a common example of engagement activity that produced improvements in health and wellbeing, without necessarily reducing energy consumption. When projects provided this support, participant engagement for the energy efficiency project was possible, and increased.

Cultural understanding was a key element to successful project delivery, including working with organisations and people with existing trusted relationships, cultural fit or commonality. This fed through into planning and execution of engagement activity that took careful consideration of participants' needs. Groups within this segment needed Project Representatives to provide a full explanation of the motivators for the initiative, and to explain the benefits to the community through their culturally shared lens or view on life. Materials and engagement messaging downplayed government involvement and took care in avoiding terms such as 'intervention', 'monitoring' and 'government' to reduce suspicion and fear. Engagement materials needed to be published in the target market's language, use culturally relevant symbols or art, and communicated in a way that is easily understood to assist in building knowledge. Projects targeting this segment tended to avoid using overly technical information in all communications material.

15.2 'Energy Without Effort' Segment

Personalising energy use in targeted and specific ways to match the characteristics of this segment was a critical element for successful engagement. The group needed to understand how energy efficiency works in their own lives. For example, how energy was viewed by an individual apprentice (small cost due to shared living arrangements or living with parents, so energy costs may not be on their radar at all) was different from a young family (maintaining a family household requires more energy in terms of heating and washing, so rising energy costs are a more pressing issue).

This segment has access to, and a strong appetite for, digital engagement tactics. This enables engagement activity to be undertaken in a non-invasive manner, and at a time and via a channel that is convenient for participants. Digital engagement enabled cost-effective, multiple touchpoints to be implemented to support behaviour and attitudinal changes. Trusted groups were also formed online,

that demonstrated similar characteristics to traditional community and support groups. These groups fostered peer-to-peer sharing and support for participants, who shared their energy improvement journey and also generated additional referrals to assist recruitment activity.

Whilst there was strong demonstrated appetite for digital engagement, face-to-face engagement activity was also successful with this segment. HEVs worked well in some projects and allowed more flexibility to deliver both energy efficiency upgrades as well as supporting engagement, education and behaviour change activity. However, there were also challenges to this approach, including: managing the logistics involved in recruiting the participant, coordinating appointments, mobilising teams to facilitate the engagement, participant sign-up and post-service support, data collection and communications.

This segment included busy households with multiple people residing within the home. Engagement activity thus needs to be designed so that it 'fits in' with this type of lifestyle, if it is to be effective. Engagement methods such as workshops may not be an appropriate type of engagement method, for example, because it is difficult for busy families to attend or do not provide sufficient time to build rapport and trust with individuals.

15.3 'Stressed About Energy' Segment

This segment has an existing level of understanding or knowledge of energy usage within the home. However, they need support to implement change or dispel energy myths or misconceptions. Projects reported that engagement activities that built upon existing knowledge enabled improvements in households' stress and attitudes towards energy.

Face-to-face methods were the preferred method of engagement for this segment. Community service providers were key in providing the gateway to engage this group. Like the 'New to Energy' segment, this segment required up-front investment from the project people delivering the energy efficiency project, which may not have been in direct alignment with the project goals. For example, a one-on-one activity such as sharing a cup of tea and a chat prior to undertaking an energy efficiency audit or providing tips was important to building trusted relationships. These touchpoints are often undervalued and therefore not costed into projects. Communication and engagement methods need to be fit-for-purpose (or person). For example, digital engagement may not be appropriate for specific segments like this, whereas written materials, such as flyers, were reported to be effective. Another important consideration was that mature-aged participants were not necessarily patient if paperwork was onerous or complex.

Energy efficiency workshops and public information session results were varied. Reports indicated positioning staff as a subject matter expert in a town hall context was a way of building trust and engagement with this group. However, reported attendance and energy efficiency results from the activity were not strong or consistent and often not measured, and so not reported.

Community service workers who delivered existing social services to this group were often under-resourced, therefore bolting on energy efficiency services or advice was not an effective engagement solution. Rather, additional capacity needs to be built into engagement activities or service solutions. Energy efficiency needs to be the primary reason for the engagement to ensure an effective outcome (ES).

15.4 Key Recommendations

This section summarises the key factors that led to effective engagement from a project management (consortia) perspective. These are drawn from the project reports and the analysis in this section.

Build trust – it should not be assumed

The importance of establishing and maintaining trust is a common theme throughout projects. The starting point for this must be to undertake engagement activity that builds trust. It cannot be assumed that trust is given just because the project has good intentions.

Put the customer first

The project's priorities are not the priorities of the participants. Engagement activity needs to be designed to be sensitive to the target group's drivers, barriers and limitations to be effective. A one-size-fits-all approach does not work. Ensuring communications material is relevant to the segment is paramount.

Resources to be planned not 'bolted on'

Additional capacity needs to be built into engagement activities or service solutions. Energy efficiency needs to be the primary reason for the engagement to ensure an effective outcome.

Time engagement around important life events

Timing of engagement activity is an important consideration to achieve better buy-in from participants, this may be when they first arrive in Australia (CALD), when they move to a new house (young people) or when their care needs change (elderly).

16. Stage Three: Awareness and Education

For many participants, overall awareness of energy efficiency was low, and participants displayed little knowledge about how to be energy efficient in the home. For these participants, the educational component of LIEEP played a crucial role in setting the scene for behaviour change around household energy use. LIEEP projects delivered awareness and educational activities in a way that was tailored to the needs of each segment. These elements were crucial for the effective implementation of behaviour change and retrofit initiatives. Without adequate education, participant confidence, comprehension levels and ability to utilise energy efficient technology would serve as significant barriers to achieving reductions in energy usage. Each project's targeted cohort was at a particular stage of the knowledge acquisition process and understanding this baseline allowed projects to tailor their educational tactics to that level. Overall, a summary of tactics for building awareness and education for each segment is provided in Table 18, indicating the aspects that were successful, unsuccessful or that produced mixed results.

Table 18 Awareness and Education Tactics by Segment

	New to Energy	Energy Without Effort	Stressed About Energy
Successful	Determine participants' rights and advocating on their behalf (multiple projects). Face-to-face interaction is heavily preferred, and used to provide education about what their bill means (multiple projects). Contextualise information provided to ensure it is culturally appropriate and at the right education level (BA). Key messages focused on benefits of energy efficiency and its adoption as a life skill needed for success (multiple projects). Raise awareness about other helpful programs (government concessions, centre pay, hardship programs, NILS) that can encourage effective use of electricity (multiple projects).	Share/co-create knowledge with participants (multiple projects) Use digital channels and direct communication via telephone (PP). Timely responses to questions using digital channels (multiple projects). Key messages focused on convenience and fun (multiple projects). Grow, and take care of, the digital community by seeding content, addressing issues quickly and respectfully, and letting participants talk to each other (multiple projects).	Education about bills helps to build support (multiple projects). Face-to-face contact is heavily preferred (multiple projects). Ability to share information with family (multiple projects). Address questions and concerns and explaining the program to participants in simple terms (multiple projects). Key messages focused on taking control and low-cost solutions (multiple projects). Reduce the amount of paperwork and collate where possible to avoid appearing overly burdensome (multiple projects).
Mixed Results	Raising awareness about program expectancies requires a balance between standardisation and contextualisation (multiple projects). Remoteness and low literacy can mean standard energy efficiency practices are not in place (multiple projects).	Overcome the 'tenant mindset' (multiple projects). Digital solutions that need internet connections and data plans can mean reduced accessibility to some people (multiple projects). Concerns about eligibility meant people were unsure whether they could participate (RYJ, PP).	Although word of mouth is effective, it takes time to become established (multiple projects). Seniors receive a large number of telemarketing calls and are therefore wary of offers that seem 'too good to be true' (multiple projects).
Unsuccessful	Mistakenly assume the baseline understanding of Australian society and foundation-level understanding of contracts and household appliances is equally present among participants (BA). Assume that extremely remote participants are usually not engaged (multiple projects).	Unbalanced resource allocation between recruitment of new participants and engagement of current participants (PP). Attempt to facilitate energy efficient actions between landlords and tenants appears to be a bridge too far (multiple projects). Lack of feedback reduced interest and increased disengagement (multiple projects).	Lack of time taken to explain the program to potential participants (multiple projects). Lack of time invested in 'getting to know you' to make participants feel comfortable and engaged (multiple projects). Underestimate time to explain the program and assuming the same amount of time would apply to everyone (multiple projects).

