Power down project
GV Community Energy

Low Income Energy Efficiency Program

April 2016

Australian Government
Department of Industry, Innovation and Science

This activity received funding from the Australian Government

GV Community Energy

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GRANT RECIPIENT

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CONSORTIUM PARTNERS

Dame Pattie Menzies Centre Inc.

Kelvingrove

Ethnic Council of Shepparton and District Inc. Reg. No. A632

VIC Parks

Greater Shepparton

Monash University

Shepparton Villages

Advance Computing

HomeLab Building Services

Wangaratta

rural housing network

the Chase and Tyler Foundation

OTHER PROJECT SUPPORT

Lifestyle Communities – Downsize to a bigger life

Moreland Energy Foundation

Australian Government
Department of Industry, Innovation and Science

"This Activity received funding from the Australian Government"

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EXECUTIVE SUMMARY

In July 2013 GV Community Energy (GVCE) received funding from the Australian Government's Round 1 Low Income Energy Efficiency Program (LIEEP) to deliver the Powerdown Project which trialled 2 different approaches to assist low-income households to become more energy efficient.

Engaging with low income households through a "one on one" Home Energy Assessment (HEA) combined with minor retrofit works will generally have a greater positive impact compared to households that attend an energy efficiency workshop. A HEA can reduce household energy consumption by 6%, empower residents to contact their electricity retailer to get a "better" tariff and to be self-motivated to undertake minor energy efficiency work on their home. Households that either received a HEA or those that attended an energy efficiency workshop reported a significant positive change in their key beliefs, barriers and attitudes towards energy efficiency and conservation that lead to an improvement in the comfort level in their homes. There was a relatively high level of self-motivation to undertake minor retrofit works, especially by those that attended workshops. There was a reduction in the barriers to adopting energy efficiency practices including the perception of expensive retrofits, being in a rental property and difficulty in understanding energy efficiency information. These barriers were reduced more through the workshop process.

Three unintended consequences of this study found that a household becoming more energy efficient was adversely affected by the following;

- 24% of HEA participants eligible for government energy concessions were not receiving this benefit.
- 20% of solar PV systems were not operating.
- 70% of houses had substandard ceiling bulk insulation.

BACKGROUND

LIEEP is a competitive merit-based grant program established by the Commonwealth Government to provide grants to a consortia of government, business and community organisations to trial approaches to improve the energy efficiency of low income households and enable them to better manage their energy use. The purpose of LIEEP is to trial and evaluate a number of different approaches in various locations to assist low-income households to become more energy efficient. It is designed to capture and analyse data and information for future energy efficiency policy and program approaches.

PROJECT DESCRIPTION

The Powerdown Project aimed to deliver immediate and ongoing savings in energy usage and costs to 1,350 low income households in target communities, including permanent residents of caravan and cabin parks, retirement estates and others disengaged from mainstream energy efficiency projects, while developing a verifiable dataset measuring relative success of different engagement methods measured against identified barriers.

The two methods of engagement trialled were: 1. Home Energy Assessments (HEAs); 2. Workshops.

The barriers to energy efficiency that the project sought to identify were: cost of energy efficiency upgrades, living in a rental property, lack of support from other people living in the home, lack of information, trouble understanding information, literacy and language difficulties.

GVCE targeted low income households living in Caravan Parks and Residential Villages as well as those living in more traditional housing within the project area. The consortium partners, who referred participants, mirrored the diversity of communities expected to be involved in the project. As the project evolved, it became evident that as a result of targeting those living in Residential Villages and finding a winning formula to attract older participants, that this project sample group represented mainly retired, older aged, 1-2 person households. The mean age of project participants was 69 years.

Originally the project delivery area included 8 municipalities across Northern Victoria. Due to strong Consortia partnerships and referral, the project delivered to 16 regional Local Government Areas (LGAs) and 8 metropolitan LGAs in Victoria. The highest number of participants were drawn from the Shepparton, Wangaratta and Bendigo areas.

To quantify and compare the 2 trial approaches in terms of energy reductions, the project sourced 6 months pre and 12 months post engagement electricity usage data. Changes to beliefs and attitudes to energy efficiency and the effects of barriers to energy efficiency were measured by conducting pre and post engagement surveys. Qualitative data was also collected through observation, focus groups, case studies and participant interviews during HEAs.

METHODOLOGY AND RESULTS

The average electricity use across the trial was quite low, 7.3kWh per day for Workshop households and 10.2kWh per day for HEA households which limited the opportunity for energy reductions. Households tended to restrict energy use as a means of saving money, often compromising health and wellbeing. Household Case Managers (HCMs) reported that households tended to overstate their comfort levels, with many living in cold (Winter) and/or hot (Summer) houses.

1. Home Energy Assessments. GVCE delivered 1032 HEAs and 1024 retrofits. The HEA was successful in reducing electricity use for trial participants by an average 0.61 kWh per day, or 6% of their usage, generating a saving of $62.55 annually. The direct cost for this approach was $590 per household which included a HEA, a recommendations report, retrofit and the offer of 6 months energy coaching and also includes client recruitment and retention costs. A cost benefit analysis over 5 years indicates a result 1.89 cost benefit ratio.

The 2 hour HEA was performed by a HCM who was experienced and trained in domestic energy assessments. The HCM visited households to perform a comprehensive home energy assessment which included a review of energy bills and concessions, ceiling insulation, appliances, building structure and energy use behaviours. At times the HCM would provide advocacy and referral, often ringing an energy retailer to assist in renegotiating contracts and sometimes, referring participants to other support agencies such as Aged Services and Financial Counselling.

All aspects of the HEA, including household demographic information were captured on site by entering the data into a tailor made database (Webform). At the start of the visit the participant completed a pre-engagement survey (Survey 1) and filled in project permissions. At the end of the visit the HCM discussed the energy efficiency retrofits available to the participant and together they decided on the retrofits best suited to the dwelling. The retrofit items included low cost draft proofing, electric throw blankets, hot water service insulation, Ecoswitches, fridge thermometers and lighting. The average value of the retrofit was $250.22. Also at the end of the HEA, HCM's and participants worked together to write down 3 energy efficiency behaviour changes or upgrades that they would consider doing. This commitment tool was called the "Fridge List" and was placed on the fridge using a project magnet. Following the HEA, households were sent a HEA Recommendations Report which had customised recommendations, a copy of their Fridge List and a list of the retrofit items to be installed. An appointment was then made to install the retrofits and for 6 months following the HEA, the HCM was available for energy coaching and information. 67 households contacted the project to utilise the coaching. A follow up survey (Survey 2) was carried out, which captured the uptake of recommendations, fridge list items, changes in levels of comfort, changes in energy efficiency attitudes and beliefs as well as the effect the HEA had on addressing barriers.

2. Workshops. Around 500 people attended Workshops. The direct cost per participant of delivering a Workshop was $67. For this group there was no significant reduction in energy use as result of the engagement.

The project achieved 350 sets of compliant data necessary for the analysis and comparison with HEAs. To be considered compliant participants were required to complete all of the following: project permission forms, pre engagement survey (Survey 1) and the commitment tool "Fridge List".

The 2 hour workshop provided an introduction to domestic energy efficiency measures including 30+ specific measures that a household could adopt to reduce energy consumption, improve comfort levels and save money. The presentation explained electricity accounts and concessions with participants receiving a Victorian concessions guide, produced by the Department of Human Services (Victoria). An extra hour was allocated for a light lunch or morning/afternoon tea and question time.

All participants received a "goody bag" with a token gift such as 6 CFLs, Ecoswitch and/or draught stoppers.

The HEA and Workshop engagements were associated with significant changes in key beliefs, barriers, and attitudes related to energy efficiency and conservation. Overall, the Workshop appeared to have been associated with stronger and more consistent changes on beliefs, barriers and attitudes relevant to motivating energy saving behaviours. The highest rating barrier across both groups was "cost of energy efficiency upgrades" and secondly for HEA households was "Living in a rental property" and for Workshop households "Problems understanding (energy efficiency) information." The effect of these barriers on households decreased as a result of participating in the project.

Retrofits had a positive impact on the comfort and wellbeing of participants. Both the HEA and the Workshops empowered participants to adopt (unassisted) energy efficiency measures. Following the HEA 302, (29.5%) of households contacted their current electricity retailer to register for a concession, seek discount or combine their gas and electricity bills. 24% of HEA households that were entitled to receive a concession on their electricity bill were not receiving one.

The Powerdown Project was proactive in promoting the dangers of carbon monoxide (CO) poisoning and found 22 homes with unflued gas appliances. As part of HEA retrofits and Workshop giveaways, 127 CO monitors were given away.

The Fridge List was an effective tool where 29% of HEA and 19% Workshop participants completed at least one of the activities listed on their list within a 6 month period. The most common activities undertaken (unassisted) by those with a HEA were lagging hot water pipes and contacting their electricity retailer to get a better deal and for Workshop attendees it was adjusting their heating/cooling thermostat to reduce energy use.

Overall, this trial demonstrated that delivering one on one Home Energy Assessments and retrofits is the most effective way to increase energy bill literacy and reduce energy costs. The HEA can be responsive to households needs, providing advocacy and referral where necessary. Whilst some behaviour change was achieved it is the permanent retrofit upgrades that will provide ongoing kWh savings and increased comfort. HEA participants were motivated by saving money as well as increasing comfort - the bill and concession reviews were very popular, substantiating GVCE's belief that energy literacy and communicating with energy retailers is challenging to most households. The HEA had a positive impact on changes in key beliefs, barriers, and attitudes related to energy efficiency and conservation.

Workshops were an effective method of delivering energy efficiency information and are relatively cheap to deliver. The Workshop was more effective in improving energy efficiency beliefs, barriers and attitudes relevant to motivating energy saving behaviours than HEAs.

In addition to trial objectives, this project has provided the opportunity for GVCE to develop database management skills, build household and community partnerships and refine client engagement tools and techniques. GVCE has built expert knowledge in the areas of concessions, embedded electrical networks, low income households and energy billing. Participants have, as a result of the project sought better electricity pricing and accessed government concessions. Also, the project raised awareness across Victoria of the dangers of Carbon Monoxide poisoning due to unflued gas appliances.

Affordability of energy (including access to eligible concessions and discounted pricing), energy literacy and investing in quality efficient housing are the key factors that should continue to be addressed in order to assist low income households to be productive energy users of the future.

Continued investment into low income household energy efficiency will improve the long term health and wellbeing of Australian households leading to less economic demand on health and social services.

DEFINITIONS

Consortia	Official contributing partners of the project who assisted with governance and (non cash) in kind contributions
CSIRO	Commonwealth Scientific and Industrial Research Organisation. Responsible for the program level analysis of LIEEP
Department	Department of Industry, Innovation and Science (Australian Government)LIEEP funding body and contract manager
GVCE	GV Community Energy- Lead organisation
HCM	Household Case Manager/Home Energy Assessor
HEA	Home Energy Assessment
Households	Private dwellings such as caravans, houses, flats and home units but excludes government-owned public housing.
LGA	Local Government Area
LIEEP	Low Income Energy Efficiency Program
Monash Sustainability Institute (Monash University)	Project research partner
NMI	National Meter Identifier
VEEC	Victorian Energy Efficiency Certificates
VEET	Victorian Energy Efficiency Target www.veet.vic.gov.au

KEY RECOMMENDATIONS

BILLING AND CONCESSIONS

1. Investigate how to instigate the designing of a mechanism to ensure eligible customers automatically receive all of their electricity concession entitlements. This could involve a process where the governing agency administering concessions has direct access to the electricity retailer (or vice versa) so that concessions are automatically applied to every bill. This process will need to accommodate the high customer churn rate where approximately 25% of electricity customers switch retail providers every year.
2. Instigate an awareness program promoting concession entitlements to be run with collaboration from the electricity/gas retailers and the relevant government agency. This could involve a summary of key concession benefits placed on the front of every bill and posting out the Victorian concession guide to all eligible to cardholders.
3. Standardise and simplify the billing format across all electricity and gas retailers which may over time improve the comprehension levels for billing. Retailers are currently required to provide a minimum of information in each bill, however the specific layout design is at the discretion of each retail company and it became very apparent with Powerdown participants that the billing format is not sufficiently clear.
4. Investigate if it could be mandatory for energy retailers to provide concession card holders a default lowest available tariff inclusive of any discounted pricing offers. The current marketing practice used by retailers is to offer discounts to new customers or existing customers that ask for a discount. This is disproportionally disadvantaging older, low income households that are less inclined to engage their electricity retailer compared to the general public. Seeking mandatory preferential treatment for concession card holders will be problematic and require careful and detailed design.

HOUSING STOCK

5. Invest in and provide financial assistance to low income households to improve the thermal performance of their existing housing stock.
6. Establish minimum dwelling energy efficiency standards for private and public rental properties.
7. Extend the list of prescribed activities under the Victorian Energy Efficiency Target (VEET) scheme to include installation and top up of ceiling insulation.
8. Implement a government sponsored awareness campaign alerting Solar PV owners to check that their system is still operating.

INFORMATION

9. Workshops- Deliver energy efficiency and energy literacy Workshops to established groups and communities as a means to increase knowledge and uptake of self driven energy efficiency upgrades.
10. HEA- Roll out Home Energy Assessments to all interested households to promote the benefits of energy efficiency and productivity. Use the HEA as a platform to empower residents to negotiate with energy retailers and consider self funded energy efficiency upgrades.

LIEEP

11. Consolidate the learnings from LIEEP grant recipients, the department and CSIRO and continue to develop the LIEEP network. The collective expertise and knowledge base developed from this project is well equipped to drive energy productivity and innovative programs into the future. Future funds should be preferentially invested directly into programs arising from LIEEP and into the organisations that proved to be successful.
12. In retrospect, the data collection software should have been developed by the funding body prior to the commencement of all LIEEP projects. Allowances for differences between projects could then have been managed by a central database/software administrator, with CSIRO working collaboratively with them to enact any Schema changes. This would have been a much more productive, streamlined and cost effective approach.
13. In future, it would assist project proponent budgets if the project application template had the specified number of project forums, including location and duration, an option to participate in project reference group and specify scope of work for participation, and the scope of works for a "cost benefit/effectiveness analysis". The provision for a schedule of rates for any approved variations would simplify the process that would provide flexibility to accommodate variations proposed by either the funding body or project proponent.

INTRODUCTION

GV Community Energy (GVCE) is a not for profit social enterprise assisting households, businesses and community organisations to reduce their carbon footprint through the introduction of renewable and/or low emission energy technologies and energy efficiency products and services.

Together with 13 Consortium partners, GVCE has led the delivery of the Powerdown Project. This project received funding of $1,825,646 from the Australian Government's Round 1 Low Income Energy Efficiency Program (LIEEP), as well as in-kind support from project partners and other supporters to the value of $977,206.

This project aimed to deliver energy savings, increased comfort and identify barriers to energy efficiency in 1,350 low income households across 8 municipalities in regional Victoria. The project evaluated and compared the efficacy of Home Energy Assessments and Energy Efficiency Workshops in achieving improved energy efficiency and increased comfort.

The project has measured and evaluated changes in household energy use, energy saving behaviours, uptake of recommendations and has also identified barriers to energy efficiency amongst trial participants.

The project ran from 6th June 2013 to 31st May 2016 and was delivered to participants who lived in rental accommodation, their own homes, gated and lifestyle communities, cooperative housing and caravan parks. The project was not open to low income households living in government public housing.

A consortium governance model was applied, which provided an opportunity for consortium members to attend project working group meetings where they contributed to decision making, project support and referral.

LIEEP Objectives: *to trial and evaluate a number of different approaches in various locations to assist low-income households to become more energy efficient, as well as capture and analyse data and information for future energy efficiency policy and program approaches.*

Powerdown Project Objective: *to deliver immediate and ongoing savings in energy usage and costs to 1,350 low income households while developing a verifiable dataset measuring the relative success of different engagement methods measured against identified barriers.*

The two methods of engagement trialled were:

1. Home Energy Assessments (HEAs)
2. Workshops

The barriers the project sought to address were:

1. cost of energy efficiency upgrades
2. living in a rental property
3. lack of support from other people living in the home
4. lack of information
5. trouble understanding information
6. literacy
7. language difficulties

The targeted households were:

1. permanent residents of caravan and cabin parks
2. residents of retirement estates
3. others disengaged from mainstream energy efficiency projects

PROJECT STATS

1032 Home Energy Assessments

350 registered Workshop participants (23 Workshops)

1024 Retrofits (average value $250)

1382 follow up phone surveys (87% response rate)

TOTAL audience for this project exceeded 4000 households not including print, billboard and radio

METHODS

GOVERNANCE

As per the project agreement, a Consortium model of governance was adopted whereby GVCE was the lead partner responsible for project management and delivery and supported by consortium partners who actively monitored, guided and provided advice in relation to the project.

The Consortia each signed partner agreements committing to the project and also declaring a value of in-kind contribution which they would make, this in-kind contribution was valued at $755,779. At the end of the project the total of in kind contributions achieved was $740,083. A schedule of contributions by milestones was established as well as a reporting process to capture the contributions. The Consortia met eight times during the course of the project.

TABLE 1 CONSORTIUM MEMBERS

CONSORTIUM MEMBER	STATUS	ACTUAL IN-KIND TOTAL END OF PROJECT
Sustainable Regional Australia	Withdrawn	$ -
Brotherhood St Laurence	Withdrawn	$ -
GVCE (including Training category)	Current	$ 299,963
Greater Shepparton City Council	Current	$ 12,432
Ethnic Council of Shepparton & District Inc	Current	$ 5,610
Victorian Caravan Parks Assoc	Current	$ 115,425
Shepparton Access	Withdrawn	$ 978
Murch River Road Caravan Park	Current	$ 1,510
Dame Pattie Menzies Centre Inc	Current	$ 4,455
Shepparton Villages	Current	$ 180
Rural City of Wangaratta	Current	$ 30,077
Kelvingrove Village	Current	$ 3,885
Rural Housing Network Inc	Current	$ 4,845
Monash University -Research Partner	Current	$ 59,213
Moreland Energy Foundation (MEFL)	Withdrawn	$ 71,800
Homelab	Current	$ 82,245
TOTAL		**$ 692,618**
Other Contributions (non Partner)		
Advance		$ 33,382
Connect GV		$ 260
TOTAL		$ 33,642
Contributions from other organisations not in in-kind budget		
*The Chase and Tyler Foundation		$ 6,084
**The Advisor		$ 400
**Top Gun Media		$ 7,339
TOTAL		**$ 13,823**
TOTAL OF ALL IN-KIND CONTRIBUTIONS FOR PROJECT		**$ 740,083.00**

At the commencement of the project there were 14 Consortium partners and 2 Contributing partners. Early in the project, 2 partners withdrew – Sustainable regional Australia (SRA) **withdrew** as they were no longer supplying the database for Group 2 and Brotherhood of St Laurence (BSL) received LIEEP funding and went on to deliver its own project. Later in the project Shepparton Access withdrew as it did not have the resources to commit to the project but remained in the In Kind contribution schedule.

Moreland Energy Foundation (MEFL) was added as a partner when they were engaged to supply and survey Group 2 participants. It became evident from the poor survey results that the project would not be able to fulfill its delivery commitment for this group, a Deed of Variation was granted, MEFL's in kind contribution was decreased.

The project signed up another two partners. Jack Labno from Homelab was the project retrofit contractor and provided valuable in kind hours to the project, he developed complex spreadsheets which allowed the project to monitor retrofit stock, costs, works orders and installations easily. He also spent time on Research and Development of products, attending staff meetings and collecting case studies. The second partner was The Chase and Tyler Foundation, established in 2010 after Chase and Tyler Robinson, then six and eight, died in their Mooroopna rental home from carbon monoxide poisoning from an un-serviced gas heater. The foundation donated 100 carbon monoxide monitors and hundreds of flyers. With the lessons learnt and heightened awareness of this tragedy the project was able to reinforce the foundation's message through workshops and home energy assessments. The project also worked collaboratively with FamilyCare Shepparton, this organisation referred clients to the project and also co facilitated 2 workshops.

The project worked with energy distributors Powercor and Ausnet Services, as well as embedded network managers: Network Energy Services, Kelvingrove and site Managers from 2 embedded network locations to retrieve household electricity usage data. GVCE is appreciative to all of these organisations, all of whom provided the electricity data at no cost.

Consortium members. Left to right.
Front row: David Tennant (Family Care- Shepparton),Dawn Taylor (GVCE), Elizabeth White (Vic Parks), Chris Walker (GVCE),
Back Row: Geoff Lodge (GVCE), Nicola Marsh (City of Wangaratta), Ed McNair (Shepparton Villages), Heather East (GSCC), Annette Johnstone (RHNL), Maree Boyle (Kelvingrove), Kevin Simpson (GVCE), Leeane Button (GVCE), & Ivonne & Jack Labno (Homelab),
Absent: Rob Chaffe (Dame Pattie Menzies Centre), Venessa Robinson (Chase & Tyler Foundation), Chris Hazelman (Ethnic Council of Shepparton), Lena Jungbluth & Brad Jorgensen (Monash University), Mark Schumann (Advance Computing)

THE CONSORTIA

GV Community Energy
Dame Pattie Menzies Centre Inc
Kelvingrove Village
Ethnic Council of Shepparton & District Inc
Victorian Caravan Parks Association
Greater Shepparton City Council
Monash University (Research Partner)
GV Community Energy
Shepparton Villages
Homelab
Rural City of Wangaratta
Rural Housing Network Inc
The Chase & Tyler Foundation
Murchison River Road Caravan Park

The added value from Consortium partners is listed below

- Assisted in recruiting.
- Referred households that were experiencing hardship, had a disability, were isolated or lacked access to support and services.
- Gave feedback and recommendations for delivery improvements.
- Deepened the knowledge and awareness around low income households living in caravan parks, retirement villages, community housing, supported living arrangements and those living in rural or remote settings.
- Expanded the energy efficiency knowledge among members.
- Raised concerns around energy costs and billing.
- Provided venues for meetings and project activities.
- Developed professional networks within the social and commercial sectors.
- Provided professional services such as IT support, development of processes and industry knowledge.
- Provided

PROJECT DELIVERABLES

Following two deeds of variation to the funding contract the project's objective was ***to deliver immediate and ongoing savings in energy usage and costs to 1,350 low income households while developing a verifiable dataset measuring the relative success of different engagement methods measured against identified barriers.***

The two methods of engagement trialled were:

1. Home Energy Assessments (HEAs) to a minimum of 1000 households. This sample is referred to as "Group 1"
2. Energy Efficiency Workshops to a minimum of 350 households. This sample is referred to as "Group 3".

The barriers to energy efficiency the project sought to identify and address were:

1. cost of energy efficiency upgrades
2. living in a rental property
3. lack of support from other people living in the home
4. lack of information
5. trouble understanding information
6. literacy
7. language difficulties

The targeted households were:

1. permanent residents of caravan and cabin parks,
2. residents of retirement estates
3. others disengaged from mainstream energy efficiency projects

ORIGINAL PROJECT SCOPE

TABLE 2 ORIGINAL SCOPE AND ACTIVITY

GROUP	ENGAGEMENT	ACTIVITY	PARTICIPANT TARGET
1	100%	Full Home Energy Assessment $500 retrofit 6 month follow up survey Household Case Manager	1000
2	75%	Basic Home Energy Assessment (provided through past program) No retrofit Household Case Manager Follow up survey	250
3	50%	Energy Efficiency Workshop Household Case Manager Follow up survey	1000
4	25%	Survey households who have had direct involvement in a renewable energy project Survey	500

a. Group 1 (100% engagement): Full Home Energy Assessment, up to $500 worth of retro-fitted energy saving measures, a six month follow-up questionnaire about energy use and behaviour and a dedicated Household Case Manager (HCM). All of the participants selected under Group 1 receive a high degree of interaction to determine if this has a greater impact on reducing energy bills and consumption compared with participants of other groups who receive less interaction. The project is not aiming to specifically identify the degree to which each measure within Group 1 was responsible (if at all) for reducing energy bills and consumption but more specifically the impact of the Group 1 intensive intervention as a whole.

b. Group 2 (75% engagement): A basic Home Energy Assessment provided through programs implemented at least six months prior to the start of LIEEP provided through the Murchison and Kyabram Renewable Projects, zero retro-fits, dedicated HCM, six month follow-up questionnaire about energy use and behaviour.

c. Group 3 (50% engagement): Quality information and strategies for reducing energy usage and costs provided through community-level Workshops, dedicated HCM, six month follow-up questionnaire about energy use and behaviour.

d. Group 4 (25% engagement): Survey of households with previous direct involvement in a renewable energy project (eg: domestic solar PV, heat pump, solar hot water, identified from the lead organisation's existing database of households).

This project was originally called "Affordable Efficiency for Low Income Households". In December 2013 it was renamed the "Powerdown Project".

THE FIRST REVISED SCOPE

Deed of Variation (Variation One) 6th June 2014

- Changed the source of data for Group 2's.

TABLE 3 REVISED SCOPE

ORIGINAL GROUP 2	NUMBER	NEW GROUP 2	NUMBER
Murchison and Kyabram Renewable Projects	250	Moreland Energy Foundation	250

The data source for Group 2 was changed as the project had difficulty accessing the Group 2 historical data from the Murchison and Kyabram Renewable projects. GVCE gained access to the MEFL client database of past HEA participants and from this pool of clients the aim was to complete 250 surveys.

THE SECOND REVISED SCOPE

Deed of Variation (Variation Two) 2nd December 2014

- Removal of Groups 2 and 4.
- Reduction in the number of participants attending Workshops from 500 to 350.

TABLE 4 REVISED SCOPE AND ACTIVITY

GROUP	ENGAGEMENT	ACTIVITY	PARTICIPANT TARGET
1	100%	Full Home Energy Assessment $500 retrofit 6 month follow up survey Household Case Manager	1000
3	50%	Energy Efficiency Workshop Household Case Manager Follow up survey	350

On completion of the pilot phase of this project, it became clear that it was not practical to achieve the prescribed works as detailed in the project scope.

After considerable time and resources had been spent by MEFL, MSI and GVCE on developing the electronic Survey 2 and sourcing 1,000 potential households from MEFL's past programs, it became clear that the anticipated survey response rate would not be achieved so this whole group 2 was removed from the trial.

The sequence of events leading up to this decision are described as follows. In July 2014 MEFL began surveying households and in the first roll out of 200 emails, 20% of households attempted the online survey and phone calls were made to 100 households with only a further 8 people completing the survey. The remaining pool was to be phoned as they did not have email addresses. Forecasts provided by MEFL showed that response rates could be as low as 11% and further to that householders had to comply with the eligibility and energy data requirements, which would likely result in further attrition. Also, the project had not given sufficient emphasis to the negative impact of clients having no tangible benefit for participation. For these reasons a variation was submitted for the removal of Group 2 from the trial.

Once Group 2 was removed from the project, then the relevance of surveying Group 4 households was reviewed. It was anticipated that Group 4 response rates would fall below those of Group 2, as similarly for both groups, there was no tangible benefits for participants to respond to a survey. Also, there had been several years since this group had received the renewable energy product/service so this would have most likely resulted in a low uptake. The time delay in receiving a renewable energy product and the type of engagement meant that this group's data was not readily comparable with Groups 1 and 3. Group 4 was therefore removed from the trial.