	Cultural norms may mean spending the most time initiating awareness with elders first (multiple projects).		

Note: For the abbreviations contained in the table please refer to the 'Abbreviations for LIEEP Programs'.

Each segment benefited most when information and education was provided in a culturally appropriate manner and was low in complexity. All information channels needed to be easily accessible and interpretable. Visual education materials were successful in engaging a diverse range of cohorts, especially when the amount of text used compared with pictures and diagrams was low, and when overly technical information was avoided.

Existing energy knowledge varied greatly between the segments. Education levels regarding bills, tariffs and appliance efficiency ratings was universally low; however, participant willingness to improve understanding was universally high.

16.1 'New to Energy' Segment

This segment generally experiences low awareness and knowledge levels when it comes to household energy efficiency. This partly stems from their limited exposure to energy as a concept (this could be due to their remoteness or being new to Australia). A key success factor for this segment was to therefore provide basic education on energy usage, and to contextualise this into the participants' everyday lives within a cultural context. Education activity focused on the energy basics, such as understanding energy bills and knowing what drives energy usage in the home. Improvements in basic energy knowledge often produced the co-benefit of improving participants' self-esteem which, in turn, improved their general health and wellbeing. The 'New to Energy' group had limited exposure to energy efficiency, whereas baseline energy knowledge in the other two segments was higher. In terms of education methods reported, it was common to put knowledge in context of each segment's needs. For example, English was a second language for some participants in the 'New to Energy' segment, therefore information that was translated into their native language to assist in overcoming information failure barriers worked best.

Education activity for this group also included advocacy for their rights when engaging with the energy sector. Advocacy included providing assistance to participants to help them enter electricity hardship programs or resolving outstanding bills or issues with their energy and other utility providers, and in remote locations pre-paid meter disconnections. Education activities for this segment were normally delivered face-to-face and in a way that was sensitive to the segment's needs and culture. Education delivered in local or native language, including information materials developed, was usually more successful, which further increased if it was also delivered by trained people who shared the same or common ethnicity. Once obtained, participants seemed keen to share their knowledge within their cultural network.

16.2 'Energy Without Effort' Segment

People in this segment typically demonstrate good baseline knowledge levels. Attitude levels towards energy efficiency were positive and reflected that people were generally open to change and demonstrated strong energy efficiency motives and values. This allowed the programs targeting this segment to focus educational tactics on convenience and fun rather than communicating the benefits of energy efficiency as this segment were already on board. Education delivered through convenient, digital channels, including social media communities and gamification, were successful because they allowed participants to feel empowered by sharing their actions with their community, co-creating content in social media channels (e.g., sharing a picture of an energy efficiency activity undertaken in their household or their energy bill).

People in this segment found it difficult to establish communication with landlords to request assistance to improve the energy performance of their rental homes. The split incentive barrier here seemed to be a bridge too far, prompting some tenants to turn away from trying to convince their landlord of the worth of receiving a 'free upgrade', even though they demonstrate strong awareness and knowledge around the benefits of energy efficiency upgrades. Other concerns, such as being behind in rent or not wanting to have their rent increased after an upgrade was installed, may have been stronger barriers than lack of knowledge. The 'Energy Without Effort' segment used digital means to share information with peers both inside and outside of the program (known as the network effect) via social media channels. Methods that used gamification to make messages more fun and engaging for the audience and their households increased engagement.

16.3 'Stressed About Energy' Segment

The 'Stressed About Energy' segment demonstrated high levels of basic energy knowledge. However, there were elements of misinformation or myths (e.g., the perception of expensive retrofits (e.g., PD), cost benefit of replacing old appliances (e.g., GHW)) that needed to be dispelled through education processes. Traditional education and information methods were effective, which were commonly provided through HEVs (e.g., ES) and other face-to-face delivery methods (e.g., PD).

The education approaches used for this segment revolved heavily around HEVs. An important component of this was that the delivery method was provided by someone who was perceived by the participant as a 'subject matter expert' who could easily and thoroughly provide information and discuss misconceptions. Addressing questions and concerns and explaining the program to participants in simple terms was considered particularly important for this segment, helping to quickly put them at ease. One of the common barriers incurred was underestimating the time it took to explain the program and assuming the same amount of time would be needed by everyone.

Interestingly, older residents who had high levels of knowledge about how to manage their energy use in the home were also interested in learning more, so they could then pass this on to their children and grand-children, which would then help support their family to adopt sensible and economic practices. This provides them with extra motivation to learn more so they could share their new knowledge (and wisdom) with others.

16.4 Key Recommendations

This section summarises the key factors that led to effective education from a project management (consortia) perspective.

Keep it short and simple

Making sure that the information, education and initiative itself are provided in the simplest and easiest to understand format is the key to success in supporting the targeted households.

Contextualise education for the audience

Education should be contextualised for the audience; delivering it in their own language, being sensitive to their cultural needs and delivering it in ways that are engaging helped to create value for the participant. This helped motivate households to actually wanting to adopt new energy efficiency behaviours.

Bust the myths to get the facts right

Myths, misconceptions and misinformation are challenging barriers. Awareness and education are important steps in putting people back on track and building energy literacy.

Paint a picture

Visual education materials were successful in engaging a diverse range of cohorts. Limiting the amount of text and overly technical information helped to improve engagement.

Key message tailored to baseline level of knowledge

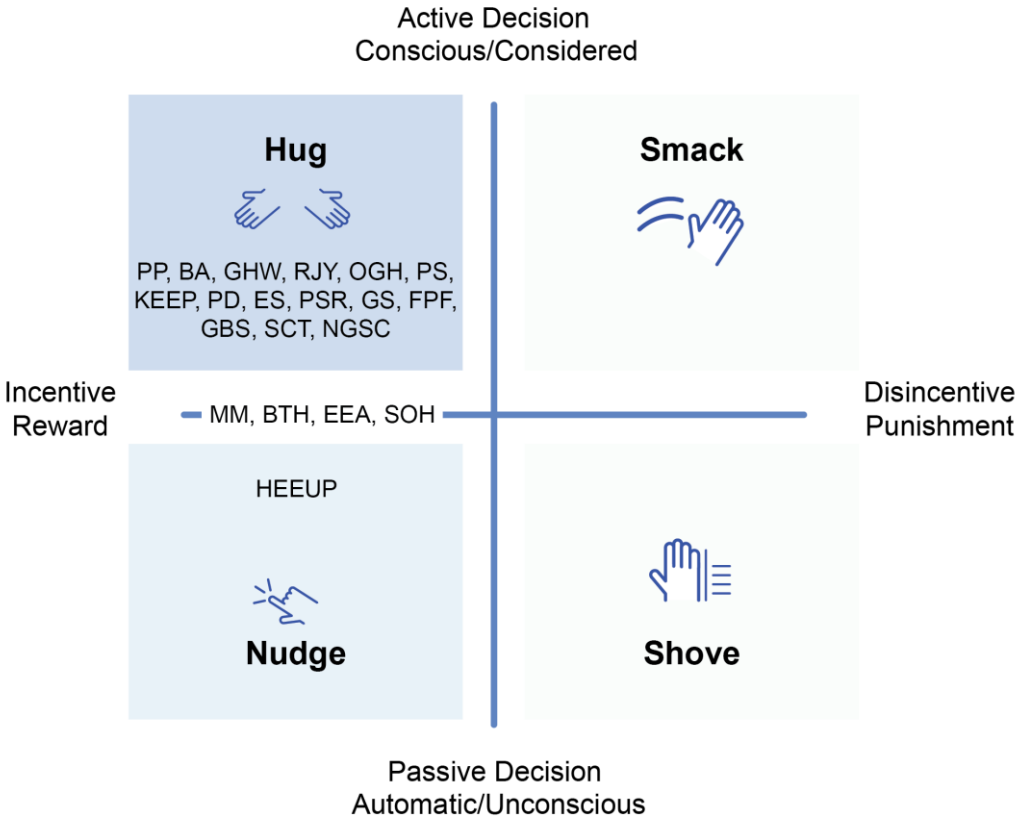
Understanding the prior level of knowledge and attitudes towards energy efficiency allowed programs to tailor the key message for the stage of knowledge acquisition. This kept the message relevant to the needs of the segment and focused on the value participants were seeking.