The original project plan required that a set number of participants attend Workshops (1000).

The project was on course to reach the attendee target, however, the terms of reference changed in what constituted an attendee. It now became a requirement that a full data set was required for each participant to be included in the number of Workshop attendees.

The project reduced the number of Group 3 Workshop participants, as attendees struggled to complete the paperwork required to meet eligibility and new project compliance parameters which included;

- Complete and sign registration form.
- Complete a pre project survey.
- Complete electricity distributor specific permission form.
- Complete follow up survey.

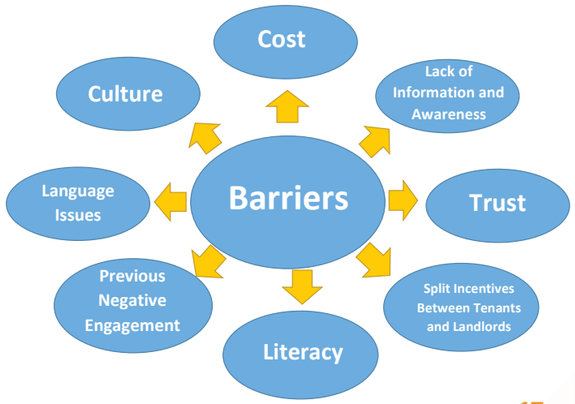
The number of participants in Group 3 was reduced from 1,000 households to 350.

BARRIERS

A LIEEP objective was to trial approaches which would overcome barriers to energy efficiency, specifically: information failure, capital constraints, split incentives (renting).

The barriers to energy efficiency the project sought to identify, measure and address were: cost of energy efficiency upgrades, living in a rental property, lack of support from other people living in the home, lack of information, trouble understanding information, literacy and language difficulties.

In addition, field observational data was collected and discussed by GVCE staff as a means to broaden the understanding of other barriers and challenges faced by households to energy efficiency, including trust, culture and living standards. The project also gained valuable professional development by drawing on the collective bank of knowledge around barriers facing low income sectors represented by the Consortia, staff and other agencies.



TARGET GROUPS

GVCE set out to target those low income households who traditionally have been overlooked by mainstream energy efficiency programs. One group included permanent residents of caravan and cabin parks, residential villages and retirement estates. Others included those living with disability, the elderly, new arrivals and refugees. The Consortium partners selected were invited to participate because of their direct involvement and long-term experience in representing or advocating on behalf of target groups and/or delivering social welfare, employment or cultural programs to low income earners.

The targeted low income households were:

1. permanent residents of caravan and cabin parks
2. residents of retirement estates/villages
3. others disengaged from mainstream energy efficiency projects

PROJECT ELIGIBILITY CRITERIA

To participate in the project households were required to meet at least one of the criteria listed below. The income levels in the criteria were based on the Centrelink 2012-13 financial eligibility for the Low Income Supplement payment. The remaining project eligibility criteria derived directly from Page 6 of the Round 1 LIEEP Guidelines- February 2012.

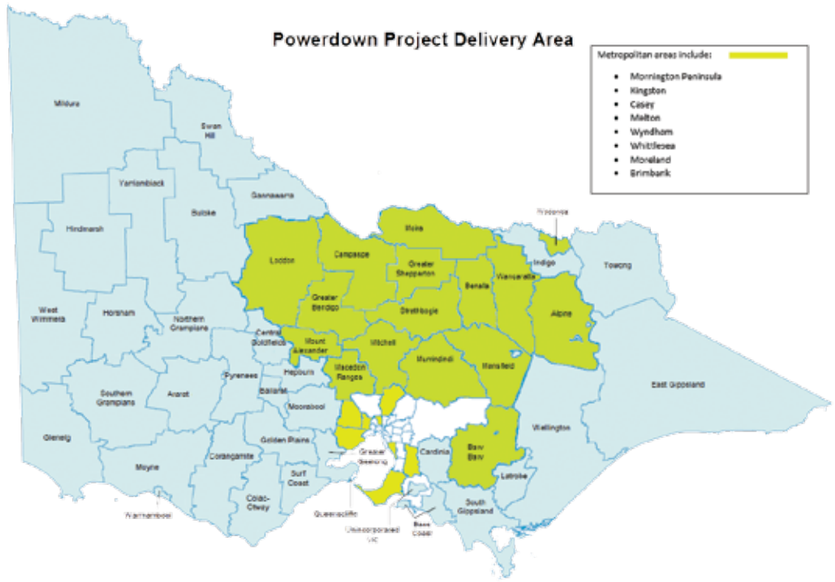
TABLE 5 ELIGIBILITY CRITERIA

€	You are an Australian Concession Card Holder
€	Your main income comes from an income support payment, e.g. disability support pension, unemployment benefit, age pension
€	You are Indigenous or Torres Strait Islander
€	English is your second language (ESL or CALD)
€	You have a disability
€	You have above average energy needs due to location or other factors, e.g. disability
€	You are already participating in an energy hardship program
€	You have been or are at risk of being disconnected from an energy source
€	Net income — single person less than $30,000
€	Net income — a couple less than $45,000
€	Net income — a single or couple with dependent $60,000
€	Refugee or new arrival

PROJECT DELIVERY AREA

GV Community Energy is located in Murchison, a rural Victorian town 37 kilometres south of Shepparton and a 2 hour drive north of Melbourne. Originally the project delivery area included 8 municipalities across Northern Victoria. These areas matched the geographic locations and service delivery areas of the lead organisation and consortium partners and contained a higher than national and state average proportion of households in the lower two quartiles of taxable income, with an average household taxable income of $34,701 (Australian Bureau of Statistics Census 2006).

Due to strong Consortia partnerships and referral, the project delivered to 16 regional Local Government Areas (LGAs) and 8 metropolitan LGAs. The metropolitan areas were primarily Workshop sites and a result of referrals from the Victorian Caravan Parks Association.



RECRUITMENT

The project trialled many recruitment and communication channels including;

- Professional advertising campaign including ads on an electronic billboard above the main road intersection in Shepparton, Facebook promotion and editorials.
- Letter drops.
- Guest speaking to existing groups (Information sessions).
- Pop up shops.
- Mail-out with Water Rates.
- Participation at agency network meetings.
- Word of Mouth.
- Radio.
- Public Information sessions.
- Project profile on local Council's web page and intranet.
- Community Expos.

A full analysis on recruiting and retaining participants can be found in the discussion section of this report.

PROJECT ACTIVITIES

HOME ENERGY ASSESSMENT

GVCE prides itself on delivering a "Gold Standard" in Home Energy Assessments (HEAs). During the 2 hour assessment, trained assessors – Household Case Managers (HCM's) reviewed energy bills, charges and eligibility of energy concessions. Part of the billing focus was also showing how to read the electricity meter and checking if the Solar PV was working to design specification. A detailed inspection of the dwelling was carried out with HCM's gathering data around heating and cooling, hot water, passive design, appliances, pumps, insulation gaps, drafts, gas appliances and safety. Also gathered was information around age, ethnicity, language, household energy needs and the number of people living in the home.

Participants were required to complete a project eligibility form, electricity consent form (one electricity distributor also required copies of 2 forms of identification) and accept the terms of the department's privacy notice.

During the assessment, HCMs offered advice and solutions in order for households to reduce energy consumption and increase comfort. These solutions were a mix of behavioural change, low cost household retrofits and also advice on larger scale upgrades. Participants also received a copy of the Victorian concessions guide. This guide is produced by the Victorian Government's Department of Health & Human Services (DHHS) and it describes all the available concessions, benefits and grants available that assist low income Victorians to pay their council rates, water, gas and electricity bills. http://www.dhs.vic.gov.au/for-individuals/financial-support/concessions/energy

SURVEY 1

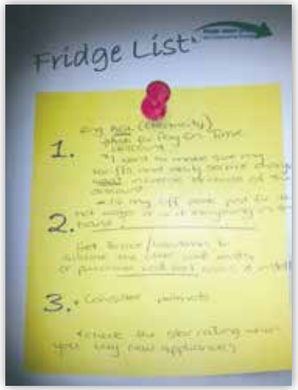
At the start of the HEA, households completed a pre-engagement survey (Survey 1), which captured attitudes and barriers to energy efficiency as well as measuring comfort. By identifying barriers via the Survey, HCM's were then able to directly address these by modifying their engagement strategies and communication techniques.

FRIDGE LIST

On completion of the pilot phase, the "Fridge List" was introduced as part of the HEA. The Fridge List was used as a commitment tool to capture at least 3 behaviours or activities that households believed they could do (within the following six months) to achieve an increase in energy efficiency and/or comfort. The list was handwritten and then placed on the fridge (secured with Powerdown magnet) for easy reference. The household's Fridge List was recorded and entered on site into the project database.

RECOMMENDATIONS REPORT

Following the Home Energy Assessment, households received a hard copy HEA Recommendations Report in the post. The report summarised findings and recommended actions specific to the household. It also listed the "Fridge List" items and a list of free energy efficient retrofit items that the Assessor and the householder had agreed to be installed.



RETROFIT

The works orders were compiled and forwarded to the installer, who made an appointment with the participant to install the retrofit items.

ORIGINAL RETROFIT BUDGET

The original project plan described the value of the retrofit as $350, which was to be funded by the generation of Victorian Energy Efficiency Certificates (VEEC's) under the Victorian Energy Efficiency Target (VEET)

The calculations were based on **13.462** VEECs per household **x** market value of a VEEC (at that time around **$26**) = **$350 per house**

On top of this, the project had an installation budget of **$150** per home.

- The total value of the Retrofit = **$500**.

REVISED RETROFIT BUDGET

Heightened VEEC activity prior to the project start had two effects;

1. Diminished opportunity in houses to carry out prescribed VEET activities.

2. Reduction in the financial value of certificates.

This price volatility led to GVCE using an accredited VEEC installer who performed retrofits and returned an agreed VEEC financial value back to the project. The agreed amount was $9 per VEEC (net) over the term of the project.

The cash budget for retrofit items was now **$150** which included retrofit stock costs and installation.

Added to this was also the **VEEC value** and a market value (**opportunity cost**) for items donated by GVCE and included in retrofits which averaged **$100** per household.

❖ At the end of the project the retrofit average value was **$250.22.**

TABLE 6 RETROFIT ITEMS

RETROFIT ACTIVITIES & PRODUCTS	
Showerheads	Hot water service valve cozy
Lighting Upgrades	HWS pipe insulation (m)
Chimney Seal	Standby Power Controller PC/TV
Adjustment/Installation of door weather seals	EcoSwitch
Exhaust Fan seals	HeaterMate
Ceiling vent seal	CO detector
Wall Vent seals	Fridge Thermometer
Seal gaps and holes	Pelmet
Install "renshade" product to window	Electric Throw Blanket
Adjust or top up installation	Manchurian Pear Tree
Install insulation on manhole cover	Electrical investigation

6 MONTHS ENERGY COACHING

Participants were able to contact their HCM anytime for a period of 6 months post the HEA for advice and guidance on any energy matter.

SURVEY 2

To quantify changes in energy efficiency, comfort, attitude, behaviour and activity, participants completed a phone survey — Survey 2. The survey also captured the uptake of "Fridge List" items by asking participants 1. Did they recall the fridge list? 2. Did they action any items from the fridge list? 3. What items did they action from the fridge list?

WORKSHOPS

Workshop → Survey 1 → Fridge List → Energy Coaching → 6 month follow up survey

The 2 hour Workshop format was informative, interactive and entertaining for both the presenter and those in attendance. The Workshop content provided an introduction to domestic energy efficiency measures with 30+ specific measures that a household could adopt to reduce energy consumption, improve comfort levels and save money. The presentation explained electricity accounts and concessions with participants receiving a Victorian concessions guide which was produced by the Department of Human Services. An extra hour was allocated for a light lunch or morning/afternoon tea and question time.

Either prior to, or at the Workshop participants completed the eligibility or registration form which captured participant details and basic dwelling information.

All audience members, regardless of whether they completed the necessary paperwork or not, received a "goody bag" with a token gift such as 6 CFLs, Ecoswitch and/or draught stoppers. The households that completed all paperwork including the Fridge list and Survey 1, were followed up with a "Survey 2" phone call. Those Workshop participants that went on to complete the Survey 2 received a $25 grocery voucher.

SURVEY 1

At the Workshop, participants completed the pre engagement Survey 1, which was the same as the one used in the Home Energy Assessment.

FRIDGE LIST

At the end of the Workshop, participants filled in a Fridge List to take home. They also copied their list onto the Survey 1 document, which was later entered into the database by GVCE staff.

6 MONTHS ENERGY COACHING

Participants were able to contact the workshop presenter for advice for a period of 6 months post the Workshop.

SURVEY 2

To quantify changes in energy efficiency, comfort, attitude, behaviour and activity, participants took part in a phone survey — Survey 2. The survey also captured the uptake of "Fridge List" items by asking participants 1. Did they recall the fridge list? 2. Did they action any items from the fridge list? 3. What items did they action from the fridge list.

RETAINING PARTICIPANTS

As this project was a research trial, the complexities involved in completing a range of data collection activities including securing participant permissions to use their electricity consumption data were substantial. During the trial it was deemed necessary to introduce other incentives to improve participation, retention and compliance levels. We did not differentiate participants that did or did not receive incentives to participate in this project.