17. Stage Four: Behaviour Change Approach

Behaviour change requires long-term, integrated approaches to be effective. Improvements in energy behaviours adopted by low-income households is a key step to producing energy savings as well as improvements in thermal comfort and health. Encouraging participants to take action on newly gained, or existing, energy knowledge was ultimately intended to lead to reductions in energy use and bills. To determine the approach adopted by LIEEP projects, each was classified into a quadrant of the social change matrix (adapted from French, 2011). In this matrix there are two dimensions: decision-making (the level of effort exerted and the level of consciousness) and reinforcement (reward or punishment). The combination of these two dimensions results in four approaches, coined: *nudge*, *hug*, *smack* or *shove* (French, 2011). A *hug* approach typically involves stimulating active decision-making using incentives and rewards. A *nudge* also uses incentives and rewards, but involves orchestrating choice such that only low levels of decision-making are required, and minimal alterations of the environment or structural landscape around the consumer are needed. Negative approaches are the *smack* (which promotes active decision-making to avoid punishment) and *shove* (encourages passive decision-making and restricts/limits consumer options and access).

None of the LIEEP projects used negative tactics such as fines or withholding services. Hence, all LIEEP projects adopted positive approaches to encourage household energy efficiency changes. Notably, almost all projects adopted some type of *hug* approach (PP, BA, GHW, RJY, OGH, PS, KEEP, PD, ES, PSR, GS, FPF, GBS, SCT, NGSC), four projects used aspects of both *hug* and *nudge* (MM, BTH, EEA, SOH) and only one project (HEEUP) solely used the *nudge* approach (see Figure 29).

Figure 29 Four Approaches to Social Change



Behaviour change was a well measured concept, with 14 of 20 LIEEP projects reporting measures of energy efficiency behaviours pre and post the initiative trialled. There were substantial improvements across the board, with the most successful being those projects that delivered HEVs with retrofits or IHDs. By learning more about energy use and efficiency, it is evident that households adopted new behaviours with the aim of reducing their bill via a reduction in energy use. However, many households adjusted their behaviour so that they could use energy more effectively in the home, for example obtain an improved level of comfort. This could partially explain the large variance in outcomes of electricity consumption and behavioural changes.

A common theme across the segments for successful behaviour change was the use of theoretical frameworks to guide the development of the behaviour change program and the evaluation. The explicit inclusion of a theoretical framework to reflect the scientific evidence-base and formative research on consumer insights is noted as a critical success factor for social marketing programs (Carins & Rundle-Thiele, 2014). For example, the use of behavioural learning theory and experiential learning frameworks was used to design the digital engagement program for RYJ, while EE3A utilised a social ecological model (Krug et al., 2002) approach to social marketing, acknowledging that tackling complex social issues like energy efficiency requires insight and action at the micro/meso/macro level (Bronfenbrenner, 2005). While KEEP drew upon a community-based social marketing framework developed by McKenzie-Mohr (2000), GBS used the theoretical frameworks of Stephenson et al. (2010) to design the evaluation. Overall, a summary of behaviour change approaches by segment is provided in Table 19, indicating factors that lead to successful, unsuccessful or mixed results in terms of participants adopting more energy efficiency behaviours.

Table 19 Behaviour Change Approach by Segment

	New to Energy	Energy Without Effort	Stressed About Energy
Successful	Workshops with small groups of neighbours or friends who spoke the same language (BA). Home visits were an effective mechanism and were more flexible and targeted than workshops (multiple projects). Timing is very important with activities more effective when conducted just after receiving an electricity bill and when participants are in stable accommodation (multiple projects). Multiple opportunities and different formats allow interaction at key points in the CALD settlement journey (multiple projects). Formative research to identify consumer insights that inform the best behavioural change that the targeted segment can and will adopt (multiple projects).	Choose specific behaviours for participants to change gives more focus to the project/initiative trialled (RYJ). Digital engagement with gamified elements prove very effective (RYJ). Normalise the practice of thinking and talking about ways to conserve energy, make it more 'acceptable' to talk about (PP). Social media communities meant participants snowballed ideas and interacted with like-mined people whenever they wanted (multiple projects). Formative research to identify theoretical approach to behaviour change and specific behaviours to changes (RYJ).	Home-based initiatives are preferable (GHW). Positive reinforcement and empowerment worked well (GS). Graduated levels of support and information should be provided. There is a fine line between too little support and too much (HEEUP). Feedback during the program encourages the adoption of new behaviours (GS). Key focus should be on improving wellbeing not necessarily focusing solely on energy efficiency (GS). Sharing person-centred insights (participant-centred approach) (EEITA). Formative research used to garner insights about best behaviours to target (multiple projects)

	New to Energy	Energy Without Effort	Stressed About Energy
Mixed Results	Larger workshops can make it harder to address multiple cultural sensitivities and levels of understanding become extremely varied (multiple projects). While home visits seem to be a very effective behaviour change approach they did not translate into large energy reductions (multiple projects). Home visits meant participants could identify problems that were sometimes beyond the scope of the project but that needed to be addressed before the energy efficiency approach would be adopted (multiple projects).	Social media elements meant negative comments could appear that needed to be diplomatically addressed in a timely manner. However, participants would sometimes address it amongst themselves without moderator assistance which interfered with the adoption of new behaviours (multiple projects).	Energy efficiency workshops targeted generally to larger audiences are not preferable (PD).
Unsuccessful	Large workshops involving multiple interpreters causes communication issues (BA). A barrier to physically accessing workshops was the cost of the commute using public transport (BA, KEEP).	Gamification on its own is not effective at promoting behaviour change (RYJ, PSR). Not including a social marketing partner in the consortium was viewed as negatively affecting some projects (PP). Online elements for regional and poorly connected participants can be a problem as access is reduced or even eliminated (multiple projects).	Behavioural changes by participants were avoided if they reduced household comfort levels, or required capital investment (multiple projects). Focusing directly on electricity use (GS). One-size-fits-all approaches (EE3A).

Note: For the abbreviations contained in the table please refer to the 'Abbreviations for LIEEP Programs'.

17.1 'New to Energy' Segment

Although different projects are grouped together as targeting this segment, it is important that a tailored approach to behaviour change is made for each cultural group within the segment. For example, in remote Indigenous communities, using approaches that are successful for mainstream and/or urban areas are less likely to succeed. Behaviour change approaches need to be focused on building social norms and address the barriers to improved energy behaviours in ways that are culturally sensitive. It is also important to recognise that home energy use is an enabler for economic and social wellbeing, health, safety, comfort and entertainment. Hence, the focus on behaviour change and education should be on improving energy productivity and not just energy reduction.

Analysis reveals that behaviour change in the CALD cohort was the highest (94%). This could be due to many CALD participants originating from developing and/or war-torn countries, where the use of electricity is limited. Potentially, CALD participants had very little in the way of experience with the purchase or use of electricity, and therefore had not previously adopted energy efficiency behaviours.

17.2 'Energy Without Effort' Segment

A perceived lack of control of household energy use was reported as a barrier in a number of projects targeting this segment. For example, participants typically felt like they were already doing everything they could to reduce energy consumption, sometimes to the point of sacrificing personal comfort levels. Participants seemed to have adopted an attitude whereby they simply accepted high electricity bills as a way of life. Normalising the practise of thinking and talking about ways to conserve energy, making it more 'acceptable' to talk about, enabled participants to overcome these barriers (e.g., PP).

Having a deep understanding of the target group and what relevant behaviour changes to apply to that audience enabled projects to build solutions that influenced attitudes and supported new behaviours being formed. For example, RYJ targeted just three specific energy behaviours during the six-week program, reinforcing these through a number of touchpoints. This suggests that approaches aiming to change all energy efficiency behaviours in the home will be less effective than those aiming to change a few specific behaviours (e.g., focusing solely on heating/cooling-related behaviour).

17.3 'Stressed About Energy' Segment

For this segment, home-based engagements were successful when delivering behaviour change activities (e.g., GHW). The face-to-face interaction yielded positive reinforcement and empowerment and helped re-shape pre-existing energy behaviours (e.g., GS). Sharing person-centred insights (participant-centred approach) was also effective in supporting behaviour change, demonstrating that even small changes in energy behaviours can produce positive results (e.g., EE3A). The key focus of behaviour change activity should be on improving wellbeing not necessarily focusing on energy efficiency (e.g., GS).

Applying a one-size-fits-all approach was highlighted as something that did not work (e.g., EE3A). Furthermore, participants tended to avoid behavioural changes that would result in a reduction of household comfort levels, or required financial expenditure (e.g., having to buy a new appliance). Rather, the provision of graduated levels of support and information worked more effectively. There appears to be a fine line between too little support and too much (e.g., HEEUP).

17.4 Key Recommendations

This section summarises the key factors that led to effective behaviour change.

Evidence-based design

The programs that used an evidence-base to design the behaviour change approach appeared to be more effective. The evidence-base created a knowledge bank of known barriers and motivators that were then used to inform the behaviour change approach.

Avoid a 'one-size-fits-all' approach

Each participant cohort required a behaviour change approach that reflected the specific characteristics of the cohort and the nature of the energy efficiency problem. The appropriate approach was one that leveraged the motivators of the cohort and addressed the barriers to energy efficiency. Innovative behaviour change approaches used new theories and evidence to inform the design.

Make the energy conversation socially and culturally normative

Normalising the practise of thinking and talking about ways to conserve energy, making it more 'acceptable' to adopt improved energy behaviours, was particularly successful.

The right skills and resources add rigour to the behaviour change approach

Sourcing the right help early in the design process maximised the chance of building a project that works. Learning from other people's mistakes, and applying an evidence-based approach to design were most effective.

Recognise energy use as an enabler for many household activities

Energy is invisible. Changing energy behaviours requires building a strong enough emotional connection with the audience to support a significant change in their lives – the difficulty of this task should not be underestimated. Hence, linking energy use to many other home aspects, such as comfort, social wellbeing and entertainment, are more likely to succeed.

18. Stage Five: Energy Program Outcomes

Measuring outcomes is the key method of determining whether positive change occurred due to the project and whether the change is statistically significant (not occurring by random chance). The aim of LIEEP was to increase the energy efficiency of low-income households. Energy efficiency was classified loosely as reducing energy consumption and bill size. While an overall reduction in energy is often considered as the best or only measure of success, other factors are also important indicators of success, such as the co-benefit of increasing energy usage to improve thermal comfort, or which produce improved health outcomes. Ultimately, the definition of the 'best measure of success' depends on the group of people under investigation. For example, mature-aged retirees who keep electricity use to a minimum to save money could be putting their health at risk by living in an extremely cold (GBS) or hot home. Adopting a narrow focus of 'energy reduction' could drive imperfect solutions for participants.

Obtaining permission from participants and industry stakeholders to collect and use personal data was often a complex process for many projects to manage. This created an unintended barrier for participants to engage in the programs. Language and literacy barriers also made it difficult to collect meaningful data, but when time and effort was spent obtaining it, it proved to be useful. Electricity consumption (or meter) data were also difficult to obtain from electricity retailers and distributors. Once obtained, the data required considerable cleaning, manipulation and transformation to be used for analysis. These procedures and techniques proved challenging and time-intensive for multiple projects. A number of projects reported an underestimation of budget and allocation of sufficient resources for data collection, management and evaluation activities. These learnings should be carefully considered in future programs by both government and practitioners.

Each LIEEP project reported outcomes (where data were available) to inform industry and policy-makers about which mechanisms were most effective in improving energy efficiency. The definition of a successful project needs to be broadened holistically to embrace co-benefits, such as energy efficiency knowledge, confidence, self-efficacy, attitudes, thermal comfort, stress and energy competency. A summary of energy program outcomes by segment is provided in Table 20, indicating the factors that produced successful, unsuccessful or mixed results.

Table 20 Energy Program Outcomes by Segment

	New to Energy	Energy Without Effort	Stressed About Energy
Successful	Energy efficiency knowledge, and other co-benefits (multiple projects). Gain EE knowledge results in many co-benefits (BA). Empowering people helps them to feel as though they are not struggling as much, which reduces their stress, even though there may be no change to their bill (multiple projects). Control for climate variation when analysing changes in electricity use produces more realistic results (KEEP). Behavioural improvement was very dramatic (PSR). Competency improved positively (KEEP).	Adopt energy efficient behaviours (multiple projects). Varied household outcomes include time saving, increased security, improved relationships, positive health impacts (reduced anxiety and stress) (PP). Energy usage (multiple projects). Behaviour change (multiple projects). Comfort improvements (FPF, PP). Stress reduction was evident (multiple projects).	Small improvements in energy efficiency (multiple projects). Controlling for the confounding effects of climate variation when modelling electricity data changes produces more realistic results (GS). Energy usage improvements (multiple projects). Behaviour adoption (ES, GHW, GS).

	New to Energy	Energy Without Effort	Stressed About Energy
	Self-efficacy improved the most in this segment compared with others (KEEP, PSR, BA).		
Mixed Results	Positive attitude adoption was mixed between projects and, while positive, was still very low (multiple projects). Measuring outcomes through qualitative methods only means quantitative measures of changes can't be determined (NGSH).	Breaking down participants by levels of engagement shows that there are different sub-segments that are more motivated and are achieving more positive results than other sub-segments. Thus, measuring whole-of-segment averages could be masking dramatic differences between sub-segments (multiple projects). Competency improvement was diverse among projects (RYJ, PP). Self-efficacy showed wildly different results (multiple projects).	Misinformation about knowledge (PD, GS). Comfort (did not really change or if it did it, was minor) (SOH, GS, PD).
Unsuccessful	Overall energy use improved was very low and in some case increased (multiple programs). Improvements in comfort were much lower than expected (multiple projects).	Knowledge improvement was poor (RYJ). Attitudinal change was very low (FPF, RYJ).	Electricity use reductions (as most of the time this group should be using more energy to improve their thermal comfort) (multiple projects). Attitudes did not change very much (EE3A, GHW). Self-efficacy was lower than expected (GS, PD). Competency level change was low (EE3A).

Note: For the abbreviations contained in the table please refer to the 'Abbreviations for LIEEP Programs'.

Most LIEEP projects trialled initiatives that helped reduce the average electricity consumption of low-income households by 2–12%. Whilst reducing energy consumption was a primary driver for LIEEP, the concept of improving energy productivity and energy co-benefits broadens this concept to include the often-underestimated improvements in quality of home life, general health and wellbeing or confidence in managing home energy use resulting from adopting new home energy practices. Furthermore, energy inefficient housing stock means a reduction in energy usage may not be realistic (multiple projects). Therefore, projects reporting increases in energy use may have affected broader improvements in other dimensions for the household. Notably, numerous improvements in the co-benefits of knowledge, empowerment, competency, stress reduction and general comfort were found in 15 (of 20) projects. This implies that energy efficiency behavioural changes may be a more substantive indicator of success over energy use reductions. Specifically, improvements in empowerment and competency in energy management were the most frequently measured. Significant qualitative data were available to support a rich picture of the human stories and the positive impact that projects had on the communities and low-income households involved. The issue of improving energy efficiency is often framed in the context of a financial issue. However, the social impact of living in poor housing stock and the negative impacts this has on energy bills and thermal comfort may be much worse than previously understood.