TABLE 7 PROJECT INCENTIVES

ACTIVITY	INCENTIVE
Recruitment	Prizes at information sessions
Agency engagement	Globes, free HEA, and other energy efficiency items for staff
Home Energy Assessment	Retrofit items
Workshop/Information Sessions	Giveaways- eg. globes, Valve Cosies, draft excluders, Ecoswitch, magnets, Ecoswitch, Promotional bags
Complete Electricity permissions	$25 grocery voucher x 81 participants
Complete Survey 2- Workshop Participants	$25 grocery voucher x 314 participants
Paperwork compliance	$25 grocery voucher x 23
Other-Prizes	$25 Vouchers x 12, $50x1

DATA COLLECTION & METHODOLOGY

Monash Sustainability Institute (MSI, Monash University) were the project research partner. MSI was responsible for developing the data analysis methodologies, data collating, data cleansing and analysing project outcomes.

The project was able to analyse a total of 1032 electricity records. ·

- 787 HEA households (723 NMI and 64 Embedded).
- 275 Workshop households (11 NMI and 264 Embedded).

The project was able to analyse a total of

- 1032 HEA households Survey 1's.
- 350 Workshop households Survey 1's.
- 1008 HEA households Survey 2's.
- 335 Workshop households Survey 2's.

Analysis of changes in electricity use for HEAs and Workshops — Methodology A quasi-experimental design was employed to evaluate the effect of the interventions on energy consumption. This design was chosen because it enables cause-and-effect relationships to be inferred by comparing the change in consumption over time in the consumption of one or more intervention groups with an independent control group. Unlike traditional experimental designs, however, participants were not randomly assigned to either an intervention or a control group. The nature of the control group is described in the following section.

The study employed two different kinds of control groups against which to evaluate change in the groups. First, a type of stepped wedge design was implemented by which participants are assigned to different intervention times. In this way, participants who get an intervention later in the study can serve as controls for participants who experienced the intervention earlier. In its pure form, the stepped wedge design requires random assignment of participants to time periods. Furthermore, the time periods themselves are meant to be few in number so that similar sized groups of participants experience the intervention around the same time. None of these characteristics were apparent in the GVCE research. Rather, as would be expected in a field experiment, participants negotiated their intervention dates with GVCE, and these dates spanned a period of approximately 18 months.

The second type of control was a group of participants from the same post-code areas as those participants who received an intervention. This independent control group was provided by Billcap; a private company specialising in the analysis of energy data. However, the electricity consumption data for the control group spanned a period approximately one year earlier than the consumption period apparent in the intervention groups. Therefore, there is an assumption that the consumption patterns between these two time periods is similar.

A baseline of household electricity consumption was established for all participants and was compared to post-intervention consumption to ascertain whether the program of retrofits and workshops served to reduce household energy consumption.

Analysis of pre and post engagement for HEAs and Workshops — Methodology Questionnaire data was collected on two occasions: pre- and post-intervention. This data was used to assess change in consumption over time as a function of factors such as perceptions of comfort, the number of residents in households, type of dwelling, barriers to energy efficiency and demographic variables such as age. Furthermore, analyses were conducted to assess whether there were changes in participant beliefs regarding energy efficiency and conservation of energy that could be attributed to the interventions.

DATA COLLECTION

The project collected the detailed HEA information as well as the mandatory CSIRO schema[1] data required by the Department of Industry, Innovation and Science. The Schema mapped out the requirements of the database that was uploaded in a standardised set of data into the program portal.

- Advance Computing designed the project's data collection software, which the project referred to as the "Webform", and they also provided help desk support and managed the data.
- Monash Sustainability Institute (MSI) was GVCE's research partner for the project and was responsible for the design of the research methodology, collating data and analysis of data at project level. They also administered a secure share drive that was used to upload and share data between GVCE, Advance Computing and MSI.
- The CSIRO provided program level analysis of LIEEP which involved collating the data collected by the 20 LIEEP trial projects from across Australia. These findings will be presented in the LIEEP final report.
- GVCE developed a participant "tracking sheet", which was the primary client management and reporting tool.
- HCM's collected the HEA data on site and entered it into the webform. Early in the project before the Webform was developed the data was entered onto spreadsheets and later entered on to the Webform.
- Workshop participants filled out hard copy permissions, forms, surveys and fridge lists which were then data entered by project administration staff into the Webform.
- Retrofit activities were reported on a spreadsheet developed by the retrofit installer and monitored by the Project Manager.
- The Survey 2 was completed by phone and entered into the webform. GVCE survey staff performed the surveys, which delivered excellent response rates: 87% for HEAs; 86% for Workshops.

TABLE 8 DATA COLLECTION OVERVIEW

DATA TYPES	HEA	WORKSHOP
CSIRO Schema	✔	✔
Participant (eg. age, address, birthplace)	✔	✔
Dwelling (structure, appliances, insulation)	✔	✔
Detailed Home Energy Assessment	✔	
Electricity Consumption	✔	✔
Retrofit items received	✔	
Qualitative Changes in household (Survey1 & 2)	✔	✔
Consultation data	✔	✔
Referral	✔	✔
Recommendations Report	✔	
Uptake of Behavioural changes (Fridge List)	✔	✔
Uptake of Recommendations (Fridge List)	✔	✔

The data above was collected to measure

a. Uptake of energy saving measures.
b. Impact on household energy consumption and costs.
c. Changes in qualitative factors, such as comfort levels, living standards, behaviour, household awareness and empowerment).
d. Costs of engagement (for comparison with benefits).
e. Significance of identified barriers to the uptake of energy efficiency measures.

[1] Schema is a term that describes the structure of a database, defining how the data is organised and the relationships of the data.

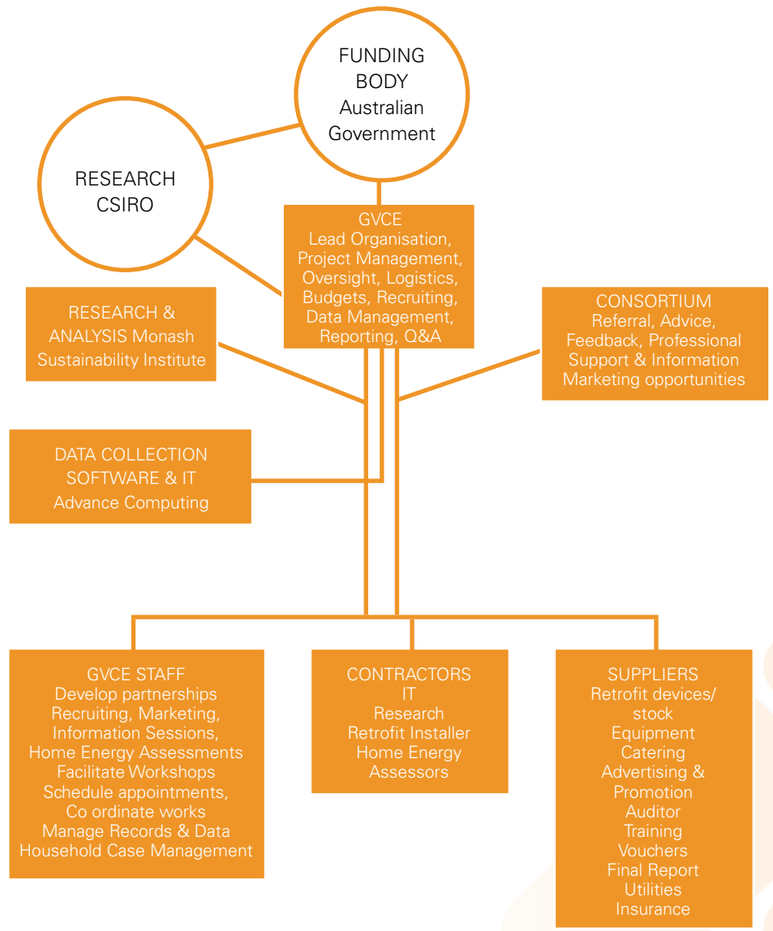
To measure electricity savings in households the energy consumption data was collected from;

1. Electricity distributers — Electricity distributors own and manage the power poles and wires which deliver to homes and business across the state[2]. In Victoria there are 5 distributors, the project area covered two of these — Ausnet Services and Powercor

2. Embedded Network — *"A distribution system, connected at a parent connection point to either a distribution system or transmission system that forms part of the national grid, and which is owned, controlled or operated by a person who is not a Network Service Provider"*[3] Common examples of embedded networks include shopping centres, retirement villages, caravan parks, apartment blocks and office buildings.

- To access household energy data the project sought permission from participants. Early in the project a "generic form" was used for all households, however this form did not meet the 2 energy distributor's requirements. Each distributor developed their own consent form, with Powercor requiring copies of id to be attached. The outcome was that project staff had to revisit households in the Powercor areas to fill in the new form and obtain copies of identification.. For Ausnet customers the project mailed out the new form (as it did not require identification) and offered an incentive to participants to send it back. Embedded networks were satisfied with the project generic consent form.

PROJECT OPERATIONS



[2] www.energyandresources.vic.gov.au/energy/electricity/electricity-distributors
[3] National Electricity Amendment (Embedded Networks) Rule 2015 no.15 Page 6Australian Energy Market Commission

GVCE submitted an Expression of Interest for this project in March 2012 and 19 months later conducted the first Home Energy Assessment. Over the project life there have been 6 changes in department project officers, with the Commonwealth Scientific Industrial Research Organisation (CSIRO) team remaining the same. There were 3 changes of Project Manager at GVCE with all other staff staying through their contracted time.

In April 2014 and August 2015 the CEO, Project Manager and Partnerships Manager attended the LIEEP Forums hosted by the department. On the second occasion the Research Partners also attended. GVCE also had a representative on the LIEEP Reference Group (Leeane Button).

The project did experience communication delays with both CSIRO and the department. Early on, protocols around contacting CSIRO via the department lacked effective process and timely follow up. This caused delays to software development and ultimately to project delivery.

The schema, schema updates, data collection and surveys were the biggest problem this trial encountered. Creating the software system to host the data was also problematic, as was applying updates and changes to the system.

Because of the trial nature of the project and data collection activities, GVCE worked very closely with MSI over the full term of the project. GVCE and MSI's collaboration resulted in the expansion of data management, electricity data, and energy efficiency knowledge and skills between the two entities.

Internally, GVCE held regular project management meetings, weekly or fortnightly which all key staff would attend with minutes and action plans created after each meeting. This was an effective tool for monitoring activity against the Gantt chart and milestones. During the active HEA phase, meetings were held with Assessors monthly and ad hoc, and for Survey and Administration staff usually a 5-10 minute briefing at the start of their shift sufficed.

EMPLOYMENT & OPPORTUNITIES

It was the intention of GVCE to provide employment opportunities and build skills within the local community. Twenty people were employed over the term of the project and a co benefit of this is that GVCE has broadened its skills base, which has in turn expanded the capacity of the organisation, including;

- Increased expertise in energy efficiency and energy billing.
- Managed and understood complex data.
- Experience in call centre type activities (Surveying).
- Advanced scheduling processes.
- Developed community and professional links.
- Refined communication and recruiting techniques.
- Professional management and accounting practices.

TABLE 9 STAFF EMPLOYED BY GVCE

POSITION	Average FTE per year over the term of the project (2.94 years)	Role
CEO	.14	Oversight of project, workshop facilitator
Finance Manager	.72	Manage finance/administration
Administration & Data	.88	Manage data, data entry, customer service
Household Case Manager/Home Energy Assessor	1.11	Conduct HEAs. Contribute to recruitment activities, data entry
Project Manager including Project Developer	.92	Develop and manage project
Partnerships/Logistics/Works Coordinator	1.06	Recruitment, networking, scheduling, customer service, data
Surveyors	.17	Surveying, data entry
TOTAL STAFF	**5 FTE**	

GVCE staff. Left to right.
Front row: Mark Hall, Monique Noles, Leeane Button, Dawn Taylor
Back row: John Davey, Lyle Taylor, Chris Walker, Geoff Lodge, Jacob Button, Megan Corbett

CONTRACTORS

This project provided employment and growth opportunities for our contractors, all of whom were based in Victoria. As well as the 5 employed Home Energy Assessors, 2 were paid as contractors.

ROLE	ORGANISATION
Research Partner	Monash Sustainability Institute
Data Collection software developer and IT support	Advance Computing
Home Energy Assessors	2 local experienced Assessors
Retrofit Installer	Homelab

SUPPLIERS — RETROFIT ACTIVITIES

There were 21 suppliers of retrofit products and services, including the retrofit installer. The total investment into this part of the project was $153,539.

Alternative Technology Association Inc	Cobram Electrical and Data	Hume Electrical
Astro Logistics (freight)	Eco results	IGA
Benalla Motorcycles & Power Equipment	ecoMaster Pty Ltd	littil Led Lights
Bicknell's Freight Shepparton	Green 'n Grow Garden Centre	Master Distributors
Billabong Garden Complex	Harvey Norman	Middendorp Electrical
Bunnings Warehouse Shepparton	Heat Saver Australia	Sage Horticulture
Carbon Reduction Industries	Homelab	Tatura Men's Shed

SUPPLIERS — OTHERS

A range of other suppliers benefitted from this project including computer retailers, the auditor, caterers, food retailers and media outlets.

BUDGET

*The following Budget calculations are based on actual figures up to the 29th February 2016 and estimates to the 31st May 2016

TABLE 12 INITIAL BUDGET, SCHEDULE 3. 2 OF FUNDING AGREEMENT

The Other Contributions (cash and in-kind) are reported below.

EXPENSE CATEGORIES	INITIAL LIEEP FUNDING AGREEMENT	ACTIVITY GENERATED INCOME	OTHER CONTRIBUTIONS (CASH)	OTHER CONTRIBUTIONS IN-KIND	INITIAL LIEEP AGREEMENT SUB-TOTAL COST
Salaries	$1,079,055	$-		$-	$1,079,055
IT services	$40,660	$-		$15,211	$55,871
Project Financial services & oversight	$90,314	$-		$22,579	$112,893
Data Analysis & Reporting	$129,900			$20,100	$150,000
Training Services	$14,567			$7,273	$21,840
Partner activities	$121,404			$485,616	$607,020
Advertising	$32,800	$-		$-	$32,800
Travel	$39,750	$-		$-	$39,750
Equipment Purchase	$29,150	$-		$-	$29,150
Energy saving devices (Cash from sale of VEECs)		$350,000		$-	$350,000
Other materials	$35,476	$-		$-	$35,476
Installation of energy saving devices (1000 installations at $150)	$150,000	$-		$-	$150,000
General expenses -	$62,570	$-		$-	$62,570
Equipment hire, Rental support, data from Lead Organisation	$-	$-		$130,000	$130,000
Supply of 250 datasheets for group 2 households provided by a consortium Partner	$-	$-		$75,000	$75,000
Other Contributions					
Connect GV= Project support – included in partner activities				$-	$-
IT subcontractors -listed above				$-	$-
Total as set out in agreement	$1,825,646	$350,000		$755,779	$2,931,425

BUDGET SUMMARY

The following budget summary of the Powerdown Project discusses the LIEEP funding and co-contributions including both in-kind and cash. The discussion will address variations from the initial budget to the final budget, focusing on the reasons that the variations were required, the effect changes had on the budget and how they were resolved.

The project was achieved within budget, nevertheless was not without problems arising which led to two major alterations. The alterations required Deeds of Variation and changes to planned activity within some expense categories to accommodate shifts in approach, these changes will be discussed under each category description in this section of the report. Prior to the LIEEP Funding Agreement being signed, negotiations between GVCE and the Department resulted in a first Milestone payment of $234,934. The unusually large upfront payment was in recognition that GVCE is a small not-for-profit organisation and required cash to begin the initiation phase of the project. The funds were moved from the back end of the project budget to the beginning, hence at times throughout the project it appeared there were excess funds in the LIEEP account. The upfront payment served its purpose as the Milestone 2 payment, which was expected in September/October 2013, was not received until February 2014. At the time of receipt of the payment the Powerdown bank account had just enough cash for two pay runs. The circumstances of the holdup in payment is unknown to GVCE, consequently beyond GVCE's control and highlights the need for reliable, consistent cash flow from funding bodies to recipients in order assure regular cash flow for smaller organisations when applying for funding.

The lag time between writing the submission and undertaking the activities to deliver outcomes was partly responsible for the variations in the project budget. This situation was influenced by the speed of change in community perception, business practices, government legislation or fluctuation in the economy and technology.

The actual project funding revenue and expenses were tracked against a baseline cash flow projection throughout the project which guided the project team to remain within budget. New baseline cash flows were introduced when Variations 1 & 2 were approved. The final expenditure included the interest accrued throughout the project. Expenditure decisions were always made with the budget category in mind. The two Variations to the Deed of Agreement in regard to the budget were;

- Deed of Variation 1 (DoV 1), June 2014 related to in-kind contribution only.
- Deed of Variation 2 (DoV 2), December 2014 related to both in-kind and LIEEP funding.

There were unexpected costs throughout the project; these costs were mitigated by reducing some activities or purchases and reassigning the unexpected costs into suitable categories. The introduction of grocery vouchers as an incentive was not in the original project budget and came at a direct cost of $10,800 for the vouchers. There were also indirect costs associated with this activity including extra administrative staffing and registered postage. The staff time spent to ensure compliance of paperwork was not included in the planning of budget. Many of the participants needed to be contacted more often than originally planned, either by phone or in person, to correctly complete paperwork due to the stringent rules set by the funding body and the electricity distributors. Paperwork requirements changed throughout the project necessitating more work than projected.

Much of the unforeseen cost was due to additional human resource requirements. Of greatest burden was the administration cost attributed to the management and processing of data. GVCE had underestimated the work involved in the data processes which were required to meet the research partner's and CSIRO standards. Also, towards the end of the project more resources were needed to produce extra reports required by the department and CSIRO; Cost benefit analysis; Co benefit analysis; Media Consents; Consortium feedback: Communication and messaging Survey.

There was a combination of over and under spend of categories throughout the budget however none exceeded the allowance stated in clauses 4.7.2 and 4.7.3 under budget flexibility. The Project manager set a limit of 1% ($18,258) of the total expenditure budget funding as a measure to describe what represented a significant transfer between categories, transfers less than $18,258 were described as insignificant. Significant transfers will be addressed per category.

*The following Budget calculations are based on actual figures up to the 29th February 2016 and estimates to the 31st May 2016.

TABLE 13 INITIAL EXPENSE BUDGET CATEGORIES AGAINST FINAL BUDGET CATEGORIES

	INITIAL LIEEP FUNDING AGREEMENT	ACTUAL LIEEP EXPENDITURE FINAL BUDGET*	DIFFERENCE NEGATIVE NUMBER = OVER SPEND (IN BOLD) POSITIVE NUMBER = UNDER SPEND
Salaries	$ 1,079,055	$ 1,052,042	$ 27,013
IT services	$ 40,660	$ 69,256	**-$ 28,596**
Project Financial services & oversight	$ 90,314	$ 61,814	$ 28,500
Data Analysis & Reporting	$ 129,900	$ 129,900	$ -
Training Services	$ 14,567	$ 14,564	$ 3
Partner activities	$ 121,404	$ 121,227	$ 177
Advertising	$ 32,800	$ 33,967	**-$ 1,167**
Travel	$ 39,750	$ 69,650	**-$ 29,900**
Equipment Purchase	$ 29,150	$ 29,751	**-$ 601**
Other materials	$ 35,476	$ 38,995	-$ 3,519
Installation of energy saving devices (1000 installations at $150)	$ 150,000	$ 153,539	**-$ 3,539**
General expenses -	$ 62,570	$ 63,120	**-$ 550**
Total	**$ 1,825,646**	**$ 1,837,826**	**$ -**
In-kind	Initial LIEEP funding agreement	Actual LIEEP in-kind received	Difference posititive number = short fall
In-kind	$ 755,779	$ 740,083	$ 15,696
VEECs & donated energy saving devices	$ 350,000	$ 237,123	$ 112,877
Total	**$ 1,105,779**	**$ 977,206**	**$ 128,573**

Note: This total includes Interest accrued during project; $12,000 spent over all categories

SALARIES

There were no reportable variations to the dollar value of the salaries category over the project. Changes in staffing levels were revised in the cash flow projection which exposed that by the end of the project there would have been an under-spend $27,012.78 as shown in table 2. The under spend was distributed to other categories that exceeded the category budget in particular partner activities. As referred to earlier, transfers from the salary, or any other category did not exceed the percentages referred to in clauses 4.7.3 and 4.7.3 under budget flexibility of the agreement. The under spend in salary was significant but was utilised to the advantage of the project.

Problems occurred during the project due to extra time necessary to complete activities. From the beginning of the HEA phase it became obvious more time was required to complete all components of an assessment than was originally calculated. It had been intended HEA recommendation reports would be generated at the time of the HEA and left with the participant. In practice it was impracticable due to time constraints and the extra writing time required to present the household with the best advice possible in the report. As a result, the process of producing and sending the recommendations report became an administrative task not a HEA task. There were many other scenarios that extended the time required to finalise the HEA process. The attrition or "drop out" of participants was never allowed for in the original project design.

The complexity of conducting phone surveys was not fully appreciated at planning stage therefore the time necessary to complete the target number of compliant Survey 2's far exceeded the original estimate, particularly as some participants were rung up to 7 times. The problem of having extra costs associated with the extra time required for delivery of target numbers was resolved through a combination of management techniques and unanticipated benefits resulting from changes to the Salary category. Staffing levels fluctuated, and at times there was less staff than originally forecast, hence the extra hours required for other staff was able to be covered but created a heavy workload. The DoV 2, in December 2014, reduced the number of participants to be surveyed; this subsequently released previously allocated salary to be used for the Group 1 and 3 surveys and other inadequately funded tasks. In August 2015 the Project Manager position became vacant and instead of filling the position from outside GVCE, a current staff member was promoted to the position, leaving one full-time position unfilled, relieving considerably the pressure on the Salary budget. It was due to not filling the positon that led to the final underspend in the category that was utilised to top up overspends in other categories.

IT

GVCE's funding proposal application included $24,442 for a feasibility study to investigate a utility scale solar photovoltaic system for embedded generation in a "gated" community such as a caravan park. The funding body requested the feasibility be removed from the application and directed the amount to be taken from the IT category, recognising this would need to be varied later in the project. DoV 2 increased the IT category value from $40,660 to $70,660. The Webform was created to collect and store the extensive data required for the project. The creation and on-going maintenance was a labour intensive and costly endeavour but was an essential tool to track and store the data collected.

PROJECT FINANCIAL & OVERSIGHT

DoV 2 included the transfer of $30,000 from the Project Financial & Oversight category to the Travel category; this reduced the initial Project Financial & Oversight category from $90,314 down to $60,314. A component of oversight projected was to be carried out by the GVCE CEO. When the variation transfer was made the allocation of the CEO salary component was reduced, that and close monitoring of the category spend, limited the over spend to $1,500 of the reduced allocation from DoV 2. In Table 2 the comparison is between the initial budget and the actual budget not taking into account DoV 2 consequently indicates a significant underspend.

DATA ANALYSIS & REPORTING

There were no variations to the dollar value of the data category; this was due to having a formal fixed cost agreement in place. The agreement covered all works to be undertaken.

TRAINING SERVICES

There were no variations to the dollar value of the training category; All training was carried out by a combination of external trainers and experienced LIEEP staff.

PARTNER ACTIVITIES

DoV 2 transferred $30,000 from the Partner Activities to the IT category to ensure there were adequate funds to cover the outlay required for the Webform development and updates. This resulted in the category total being reduced from $121,404 to $91,404. The reduction of such a large amount from the category created pressure budgeting for the all planned activities including final report activities toward the end of the project. When changes to the Salary category showed an under spend, an internal transfer of funds was made from Salaries to Partner Activities bringing the category to $121,227 close to the initial budget total.

ADVERTISING

There were no variations to the Advertising category. However, there was an overspend of $1,167 which was insignificant and covered by underspends in other categories.

TRAVEL

DoV 2 transferred $30,000 from Project Financial Services & Oversight to Travel. The necessity for extra funding for travel became apparent as the HEAs and Workshops were delivered to a wider area than first anticipated. Also the erratic nature of incoming appointments had not been sufficiently taken into account during the planning phase of the project. The travel costs had been estimated using a best case scenario design, calculating that maximum HEAs would be undertaken on one day and in a cluster area which would limit travel distance and time. In reality it was rarely possible to organise appointments in clusters due to extensive geographic area the project covered. The project also incurred extra travel and accommodation costs to attend the 4 LIEEP interstate Forums.

EQUIPMENT

There were no variations to the dollar value of the Equipment Purchase category. There was an insignificant over spend in the category which was covered by other category underspends.

VEECS & DONATED ENERGY SAVING DEVICES

TABLE 14 ENERGY SAVING DEVICES (CASH FROM VICTORIAN ENERGY EFFICIENCY CERTIFICATE (VEEC))

SUMMARY OF $VALUE ATTRIBUTABLE TO EXPENDITURE ITEM; ENERGY SAVING DEVICES FOR ALL PROJECT		
DESCRIPTION OF TABLE		**TOTAL FOR PROJECT**
$value of VEECs reported to invoice #65 priced at day of installation		$ 46,032.00
$value of retrofit opportunity cost reported		$ 59,933.96
$value of Workshop & giveaway products reported		$ 114,138.87
$value of HEA recruitment drive giveaways (popup shop)		$ 17,018.13
TOTAL ENERGY SAVING DEVICES AND VEECS REPORTED IN ALL PROJECT	**TOTAL**	**$ 237,122.96**

In the approved Budget, cash raised from the sale of VEECs was referred to as "activity generated income". It was projected through GVCE's planning process, the sale of VEECs would raise $350,000 based on a single VEEC value of $26.00 (current at time of writing application). During negotiation, prior to the signing of the agreement, the description of VEEC value to the project was altered to "market value at time of installation" with no set dollar value attributed. The alteration of the description was in recognition the VEEC value had already dropped considerably and would continue to vary throughout the project. At the same time, it was recognised that the VEEC market had changed noticeably, there was a high amount of businesses being accredited to deliver VEEC activities. These businesses were aggressive in their approach which quickly reduced the amount of prescribed retrofit activity available in the project area. This resulted in less VEECs per retrofit available to the project.

As a sign of good-faith GVCE enlisted a combination of ways to make up for the shortfall in the VEECs value and increase GVCE's contribution to the project;

1. The total dollar value of VEECs installed in the project is based on 2,863 VEEC's created from retrofitting activities and were calculated by the market value on the day of installation, resulting in a total value of $46,302.00 added to the project.
2. The dollar value of "opportunity cost" forgone by GVCE and given directly to the project in the form of energy saving products many donated by GVCE at no cost to the project. The estimated value was $59,934.96.
3. The energy efficient products given away at Workshops, Information Sessions and as appreciation to partners to encourage participation donated by GVCE to the project, was estimated at $114,139.87.
4. The dollar value of products given away at pop up shops and expos to recruit HEA participants at no cost to the project. The estimated value of $17,018.13.

The above mentioned donations to the project by GVCE returned $191,091, which reduced the cash outlay required. When the donations were added to the cash value of the VEEC's created this resulted in a total of $237,122.96 for "schedule 3.2, Activity generated" income budget line. The shortfall is acceptable as the category wording in the agreement allows for a the calculation based on "market value at time of installation" with no set dollar value.

OTHER MATERIALS

No variations were made to this category during the project however there was an insignificant over spend of $3,519.15 which was covered by other categories underspends.