At the time of reporting, LIEEP projects had collected matched pre- and post-initiative data for only 5,108 households in their pre–post electricity consumption analysis, representing only 16% of all LIEEP participants. This demonstrates the importance of allowing sufficient time to collect energy data (especially if having to obtain it from providers) in large projects, and the challenges of working within the highly regulated energy industry. Retailers were invariably reluctant or sluggish in responding to energy data requests, and many households did not keep energy bills on file. This means that the

outcomes of LIEEP are highly under-represented by energy data alone, further attesting to the importance of expanding outcome measures in energy-related projects in future.

18.1 'New to Energy' Segment

LIEEP projects that targeted this segment generally showed low to moderate reductions in energy consumption, ranging in changes from +8% to -10%. Rather, improvements were reported in energy efficiency behaviours, knowledge and attitudes, resulting in improvements in health and social wellbeing. In terms of defining what success looks like for this segment, an *increase* in energy use could actually reflect improved thermal comfort and other quality of home life co-benefits. The common initiatives trialled for this segment were HEVs and community-based workshops that allowed for direct interaction between those delivering the initiative and the household participant.

Programs that helped this segment reported empowering people, helping them to reduce their stress, even though there may be no change to their bill. Self-efficacy improved the most in this segment compared with others, which was a result of improvements in energy knowledge and behaviours.

18.2 'Energy Without Effort' Segment

Energy use reductions ranged from 0–12% for projects targeting the 'Energy Without Effort' segment, perhaps demonstrating the most improvement in energy efficiency through changing energy behaviours. Digital engagement and the use of gamification were interesting mechanisms used to assist participants, whilst HEVs with minor retrofits also produced positive outcomes.

Highlighting that knowledge does not always equate to behaviour change, the RYJ project found that 'most participants already had a high level of knowledge [regarding energy efficiency]' and that "People already "know" what they should be doing but in many cases, need to be reminded or reengaged or motivated to act. Factors of control, motivation, and self-efficacy were evidently more important in building confidence and empowering participants to alter their habits" (Swinton et.al. 2016, p. 157). Similar to other segments, projects targeting this cohort also measured co-benefits, where improvements were most commonly found in knowledge, empowerment and stress reduction.

18.3 'Stressed About Energy' Segment

Similar to the 'New to Energy' segment, success for this group may not be best demonstrated through energy reduction, given this segment's already low energy usage and high tolerance of thermal discomfort. Energy use reduction for this group ranged from -6% to +1%. Rather, success may be more appropriately measured through improvement in competency and self-efficacy, which in turn results in household reductions in stress and improvement in general health. For policy-makers, a key consideration in evaluating the success of future energy efficiency programs targeting older Australians is that small reductions in energy efficiency pale in significance to the cost savings delivered through avoided interactions with the health system caused by poor health due to living in extremely cold (or hot) home conditions.

Australia's aging population means that this will be a growing segment. There is significant opportunity for 'energy efficiency' projects to fully address co-benefits, including improved health and thermal comfort, for this segment and not focus solely on energy reduction. Working in collaboration with existing and trusted health and social welfare providers is a proven way to reach this segment and to also provide additional personalised support that will be needed to change existing energy habits and low self-efficacy through the engagement process. HEVs with minor or major retrofits were the most

effective engagement approach for this segment, resulting in moderate improvements of up to 6% reduction in electricity consumption.

18.4 Key Recommendations

This section summarises the key factors that led to effective energy efficiency outcomes from a project management (consortia) perspective.

Success in energy efficiency is more than a reduction in energy use and bills

LIEEP projects delivered many benefits and robust outcomes for the communities who were engaged. Examining the outcomes from the single dimension of energy reduction conceals other social and policy outcomes that are of equal or greater impact.

The co-benefits of improved energy efficiency create strong outcomes

Having multiple measures of success, including co-benefits, will create a better understanding of the holistic impact of projects and reveal stronger outcomes. Energy efficiency is only one outcome; co-benefits of improved knowledge, confidence, attitudes, stress levels, health and thermal comfort should be considered as outcomes that supersede energy use.

Ensure data collection methodologies are fit-for-purpose

Data collection methodologies need to be well considered, designed appropriately for the audience and resourced with enough of the right type of skills and experience. Sufficient time needs to be provided before a project ‘ends’ to collect follow-up (post-initiative) data.

19. Communications Across Program Delivery

Targeted and personalised communications is a consistent theme in LIEEP projects and underpins the successful delivery of projects across all five stages of the delivery framework outlined above. The methodologies adopted by projects demonstrated commonalities in overcoming attitudinal barriers and pre-conceptions, as well as complex concepts and process issues to help disparate audiences improve their energy knowledge, behaviours and productivity.

Common themes emerged in the analysis during the steps above with regards to communication activities, including that communication needs to be:

- personalised and targeted to meet the audiences' needs
- helpful and supportive, not dictatorial.

A deep understanding of the audience is required to develop effective communications, which will ensure that concepts can be explained in a way that makes sense to the participant and positions the concept of 'energy efficiency' to fit into their lives. In delivering this element, it was important to take the time to first ensure the most appropriate language was used and to then build upon that using the target market's feedback and consultation. This supports the concept of facilitating two-way conversations with the target market to improve their buy-in and experienced outcomes. It had the added advantage of encouraging participants to provide referrals to their peers and to advocate for holistic energy efficiency activity within their community.

LIEEP projects were delivered through a multi-disciplinary consortium model, where different skills and experiences were brought together for the benefit of the community. In the context of communications, this approach shifted communications from using the traditional, and sometimes sterile, styles (using hard facts) to a more authentic, humanised style (typically adopted by social service providers), each of which were tailored to meet the needs of different audiences. Delivering authentic communication that is able to reach this audience requires an honest and respectful approach throughout the engagement with the audience. Overly complex language and concepts can easily lead to confusion, a sense of inadequacy and result in suspicion of the project and the government. The tone in communications needs to reflect the intent in delivery. For example, providing a 'helping hand' rather than dictating how people should use energy in their lives. Additionally, communication needs to be direct and clear, with the least amount of technical jargon, in order to yield a favourable response.

Communications that were goal-focused, and clearly explained the benefits of the action to be adopted were more effective, for example 'if I do this, I save that'. The purpose of this type of messaging was to build capacity in households and communities targeted. As identified in the discussion above, different segments may have different goals, including improving energy knowledge, reducing energy bills or learning how to 'stay on top' of energy-related matters in the home. Careful consideration should be given to clearly define the end goal prior to developing messaging. Successful communications support the user's journey towards their end goal, and not the project's end goal, in a clear and supportive way that is self-paced and sensitive to the cultural needs of the audience.

Whilst this concept sounds like common sense and appears to be straightforward, good execution of this is more difficult and complex than initially thought by numerous LIEEP projects. Well-executed communication strategies involved an investment of time and effort to test pre-conceived ideas. Some projects adopted a process of engaging the audience during the design stage of their programs to understand the best approach, and to determine how the audience viewed energy efficiency within their normal lives to test assumptions and revise strategy and delivery solutions accordingly. This approach delivered better communications results and engagement with the audience.

Repetition of key messages was another concept that produced positive results, where a short list of important or key concepts were repeated to convince and influence the target markets. For example, one energy efficiency behaviour was introduced and presented in communications across multiple channels (verbal, flyers, education materials, email, text, website) and/or in multiple ways. This focused type of communication method was employed because different people absorb information in different ways – the concept is to deliver the same message to multiple people in a way that is relevant to them.

19.1 'New to Energy' Segment

Information failure was a common barrier for the 'New to Energy' segment. Information failure barriers presented in numerous forms. For example, not having information materials available in a native language, or energy efficiency information not being contextualised or relevant to the participant's daily lives.

Projects that were delivered to Aboriginal audiences reported communities having a perception that there has been a long history of problems with communication and cultural misunderstandings between Indigenous and non-Indigenous people and, in particular, with the government. This was reported to be the result of non-Indigenous people previously introducing changes without engaging, asking or explaining things to the Indigenous people. Non-Indigenous people not understanding or respecting Indigenous Law, or the significance of kinship relationships, or the respectful use of body and verbal language are prime examples. Projects targeting this segment seemed to use good communications alongside engagement methods to ensure they did not repeat mistakes of the past. For example, considerable time and resources were spent in training Aboriginal people to deliver the energy efficiency initiative themselves, within their communities. This allowed time for consultation before the rollout began, and for project refinement and delivery processes to be adjusted in a way that optimised cultural respect (e.g., KEEP, MM, BA).