INSTALLATION OF ENERGY SAVING DEVICES (1024 INSTALLATIONS)

The total amount of funding paid out for retrofit installations and to purchase stock products to retrofit was $153,539. The approved budget was $150,000. At the end of the retrofitting stage of the project $3,276 of stock remained in the warehouse reducing the total spent for actual retrofitting to $150,263. In the agreement between the retrofit contractor and GVCE a baseline value of $9.00 was struck for each VEEC. The contractor created and traded the VEEC's generated from the project's retrofit activity, then sold the VEECs outside the project. The invoice presented by the Contractor to the project credited $9.00 per VEEC off the invoice, thereby returning the value directly back to the project. When VEEC's were sold at a higher value than $9.00 the extra money stayed with the Contractor, compensating him for the low installation rate struck in the retrofit installation contract. This arrangement brought in $46,032 of unseen funding to the project which is included in the Activity Generated income. The full VEEC value subsidised the retrofit project costs rather than returning cash but resulted in the same outcome.

GENERAL EXPENSES

There was no variation to the dollar value of this category an insignificant overspend that was covered by underspends in other categories.

CREDIT INTEREST ON LIEEP FUNDING

Credit interest received during the project of $12,000, was added to the expenditure budget resulting in a final expenditure during the project of $1,837,826.

SUMMARY

- The project was achieved within budget.
- The lag time between writing the submission and undertaking the activities to deliver outcomes was partly responsible for the variations being necessary.
- Human resources to collect, manage and process data was underestimated.
- Changes after the commencement of the project did increase the reporting requirements through the project and this increased required hours.
- Distances essential to be travelled in rural projects were a burden on the budget.
- Consistent cash flow from funding bodies to recipients is particularly critical for small organisations.

IN-KIND CONTRIBUTIONS

The in-kind contributions were a significant financial non cash input to the project. The in-kind came from Consortium partners including GVCE (Schedule 3.1) and non-partner contributions (Schedule 3.2) and was budgeted at $755,779 in the approved Agreement.

At project start there were 14 Consortium partners and 2 other non-partner in-kind contributors.

In June 2014 DoV 1, Sustainable Regional Australia (SRA) and Brotherhood of St Laurence (BSL) withdrew from the project. This resulted in a loss of budgeted in-kind of $284,012.

In DOV 1, two new Consortium partners were added. Moreland Energy Foundation (MEFL) was contracted to supply the Group 2 database and also to develop and conduct Surveys for this group. Jack Labno from Homelab, the project retrofit contractor, also became a partner. These two partners added $163,996 and $79,960 respectively to the in-kind budget compensating for 86% of the loss from the original consortium withdrawals. On top of this, the research contract with Monash University was varied, which resulted in an in-kind increase of $39,030.

GVCE also negotiated with Advance Computing, the IT contractor (non- partner) to increase their in-kind contribution as it was evident that the amount of work required for the Webform had been underestimated. This contribution increased from $15,211 to $30,000.

The DoV 2 was signed off in December 2014, which included 2 changes to in-kind contributions. The first was a significant increase of $150,000 to GVCE's contribution. It was clear from early reporting calculations that GVCE was contributing in-kind well beyond the original estimates. The second change arose due to the removal of Group 2 from the project, MEFL's in-kind reduced to reflect the amount of work completed and the value of the database.

BUDGETED IN-KIND AND REPORTING

TABLE 15 IN-KIND CONTRIBUTION BY BUDGET CATEGORY

EXPENSE CATEGORIES	CONTRIBUTIONS IN-KIND AS SETOUT IN AGREEMENT	ACTUAL OTHER IN-KIND CONTRIBUTIONS	DIFFERENCE NEGATIVE NUMBER = MORE IN-KIND INCLUDED THAN INITIAL AGREEMENT (IN BOLD) POSITIVE NUMBER = IN-KIND NOT RECEIVED
IT services	15211	33382	-18171
Project Financial services & oversight	22579	24885	-2306
Data Analysis & Reporting	20100	59213	-39113
Training Services	7273	22639	-15366
Partner activities	485616	384081	101535
Equipment hire, Rental support, data from Lead Organisation	130000	130000	0
Supply of 250 datasheets for group 2 households provided by a consortium Partner	75000	71800	3200
Connect GV= Project support		260	-260
Total	755779	726260	29519

TABLE 16 IN KIND CONTRIBUTION BY ORGANISATION

CONSORTIUM MEMBER	IN-KIND TARGET ORIGINAL	IN-KIND TARGET VARIATION 1 JUNE 2014	IN-KIND TARGET VARIATION 2 DEC 2014	ACTUAL IN-KIND TOTAL END OF PROJECT
Sustainable Regional Australia	$ 204,489	Withdrawn	$ -	$ -
Brotherhood StLaurence	$ 79,523	Withdrawn		$ -
GVCE (including Training category)	$ 147,587	$ 147,587	$ 297,587	$ 299,963
Greater Shepparton City Council	$ 56,802	$ 56,802	$ 56,802	$ 12,432
GV Ethnic Council	$ 17,041	$ 17,041	$ 17,041	$ 5,610
Vic Caravan Parks Assoc	$ 113,605	$ 113,605	$ 113,605	$ 115,425
Shepparton Access	$ 17,041	$ 17,041	$ 17,041	$ 978
Murch River Road Caravan	$ 5,680	$ 5,680	$ 5,680	$ 1,510
Dame Pattie Menzies	$ 5,680	$ 5,680	$ 5,680	$ 4,455
Shepparton Villages	$ 17,041	$ 17,041	$ 17,041	$ 180
City of Wangaratta	$ 28,401	$ 28,401	$ 28,401	$ 30,077
Kelvin Grove Relocatable	$ 5,680	$ 5,680	$ 5,680	$ 3,885
Rural Housing Network	$ 17,041	$ 17,042	$ 17,041	$ 4,845
Monash University	$ 20,100	$ 59,130	$ 59,130	$ 59,213
MEFL		$ 163,996	$ 72,000	$ 71,800
Homelab		$ 79,960	$ 79,960	$ 82,245
TOTALS	**$ 735,711**	**$ 734,686**	**$ 792,689**	**$ 692,618**
Other Contributions				
Advance	$ 15,211	$ 30,000	$ 30,000	$ 33,382
Connect GV	$ 4,857	$ 4,857	$ 4,587	$ 260
*The Chase and Tyler Foundation				$ 6,084
**The Advisor				$ 400
**Top Gun Media				$ 7,339
TOTAL IN KIND	**$ 755,779**			**$ 740,083**

Total VEECS & donated energy saving devices	**$ 237123**
TOTAL OF ALL IN KIND CONTRIBUTIONS FOR PROJECT =	**$ 977,206**

*The Chase and Tyler were added as a partner but did not have an in-kind target added to the Schedule

**The Advisor and Top Gun Media provided advertising at a discounted rate

Yellow indicates a variation to in-kind

- Compared to the approved budget, there was a shortfall of project in-kind contributions from partners to the value of $29,519. If consideration was given to reported in-kind from other organisations then the shortfall was only $15,696.
- Whilst the project responded to major in-kind changes by seeking approval for variations to the schedule, it did not review all of these individual contributions. There were no adjustments made to in-kind targets for the consortium partners that remained in the full length of the project, the result of this was that the in kind targets set for some partners was unrealistic.
- GVCE, VicParks, City of Wangaratta, Monash University, Advance Computing and Homelab all exceeded their in-kind target. These results certainly reflect the workload distribution within the project.
- Feedback from the Consortia was that In-Kind targets were set too high at the start of the project. Partners found it hard to report their contributions as in the beginning there were no set guidelines. The project went on to create processes, templates and costings to assist partners in their reporting.

PROJECT RESULTS

REFERRALS BY CONSORTIA

Consortium partners referred 600 clients to the project equating to 43% of all participants.

TABLE 17 HEA REFERRALS BY CONSORTIA

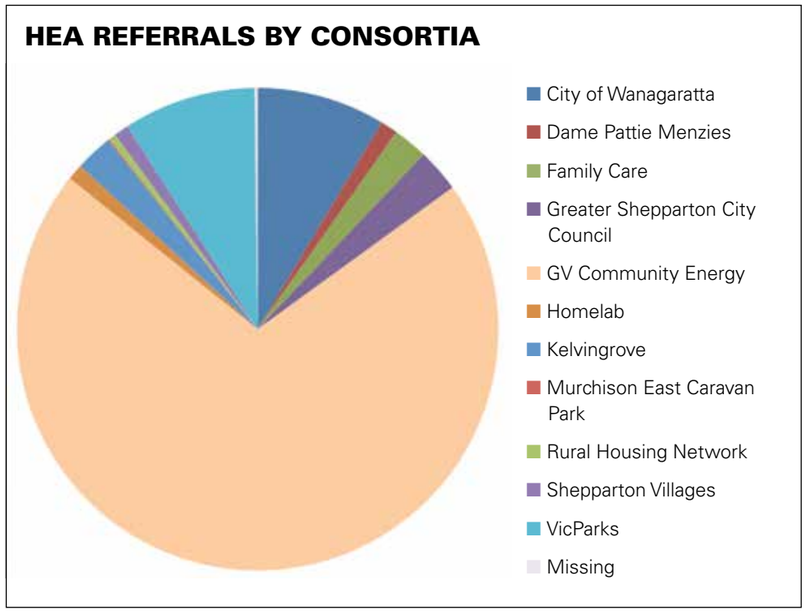
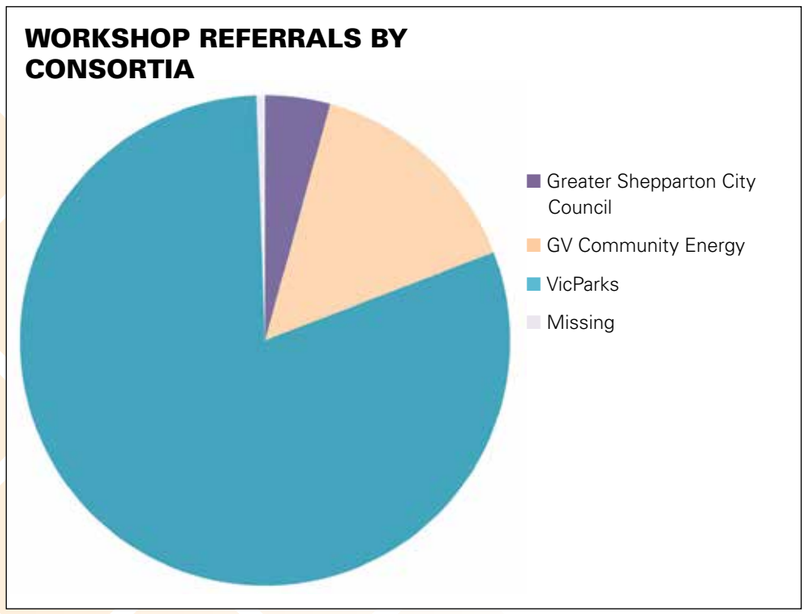


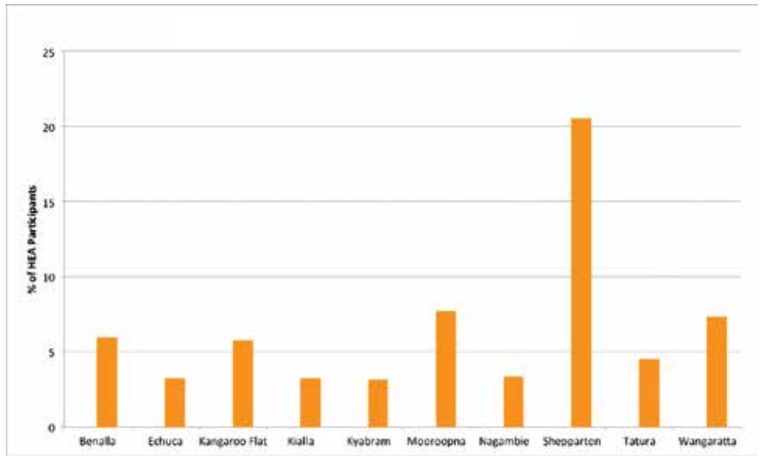
TABLE 18 WORKSHOP REFERRALS BY CONSORTIA



GROUP 1 HOME ENERGY ASSESSMENT PARTICIPANT SNAPSHOT

The Powerdown Project delivered HEAs to 1,032 households across 113 towns.

TABLE 19 TOP 10 GREATEST NUMBER OF HEA PARTICIPATION BY TOWN



PEOPLE

- The mean age of HEA participants was 68.
- 69% of the sample were retired.
- 23% of participants were aged 59 and under.
- 45% of households had one occupant and 39% had 2 occupants.
- 48% of participants highest level of education was High School-Year 10.
- 23% of households were renting.
- 149 participants were born overseas-38 different countries were represented in "Country of birth".
- 3.8% of households spoke a language other than English at home.
- 7.8% or 81 households have a person with a disability living in the home.