Due to being approximately 16 years behind in meeting the housing needs of Indigenous Australians (Fien & Charlesworth, 2008), there was often overcrowding in households which needed to, at times, accommodate multiple families or host extended families in the one home (MM). This increases the cost of household electricity, which makes paying the power bill difficult. Households included a diverse range of energy consumers, ranging from kids, teenagers, adults and the elderly. Communication needs to be deployed in a way to make energy relevant for each one of these groups, in a culturally sensitive way, which can be easily understood and implemented. Furthermore, additional communications support and tools were developed for leaders within the community to share new energy knowledge and skills within their community. Improvements in energy knowledge in this situation are important achievements and should have an ongoing, beneficial ripple effect.

19.2 'Energy Without Effort' Segment

Many of those in the 'Energy Without Effort' segment demonstrated a strong appetite for digital communication methods. New and innovative approaches were trialled in the LIEEP projects, including gamification, social media engagement and a vast array of electronic communications. Clear and concise information was the corner stone of successful communication in the digital environment.

Understanding the needs of today's energy consumer will be an important issue for future programs. The digital age offers many consumers, including low-income households, ubiquitous access to the internet, creating new opportunities to reach, engage and assist consumers to improve their energy efficiency. Access to the internet is no longer an issue for the vast majority of low-income households. In fact, the evidence collected through various LIEEP projects supports the idea that this segment is

amongst the most hyper-connected and digitally savvy Australians (RYJ, PP). Furthermore, access to the internet will be through mobile devices, allowing access to information at anytime, anywhere.

19.3 'Stressed About Energy' Segment

Good communications delivered to the 'Stressed About Energy' segment shared many of the characteristics of communications delivered to the other segments, though the tactics deployed changed subtly. This group valued trusted sources of information and were motivated to explore information about energy efficiency. This group viewed the information and communications from LIEEP projects through the lens of already being quite knowledgeable and savvy around energy use – therefore managing misconceptions was an important component of the communication process. Information that was communicated needed to provide evidence and be perceived as being trustworthy, which meant using credible sources. LIEEP projects discussed a range of tactics for good communication, including developing tools that were visual and easy to comprehend. Clear and concise information should not be confused as being 'simplistic' for this audience. Rather, the tools developed were complementary of HEVs in so much as the communication was delivered partly in an oral format (informal conversation at the participant's home) and partly by leaving information materials for the participants to refer to and share at a later time.

For this audience, several reports advised that digital communications and websites were not valued sources of communication. However, one project demonstrated positive sentiment towards the acceptance of new technologies such as text with this cohort (SoH). The uptake of technologies in older demographics is growing at a high rate and would be something that would need to be reconsidered for projects targeting this segment in the future.

19.4 Key Recommendations

This section summarises the key factors in successful communication:

No silver bullet

There is no single recipe to follow. Each segment and sub-segment has its own drivers, barriers and limitations. Invest the time upfront to understand what they are and design communications that address them in a respectful manner.

Start with the end in mind

Be clear on the end goal for both project and participants. Design a communications strategy that supports the audience throughout the program to meet both goals, being mindful of their drivers, barriers and limitations.

Less is more

Deliver fewer key concepts, in multiple ways, rather than multiple concepts in the hope that one of them sticks.

Clear and concise, avoiding jargon

Explain concepts in clear and concise language that avoids using overly technical information and the use of energy jargon.

Authentic communications to support the intent of delivery

Be respectful in the use of communications to ensure materials support the ethos and intent of the delivery of social service and support offered. Let the audience know someone wants to help them, rather than dictate how they should live their lives.

20. Conclusion

The Commonwealth Government's Low-Income Energy Efficiency Project (LIEEP) was designed to stimulate creativity in ways to support low-income households to become more energy efficient and thus reduce energy consumption and bills. Accordingly, 20 consortia representing 20 projects trialled nine initiatives, and combinations therein, across more than 18,000 homes in Australia. The result should be clear in determining which initiatives trialled produced the best outcome for the home. However, perhaps underestimated by all concerned was the complexity beneath the meaning of a 'low-income' household. Rather than being a single group, it comprised nine identified cohorts, each experiencing unique lifestyles and issues, and thus requiring unique services or support to improve their household energy efficiency. Trialling various initiatives to such a broadly defined group thus hindered comparisons across projects, rather than facilitated them. The task of simply determining 'what worked best' became problematic and required deeper analysis and substantial extrapolation to produce meaningful results.

One further factor hindered the comparison across projects: the lack of post-initiative data collection. Reflecting a difference in project objectives, many of those providing the energy efficiency initiative (which could be viewed as a support service) wanted to genuinely help the household participant, perhaps through a difficulty or crisis, and had a very low priority on data collection. Seen as intrusive and onerous, the requirements to conduct effective project evaluation were scant and not consistently measured or reported upon. This meant that only a small fraction of data have been collected, and thus available for analysis, for those who participated in LIEEP (16%).

Notwithstanding these limitations, we have made every effort to compare the incomparable, to condense the swathe of information contained in 20 LIEEP reports into bite-sized pieces and, by so doing, we have represented the projects and their unique outcomes in the most respectful way we could find. The basis for this report was to provide a synthesised view of LIEEP by collating the unique findings per project into a greater understanding of LIEEP in the hopes it guides, or at least provides food for thought, for future projects, policies and energy providers.

The need for a unified effort to support the variety of low-income households is paramount. Major, recurring issues of energy affordability, ongoing disadvantage and discrimination, fear and a real incapacity to make the changes needed in their lives (especially for tenants where structural changes in the home are dependent on the landlord and their ability to afford the energy technology) means that most low-income households face a dire future as it relates to energy. Allowing things to continue as they have been will mean that most low-income households will experience an even greater financial struggle than they do at present, which, from the findings of this report, will substantially worsen their quality of life and wellbeing. Reported levels of 'co-benefits' indicate that factors of stress, thermal comfort, confidence, control and self-efficacy as they relate to energy will become worse unless low-income householders receive help. There is no margin for these factors to worsen as they have already reached untenable levels.

Numerous issues have been uncovered, and a range of insights gained, in this report that would be useful to guide future actions in a cross-sectorial manner. We believe that joining forces to provide an eco-system of support to Australians experiencing vulnerability in their lives is a viable solution; one that would also improve household energy experiences by all Australians.

In the short-term, efforts should be directed towards ensuring that those who are eligible are placed immediately on a payment plan and provided access to financial support by energy providers. We found that most low-income households were unaware that there were support options available to them from energy providers and, that when dealing with their providers, many found it to be an unsavoury experience. This needs to be turned around so that the low-income household is seen as a viable and

important segment of the market. Also requiring immediate action is reform for landlords and the obligations they have to their tenants. Ensuring that their rented properties meet minimum requirements, and stimulating their motivation to work 'with' tenants, rather than from a place of disinterest, is urgently needed.

In the longer term, low-priced energy supply options need to be available, so that people can choose the level of service with which they receive energy, and thus the price they pay. Just like flying a plane, safety is paramount, but the extra services can differentiate providers and provide cheap and affordable options to those with limited disposable income. Also vital is a reform of regulation, such that housing stock across Australia is reviewed in terms of meeting minimum energy efficiency standards. There is an opportunity for government to lead the way here, and refit all social housing homes to a high energy efficiency level, which would not only set the standard, but provide much more affordable housing, of decent quality, to those most in need.

References

Australian Bureau of Statistics [ABS] (2011). *Census: Cat: 3238.0.55.001 - Estimates of Aboriginal and Torres Strait Islander Australians, June*. http://www.abs.gov.au/ausstats/abs@.nsf/mf/3238.0.55.001

Australian Bureau of Statistics [ABS] (2012). 4671.0 – Household Energy Consumption Survey, User Guide. Climate Zones. Retrieved from: http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4671.0~2012~Main%20Features~Climate%20zone~17

ABS. (2013). *6523.0 - Household Income and Wealth, Australia, 2013-14*. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6523.02013-14?OpenDocument

Alexander, J., Gabrielle, M., Houstein, T., Rooney, M., Watson, P., Watson, S., & Vikstrom, A. (2016). *Get Bill $mart. Final Report June 2016*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/mission-australia.pdf

BEST Employment. (2016). *New England/North West Energy Efficiency Campaign*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/best-employment.pdf

Bedggood, R., Farquharson, K., Meyer, D., Perenyi, A., Bedggood, P., Johansson, C., Milgate, G., Leece, J., Downey, J, & Bloomfield, I. (2016). *Koorie Energy Efficiency Project: Final Report*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/kildonan.pdf

Brechin, E. (2008). *Reconciling market segments and personas*. Retrieved from: https://www.cooper.com/journal/2002/03/reconciling_market_segments_an

Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development*. Sage.

Button, L., Lodge, G., & Taylor, D. (2016). *Power down project GV Community Energy. Low Income Energy Efficiency Program April 2016*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/gv-community-energy.pdf

Carins, J. E., & Rundle-Thiele, S. R. (2014). Eating for the better: A social marketing review (2000–2012). *Public Health Nutrition*, *17*(7), 1628-1639.

Chiang, F., & Miller, R. J. (2008). Discovering data quality rules. *Proceedings of the VLDB Endowment*, *1*(1), 1166-1177.

Cooper, P., Gordon, R., Waitt, G., Petkovic, D., Burroughs, N., Tibbs, M., Butler, K., Roggeveen, K., McDowell, C., Kokogiannakis, G., Ledo Gomis, L., &, Magee, C. (2016). *EE3A: Pathways and initiatives for low-income older people to manage energy: Final Report*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/rdai.pdf

Krug, E. G., Dahlberg, L. L., & Mercy, J. A (2002). The world report on violence and health. *The lancet*, *360*(9339), 1083-1088.

Duriau, V., Reger, R., & Pfarrer, M. (2007). A content analysis of the content analysis literature in organization studies: Research themes, data sources, and methodological refinements. *Organizational Research Methods, 10*(1), 5–34.

Energy Networks Australia, & CSIRO. (2016). *Electricity Network Transformation Roadmap: Key Concepts Report*.

Fien, J. &, Charlesworth, E. (2012). Why isn't it solved? Factors Affecting Improvements in Housing Outcomes in Remote Indigenous Communities in Australia. *Habitat International, 36*(1): 20-25.

French, J. (2011). Why nudging is not enough. *Journal of Social Marketing, 1*(2), 154-162.

Hoyer, W. & MacInnis, D. (1997). *Consumer Behavior*. Boston: Houghton Mifflin Company.

Indigenous Essential Services Pty Ltd. (2016). *Manymak Energy Efficiency Project*: Indigenous Essential Services Pty Ltd, on behalf of the Manymak Energy Efficiency Project consortium.

Final Report. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/ies.pdf

Korb, A. (2015). *The Upward spiral: Using Neuroscience to Reverse The Course of Depression, One Small Change at a Time*. New Harbinger Publications: Oakland.

LIEEP – *Low Income Energy Efficiency Program* (2012). Retrieved from: http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4671.0~2012~Main%20Features~Climate%20zone~17

Lynch, D., Tuck, J. Hurley, C., Fraser, P., & Brown, J. (2016). *Glenelg SAVES (Seniors Achieving Valuable Energy Savings)*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/western-district-health-services.pdf

Leung, X., & Bai, B. (2013). How motivation, opportunity, and ability impact travelers' social media involvement and revisit intention. *Journal of Travel and Tourism Marketing, 30*(1–2), 58–77

MacInnis, D., Moorman, C., & Jaworski, B. (1991). Enhancing and measuring consumers' motivation, opportunity, and ability to process brand information from ads. *The Journal of Marketing*, 32-53.

McDowell, C., Kokogiannakis, G., Ledo Gomis, L., & Magee, C. (2016). *EE3A: Pathways and Initiatives for Low-income Older People to Manage Energy: Final Report*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/rdai.pdf

McKenzie-Mohr, D. (2000). Fostering sustainable behavior through community-based social marketing. *American Psychologist*, 55 (5), 531-537.

McVey, D., & Walsh, L. (2009). Generating 'insight' and building segmentations–moving beyond. In *Social Marketing and Public Health: Theory and Practice*, by Finch, J (2017), Oxford University Press: United Kingdom.

Morel, K., Poiesz, T., & Wilke, H. (1997). Motivation, capacity and opportunity to complain: Towards a comprehensive Model of consumer complaint behavior. *NA-Advances in Consumer Research,* Volume 24.

Neuendorf, K. (2016). *The Content Analysis Guidebook*. SAGE, Los Angeles.

Northern Grampians Shire Council. (2016). *Northern Grampians Shire Council: Low Income Energy Efficiency Project Final Report*. Retrieved from: http://www.environment.gov.au/system/files/pages/f29739bb-08bf-4946-af6fd60dad9448e3/files/northern-grampians-shire-council-final-report.pdf

Queensland Council of Social Service (QCOSS). (2016). *Final Report of the Bright Actions Project*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/qcoss.pdf

Romanach, L., Meikle, S., Hall, N., & Gardner, J. (2016). *Green Heart Wisdom: Supporting low-income senior households to reduce energy use*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/brisbane-city-council.pdf

Rothschild, M. (1999). Carrots, sticks, and promises: A conceptual framework for the management of public health and social issue behaviors. *The Journal of Marketing*, 24-37.

Skillset Environment. (2016). *Powerplay: Final Report – May 6, 2016*. Retrieved from: http://www.environment.gov.au/system/files/pages/f29739bb-08bf-4946-af6f-d60dad9448e3/files/skillset.pdf

Sherman, R. (2015). *Explained in 60 Seconds: Segment vs. Persona* | OHO Interactive. Retrieved May 20, 2017, from: https://www.oho.com/blog/explained-60-seconds-segment-vs-persona

Sheth, J., & Frazier, G. (1982). A model of strategy mix choice for planned social change. *The Journal of Marketing*, 15-26.

Sheth, J., Sisodia, R., & Sharma, A. (2000). The antecedents and consequences of customer-centric marketing. *Journal of the Academy of Marketing Science, 28*(1), 55-66.

South East Councils Climate Change Alliance (SECCA). (2016*). Energy Saver Study: Final Report. Low Income Energy Saver Direct Care and Motivators Project*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/seccca.pdf

Steinborner, J., Michael, C., Trombley, J.; & Halawa, E. (2016). *Smart Cooling in the Tropics Report, Department of Industry, Innovation and Science, Canberra*. Retrieved from: http://www.environment.gov.au/system/files/pages/f29739bb-08bf-4946-af6f-d60dad9448e3/files/environment-centre-nt.pdf

Stephenson, J., Barton, B., Carrington, G., Gnoth, D., Lawson, R., & Thorsnes, P. (2010). Energy cultures: A framework for understanding energy behaviours. *Energy policy*, *38* (10), 6120-6129.

Sustainable Business Australia Limited (SBA). (2016). *Low Income Energy Efficiency Program (LIEEP), Sustainable Business Australia, Our Green Home, Final Report*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/sustainable-business-australia.pdf

Sullivan, D., Byrne, G., Jorgensen, B., Jungbluth, L., Smith, L., Ward, M., Brent, D., Johnson, V., O'Mullane, L., Hoch, L., & Greenwood, O. (2016). *Home Energy Efficiency Upgrade Program*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/brotherhood-of-st-laurenece.pdf

Swinton, T., Little, J., Russell-Bennett, R., Mulcahy, R., McAndrew, R., & Passion, C. (2016). *Reduce Your Juice Digital Social Marketing Program (LIEEP): Final Report.* CitySmart, Brisbane, Australia. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/citysmart.pdf

The City of Gosnells, City of Armadale and Shire of Serpentine Jarrahdale. (2016). *Switched on Homes Final Report*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/city-of-gosnells.pdf

The Nature Conservation Council of NSW (NCC), United Voice NSW, Institute for Sustainable Futures, University of Technology Sydney. (2016). *Final Report of the LIEEP Power Savers Program (PSP)*. Retrieved from: http://www.environment.gov.au/system/files/pages/f29739bb-08bf-4946-af6f-d60dad9448e3/files/ncc-final-report-apendices.pdf

Uniting Communities (UoSA). (2016). *Beat the Heat! Final Report*. Retrieved from: http://www.environment.gov.au/system/files/energymog/files/uniting-communities.pdf

Wedel, M., & Kamakura, W. A. (2012). *Market Segmentation: Conceptual and Methodological Foundations* (Vol. 8). Springer Science & Business Media: New York.