TABLE 20 HOME OWNERSHIP STATUS — HEA

OWNERSHIP STATUS (HEAS)	NUMBER OF HOUSEHOLDS	PERCENTAGE
Owned	465	45.1
Mortgaged	87	8.4
Rent/buy Scheme	2	0.2
Rented	240	23.3
Life tenure Scheme	5	0.5
Village contract	229	22.2
Other	1	0.1
Missing	3	0.3
Total	**1032**	**100.0**

TABLE 21 AGE OF PARTICIPANTS – HEA

OWNERSHIP STATUS (HEAS)	NUMBER OF HOUSEHOLDS	PERCENTAGE
10 to 19	1	0.1
20 to 29	20	1.9
30 to 39	61	5.9
40 to 49	69	6.7
50 to 59	91	8.8
60 to 69	208	20.2
70 to 79	323	31.3
80 to 89	232	22.5
90 to 99	20	1.9
Missing	7	0.7
Total	**1032**	**100.0**

TABLE 22 BIRTHPLACE OF PARTICIPANTS

BIRTHPLACE	PERCENTAGE
Austria	0.1
Bahamas	0.1
Bangladesh	0.1
Bosnia and Herzegovina	0.1
Estonia	0.1
Fiji	0.1
Former Yugoslav Republic of Macedonia (FYROM)	0.1
Greece	0.1
Hungary	0.1
Iran	0.1
Iraq	0.1
Lithuania	0.1
Malaysia	0.1
Pakistan	0.1
Philippines	0.1
Samoa	0.1
Singapore	0.1
Slovakia	0.1
Southern and East Africa	0.1
Sri Lanka	0.1
Vanuatu	0.1
Congo, Democratic Republic of	0.2
France	0.2
Latvia	0.2
Poland	0.2
Sudan	0.3
Wales	0.3
Ireland	0.4
Germany	0.5
India	0.5
New Zealand	0.8
Scotland	0.8
Missing	0.8
Afghanistan	1.0
Netherlands	1.0
Italy	1.6
United Kingdom, Channel Islands and Isle of Man	2.1
England	2.4
Australia	84.8

HOUSING

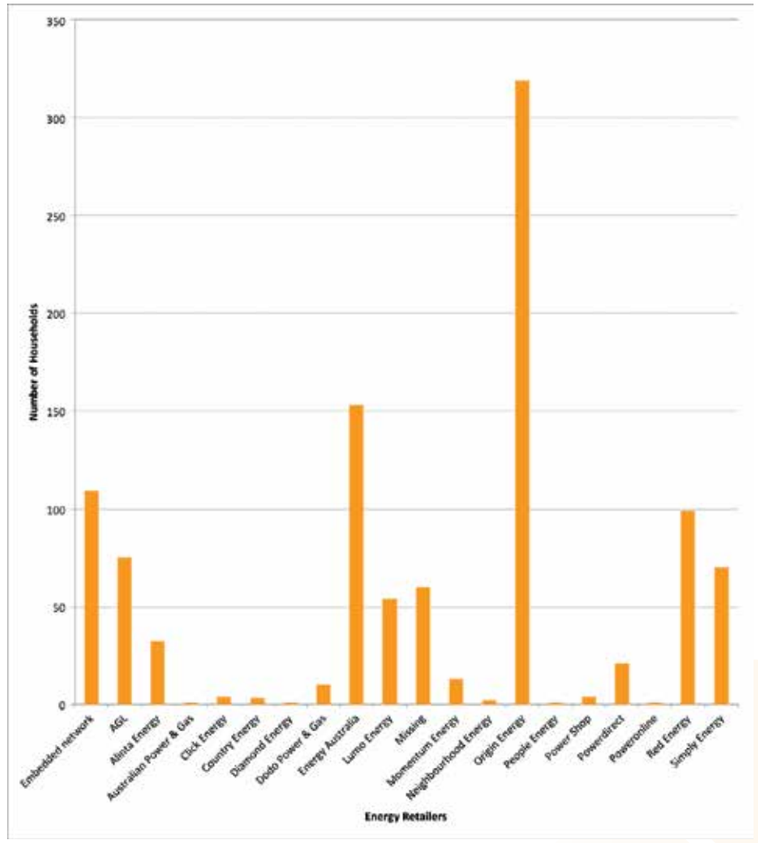
- Housing stock varied in age,143 dwellings were 60 years and over.
- 345 homes had an electric storage hot water service.
- 21% of homes had best practice bulk ceiling insulation.
- 22 homes had un flued gas heaters.
- 21% of houses had Solar PV.
- 20% of households reported that their Solar PV wasn't working.

ELECTRICITY

HEA Households in the project were customers of 15 of the 18 Electricity Retailers in Victoria, as well as customers of 3 embedded networks.

- 109 HEA households were connected to an embedded network.
- Origin Energy had the most retail customers in the project followed by Energy Australia, Red Energy & AGL.
- 673 HEA participants were receiving a government concession on their electricity bill.
- 243 or 24% of participants eligible for a government concession on their electricity bill were not receiving it.
- The pre engagement median daily electricity consumption for HEA households was 10.2kWh.
- After having a HEA, 302 (29.5%) participants rang their energy retailer to register for a concession, seek discount or combine their gas and electricity bills.
- 67 HEA households changed their retailer following the HEA.

TABLE 23 HEA ELECTRICITY RETAILERS



*Neighbourhood Energy is part of the Alinta Energy Group

**Australian Power & Gas is a part of AGL

***Country Energy is part of Origin

****Power online is not a registered retailer

RETROFITS

- 865 houses received draught stopping.
- Half of homes received a hot water service Valve Cosy.
- Half of homes received HWS insulation.
- 34% of households received change over lighting.
- Average value of retrofit per house was $250.22.

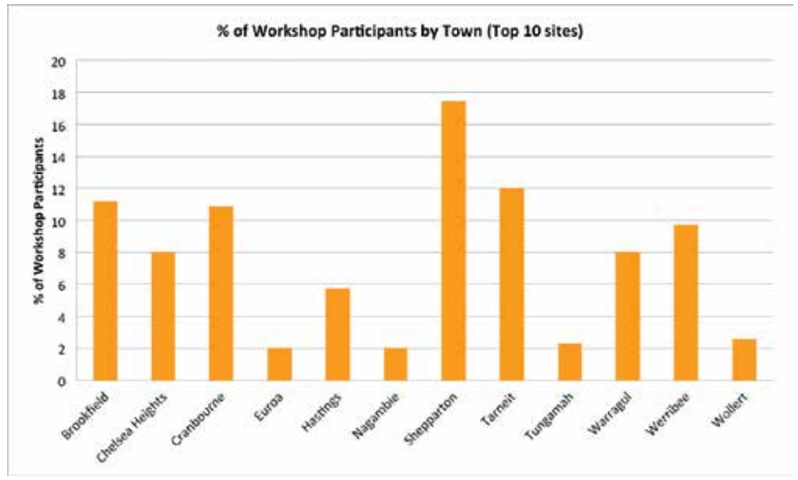
TABLE 24 NUMBER OF HOUSEHOLDS RECEIVING RETROFITS BY TYPE

RETROFIT TYPE	NUMBER OF HOUSEHOLDS	PERCENTAGE
Draught stopping	865	84.6
HWS valve cozy	533	52.1
HWS pipe insulation	515	50.3
EcoSwitch	367	35.9
Lighting	347	33.9
Upgrade ceiling insulation	285	27.9
Electric blanket	193	18.9
CO detector	127	12.4
Fridge thermometer	111	10.9
Showerhead	88	8.6
Additional expense	29	2.8
SPC PC/TV	13	1.3
Manchurian pear tree	12	1.2
HeaterMate	9	0.9
Electrical investigation	5	0.5
Pelmet	4	0.4
Renshade window cover	2	0.2
Total	**1023**	**100.0**

GROUP 3 WORKSHOP PARTICIPANT SNAPSHOT

541 people attended 23 Workshops, of these, the project registered and retained 350 participants that completed all relevant activities and paperwork.

Table 25 Workshop participants by town



- 305 participants lived in a residential village, 240 of these, resided at a Lifestyle Community site.
- The mean age of HEA participants was 73.
- 87% of households are retired.
- 96% of participants were 60 years or older.
- 50% of households have one occupant and 47% have 2 occupants.
- 47% of participant's highest level of education was High School-Year 10.

TABLE 26 AGE OF PARTICIPANTS — WORKSHOPS

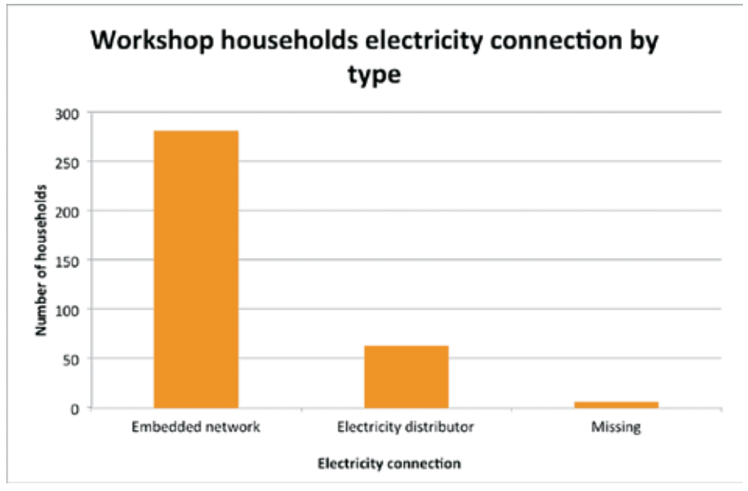
AGE OF PARTICIPANTS (WORKSHOPS)	NUMBER OF PARTICIPANTS	PERCENTAGE
10 to 19	0	0.0
20 to 29	1	0.3
30 to 39	1	0.3
40 to 49	2	0.6
50 to 59	10	2.9
60 to 69	95	27.1
70 to 79	149	42.6
80 to 89	62	17.7
90 to 99	6	1.7
Missing	24	6.9
Total	**350**	**100.0**

TABLE 27 OWNERSHIP STATUS — WORKSHOPS

OWNERSHIP STATUS	NUMBER OF HOUSEHOLDS	PERCENTAGE
Owned	44	12.6
Mortgaged	0	0.0
Rent/buy Scheme	2	0.6
Rented	13	3.7
Life tenure Scheme	0	0.0
Village contract	290	82.9
Other	0	0.0
Missing	1	0.3

ELECTRICITY

TABLE 28 WORKSHOP ELECTRICITY CONNECTIONS



- 281 Households were connected to an embedded network.
- 25 (40%) of Workshop participants connected to the grid contacted their current electricity retailer to register for a concession, seek discount or combine gas and electricity bills following the Workshop
- Seven Workshop households changed their retailer.
- Prior to the Workshop the median daily use for households was 7.2kWh

TRIAL RESULTS

The aim of this study was to examine attitudes and perceptions associated with the voluntary implementation of domestic energy use behaviours and/or products and to identify barriers that impact on adoption levels.

This section describes the outcomes of the self report questionnaires Survey 1(pre engagement survey) and Survey 2 (6 month post engagement survey). The surveys collected data to assess and compare the efficacy of the Home Energy Assessment and Workshop toward: Perceptions to energy efficiency; Barriers to energy efficiency; Attitudes to energy efficiency; Effectiveness of a behaviour commitment tool(Fridge List); Uptake of project recommendations (activities/ behaviours).

PERCEPTIONS TO ENERGY EFFICIENCY

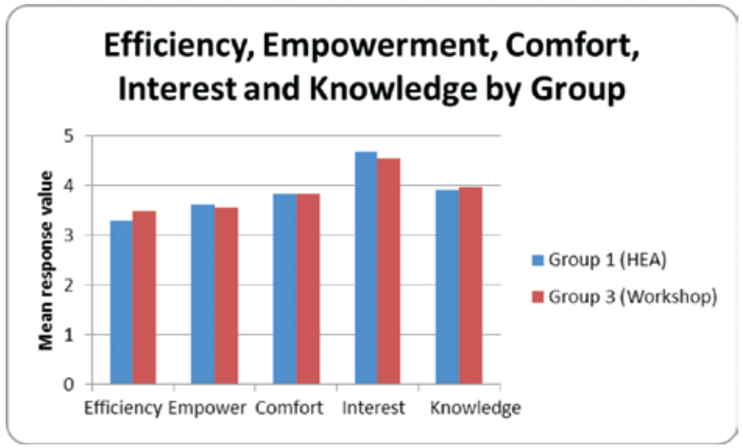
The following questions were asked to evaluate perceptions to energy efficiency. Participants were asked to respond on a scale of 1-5:

How energy efficient has your household become over the last 2 years?
How empowered does your household feel in relation to its energy consumption?
How comfortable does your household feel? (heating/cooling/lighting/etc)
How interested is your household in conserving energy in the home?
My household knows what to do to conserve energy in the home.

PERCEPTIONS TO ENERGY EFFICIENCY AT SURVEY 1

In general, at Survey 1, both groups reported medium levels of current energy efficiency, and a high level of interest in conserving energy in the home. Therefore, both groups showed some motivation and scope for improved energy efficiency.

FIGURE 1 PERCEPTIONS TO ENERGY EFFICIENCY



CHANGES IN PERCEPTION TO ENERGY EFFICIENCY FROM SURVEY 1 TO SURVEY 2

The analysis of key beliefs about household energy efficiency, comfort and capacity to save energy over time, revealed that both groups showed improvements. The effect was stronger for the Workshop than for the HEA on perceptions of household energy efficiency and ratings of comfort in the home. Therefore, perhaps because of differences in housing contexts between groups, the activities undertaken in the Workshop, or the interaction between these and other household characteristics, individuals who had attended the Workshop came to believe more strongly over time than HEA participants that their households were energy efficient and somewhat more comfortable.