Yang, Y., Akers, L., Klose, T., & Yang, C. B. (2008). Text mining and visualization tools–impressions of emerging capabilities. *World Patent Information, 30*(4), 280-293.

Yang, A., Martinelli, A., Settle, D., Erwin, R., & Crawley, N. (2016). *The Future Powered Families Report*. Retrieved from: http://www.environment.gov.au/system/files/pages/f29739bb-08bf-4946-af6f-d60dad9448e3/files/environment-victoria.pdf

Appendix 1 – Summary of LIEEP Initiatives

Table 21 LIEEP Project Descriptions

Project	Initiatives	Description
KEEP	HEV + Retrofit: Minor HEV + IHD + Retrofit: Minor HEV x 2 + Retrofit: Minor	CDOs conducted HEVs, surveying residents, collecting key dwelling and household information and obtaining consent for monitoring of energy-use data. These participants received a HEV (see details above) and an IHD plus energy-saving stickers, magnets and thermometers. Two home visits and two follow-up phone calls (one after each visit).
PS	HEV	HEV involving assessment of participant's energy efficiency standards and behaviours. Followed by the provision of tailored energy efficiency recommendations.
HEEUP	Retrofit: Major	Upgrades of hot water systems in low-income households (received by 71%) as well as replacement upgrades (3%) and independent installations (6%).
NGSC	HEV + Retrofit: Minor	HEV involving exploring current energy use and needs within aged and disability pensioners' households. Installing specific energy efficiency upgrades as approved by households.
PD	HEV + Retrofit: Minor EE Workshop	HEV involving assessment of participants' energy efficiency standards and behaviours. Participants completed a pre-engagement survey and discussed retrofits that might improve energy efficiency. Retrofits were then installed. Workshop detailing 30+ energy efficiency measures, and energy comprehension advice. Provision of 'goody bags' at the end of the workshop.
MM	HEV x 2-4 HEV + IHD HEV + Retrofit: Major HEV + Retrofit: Minor	HEVs informing participants about the project and some general tips for efficient use of power and water. 'Pre-payment token meters' were installed for the purpose of data logging. An IHD was installed in participating households to monitor energy consumption and cost in real time. Major retrofits installed during visit. Replacement of electric hot water units with 'a mix of Quantum 340L heat pump HWS and Solahart 302J solar HWS', installation of bulk ceiling insulation in houses with air conditioners. Minor retrofits were installed in participating households, including stove timers, eco switches, air conditioner thermostats and LED outdoor light bulbs.
ES	Retrofit: Minor HEV HEV + Retrofit: Minor	Retrofit: predominantly insulation, droughting, LED lights based on HH need. HEV: predominantly two home visits, one group session; some HH received IHD (no separate analysis). Retrofit: predominantly insulation, draught sealing', LED lights based on HH need; HEV: predominantly two home visits, one group session; some HH received IHD (no separate analysis).
PSR	HEV x 2 + Retrofit: Minor	Initial HEV with cheap ($50) retrofits; tailored retrofit plan posted and retrofit items delivered or rebated up to $250; three follow-up phone calls before post-initiative survey call; subset of 79 received solar hot water for free, but no separate analysis.
GS	Multiple HEVs + Retrofit: Minor Multiple HEVs + Retrofit: Minor	HEVs related to efficient use of fridge, stand by, laundry, clothes in winter, draught proofing. HEVs with tailored retrofits ($200). HEVs related to efficient use of fridge, stand by, laundry, clothes in winter, draught proofing. HEVs with tailored retrofits ($200).
PP	Gamification	Engagement in energy conservation actions through games and social media with a $120 retrofit kit for a subset of participants.
BA	HEV EE Workshop EE Workshop (NILS) EE Workshop (Immigrant Orientation)	Culturally appropriate HEV (conducted in participant's language), involving observation, assessment and recommendations for energy efficient behaviour. All visits included a free show bag of small energy efficiency items (up to $30 in value). Two-hour workshops delivering energy efficiency information to small groups in their dominant language and in a culturally sensitive manner. Designed as a recruitment strategy for home visits.

Project	Initiatives	Description
		NILS offered to participants. All who expressed an interest in purchasing a refrigerator or washing machine were invited to attend a clinic to learn about energy-efficiency in regard to appliances. Energy efficiency information provided as part of mandatory information sessions for refugees. Delivered in participants' dominant languages and culturally sensitive. Designed as a recruitment strategy for both the workshops and home visits.
SOH	Digital Engagement (SMS) Digital Engagement (Personal SMS) Digital Engagement (Personal SMS) + Retrofit: Major	Energy efficiency tips and notification of peak energy use times across the participant's area delivered via text message at 7pm every Monday. As above, with the addition of personalised energy efficiency text messages created through analysis of participant energy consumption data. As above, with the addition of a voltage regulator unit designed to limit incoming voltage to participant houses.
GHW	HEV EE Workshop HEV + EE Workshop HEV (EE Workshop Materials) EE Workshop Materials	HEVs delivering tailored energy recommendations and assessment. 628 participants received a discounted energy efficiency appliance upgrade, 920 participants received a discounted appliance upgrade plus energy efficiency modifications. A series of workshops for the purpose of discussing energy efficiency information. The workshops used information and format advice developed for senior persons by CSIRO. A combination of the two initiatives detailed above. HEV with the provision of informational material from the workshops. Participants only provided with the informational material from workshops, no actual workshop was delivered.
FPF	EE Workshop EE Training (Energy Workers) HEV + Retrofit: Minor	Workshops delivered to existing parent groups, adult English classes, or parents with young children. Parents trained by staff to deliver basic HEVs to households identified through their own social networks. Personalised energy saving advice delivered to members of the community in their homes. Each household received a minor retrofit kit (e.g. showerhead, draught sealing).
GBS	HEV + Retrofit: Minor EE Training (Energy Workers) HEV + Retrofit: Minor	Two energy assessors performed HEVs. One provided energy efficiency advice, whilst the other assessed the household and performed upgrades (showerheads, pressure release valves, light globes, draft proofing). Recruitment and deployment of 'Energy Champions' from the community by the community engagement officer, trained to deliver community events and generate awareness. A combination of the two initiatives detailed above.
EE3A	Digital Engagement + Retrofit: Major EE Training (Community)	General householder information and remote-control switches, fridge magnets through mass media, newsletters and websites, peer-to-peer networking and macro-marketing. Tailored retrofits (ceiling insulation, new HWS, reverse cycle air conditioning, lights, fridges, IHDs). iPad training on how to access information online; energy saving courses for HACC and other community workers.
BTH	HEV + IHD + Retrofit: Major	A HEV in addition to the installation of a new RCAC, ceiling insulation, IHD or a 12-month rent freeze where needed.
OGH	Digital Engagement	In-home real-time energy monitor and its associated software platform; enabled consumption data to be accessed in real time (5-minute intervals) through a dedicated web portal.
RYJ	Digital Engagement + Gamification	Digital engagement channels, education, gamification with energy efficient rewards (e.g., fridge replacements), landlord engagement through rebates.
SCT	HEV + Retrofit: Minor	HEV with free simple energy saving products e.g., thermometers, individual appliance electricity monitors, information, tailored reports and recommendations, fly screens, free behaviour change services, pedestal fans, and AC cleaning.