FIGURE 2.1 CHANGE IN ENERGY EFFICIENCY

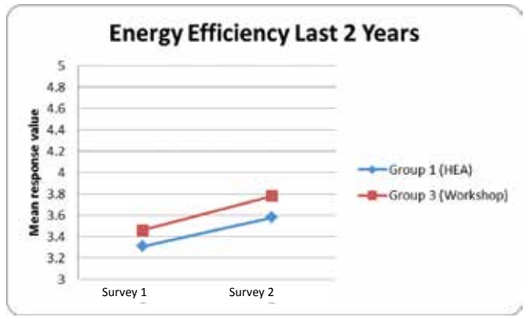


FIGURE 2.2 CHANGE IN EMPOWERMENT

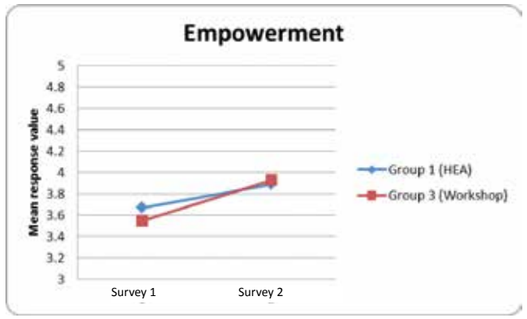


FIGURE 2.3 CHANGE IN COMFORT

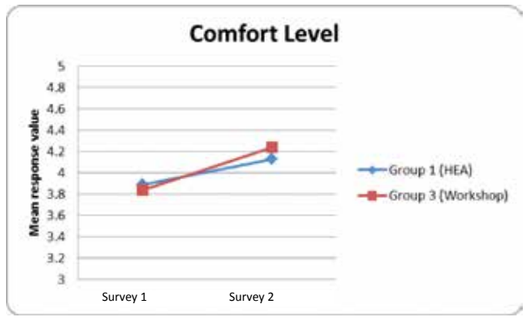


FIGURE 2.4 CHANGE IN INTEREST

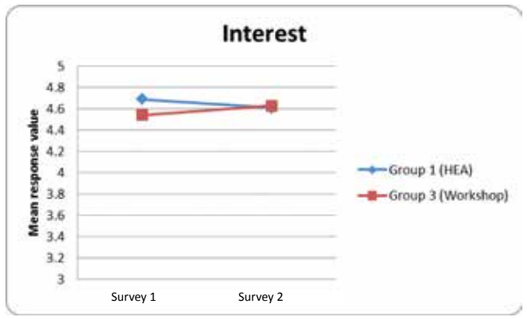
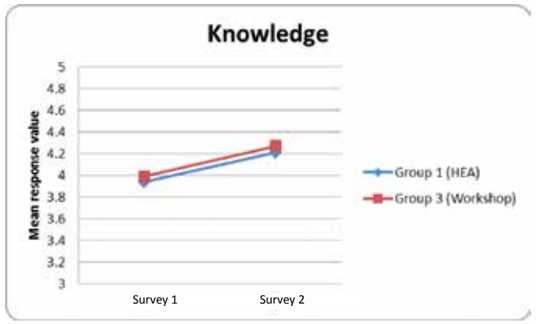


FIGURE 2.5 CHANGE IN KNOW LEDGE



EFFECTIVENESS OF HEA & WORKSHOPS ON PERCEPTIONS TO ENERGY EFFICIENCY

The results reported that Group 3 attributed a perceived increase in empowerment in energy consumption to the Workshop to a greater extent than did participants in Group 1 after the Home Energy Assessment. However, there was no difference between groups in attribution to the HEA or Workshop of comfort level. Moreover, there was a relatively higher and significant attribution of interest regarding energy efficiency to the intervention in Group 3 compared to Group 1. Group 3 attributed a perceived change in their knowledge of energy efficiency measures to the intervention to a greater extent than did participants in Group 1. The Workshop had a higher level of positive impact than that of the HEA in increasing energy efficiency Empowerment, Interest and Knowledge.

BARRIERS TO ENERGY EFFICIENCY

To identify and measure changes to barriers to energy efficiency participants were asked to rate, on scale of 1-5, the following barriers.

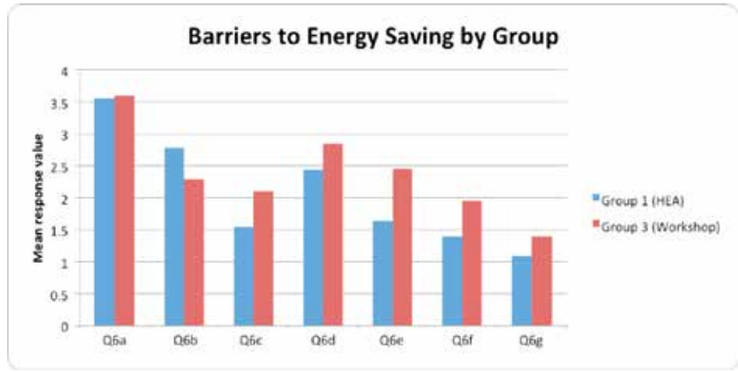
6a. Cost of energy efficiency upgrades
6b. Living in a rental property
6c. Lack of support from other people living in the home
6d. Lack of information
6e. Problems understanding the information
6f. Finding it hard to read
6g. Language difficulties

IDENTIFY BARRIERS TO ENERGY EFFICIENCY

Factors that impeded energy conservation were associated with living in a rental property, where participants in Group 1 rated more highly than Group 3 on this measure. The lack of support from other people living in the home was also an impediment to the implementation of energy saving measures that differed between groups. Lack of information was reported more highly as a contributing factor to the use of domestic energy conservation behaviours in Group 3 than Group 1.

Group 3 had greater difficulty understanding the information they were given than Group 1. Group 3 also had greater difficulty reading the information they were given compared to Group 1. Reports of language difficulties (i.e. proficiency with English) were generally low (between 1 and 1.5 on a scale ranging from 1 to 5), but were significantly different between groups. Group 3 reported more highly on this measure on average than Group 1.

FIGURE 3 BARRIERS TO ENERGY SAVING



Q6a Cost of energy efficiency upgrades.

Q6b Living in rental property.

Q6c Lack of support from other people living in the home.

Q6d Lack of Information.

Q6e Problems understanding the information.

Q6f Finding it hard to read.

Q6g Language difficulties.

CHANGE OF EFFECT IN BARRIERS TO ENERGY EFFICIENCY

Results of between-group differences indicated that, after controlling for group differences in Survey 1, having a lack of support from other household residents (Figure 4.3), problems understanding energy efficiency information (Figure 4.5), and difficulties in reading the information (Figure 4.6) showed significant group differences at Survey 2. In all these instances, Group 3 was significantly, albeit slightly, lower on average ratings of the barriers compared with Group 1. That is, for Group 3 at Survey 2, these barriers were considered to have a reasonably low impact on impeding energy saving.

Within groups, a number of barriers showed significant reductions from Survey 1 to Survey 2. These barriers included the cost of upgrades, rental property restrictions, a lack of information, problems understanding information, and hard to read information. Moreover, in Survey 1 prior to the interventions, the barriers "cost of upgrades" and "living in a rental property" were seen as moderate to high impact impedements to energy saving.

Exceptions to improvements in the perception of barriers were for Group 1 where ratings concerning support from other household residents and language difficulties remained relatively unchanged over time. Nonetheless, for the most part, both groups showed a significant reduction in the effect of obstacles to energy efficiency reduction from Survey 1 to Survey 2 (Figures 4.1-4.6)

FIGURE 4.1 CHANGE TO COST OF UPGRADE BARRIER

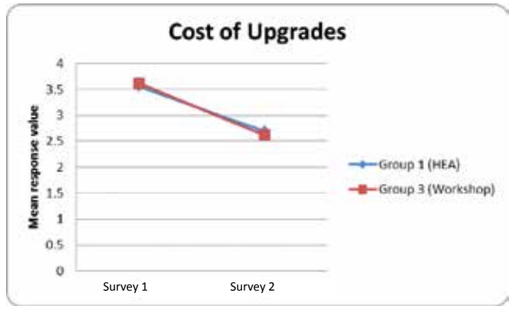


FIGURE 4.2 CHANGE TO RENTING BARRIER

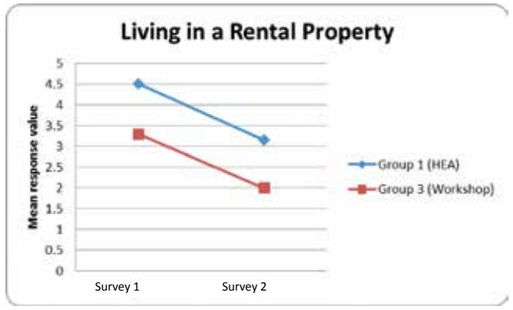


FIGURE 4.3 CHANGE TO SUPPORT BARRIER

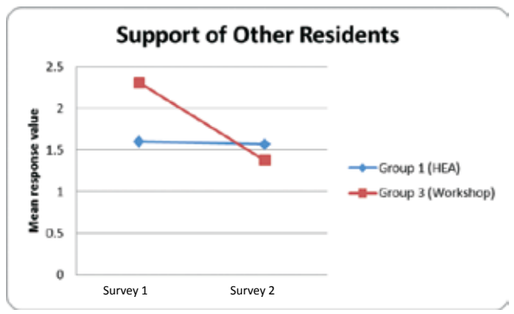


FIGURE 4.4 CHANGE TO INFORMATION BARRIER

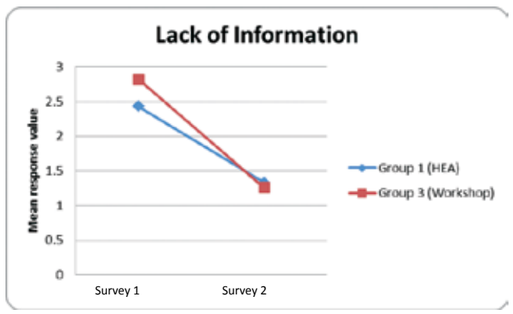


FIGURE 4.5 CHANGE TO UNDERSTANDING BARRIER

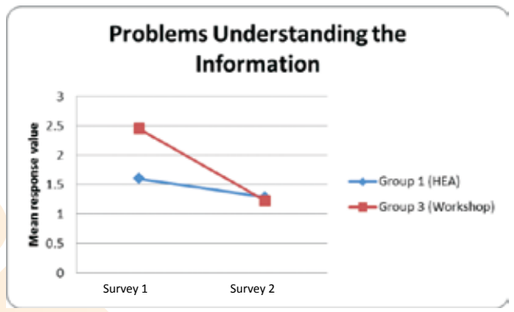
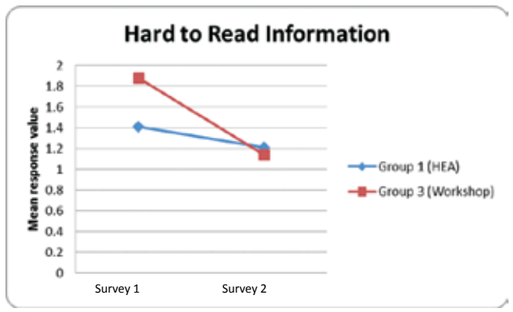


FIGURE 4.6 CHANGE TO HARD TO READ BARRIER

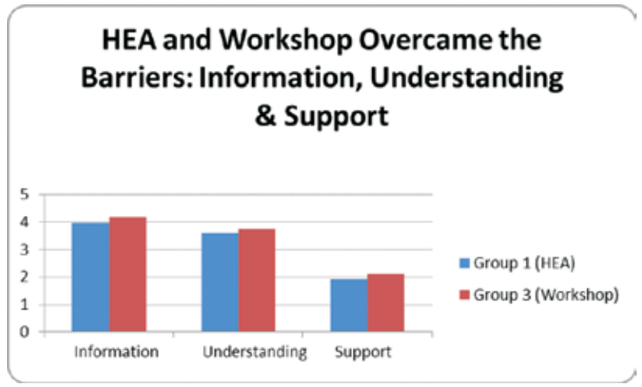


PERCEIVED EFFECTIVENESS OF THE HEA IN REDUCING BARRIERS

Participants in Groups 1 and 3 were asked questions on Survey 2 in relation to the extent to which the HEA or Workshop overcame barriers in energy saving that included: lack of support from others living in the home, lack of information, and problems understanding the information. Independent t-tests on these measures at Survey 2 showed that responses indicated that these barriers were overcome in greater measure for Group 1 than Group 3.

In sum, Figure 5 shows that Group 1 and 3 were effective tools for overcoming obstacles to energy efficiency behaviours, specifically with regard to the provision of information related to energy efficiency. Both groups rated highly that the HEA or Workshop helped overcome the barriers of lack of information and understanding of information highly. Response values were slightly higher for Group 3 than Group 1.

FIGURE 5 OVERCOMING BARRIERS



HOUSEHOLD ATTITUDES TO ENERGY EFFICIENCY

The following questions were asked to evaluate attitudes to energy efficiency. Participants were asked to respond on a scale of 1-5 how much they agreed/disagreed:

7. Energy efficiency is too much hassle.
8. Energy efficiency means I have to live less comfortably.
9. My quality of life will decrease when I reduce my energy use.
10. Energy efficiency will restrict my freedom.
11. Energy efficiency is not very enjoyable

Attitudes towards energy savings in households were generally favourable for participants involved in the HEA and the Workshop. Oddly, however, the HEA was associated in diminishing these positive attitudes over time while participants in the Workshop tended to show improvement over time. These outcomes may be due to a statistical artefact – regression to the mean - that can operate in repeated measures designs where the same variables are evaluated over time. This explanation may be more likely than an alternative one suggesting that the HEA actually made energy saving more unpleasant than they had first believed. Nonetheless, it is worth reflecting on the activities of the HEA with the goal of providing as much support to householders when their living environments are subject to intrusive conditions or activities (e.g., installation activities, introduction of new devices, etc.).

COMMITMENT TOOL – FRIDGE LIST

The project trialled using a commitment tool (The Fridge List) to encourage energy efficiency behaviours.

The Fridge List was a list of at least 3 activities that households decided they would undertake following the Home Energy Assessment or Workshop. Each participant was given a magnet and encouraged to place the list on their fridge. The project kept a record of the list and during Survey 2, participants were asked if they recalled their fridge list and whether they had completed any of the activities.

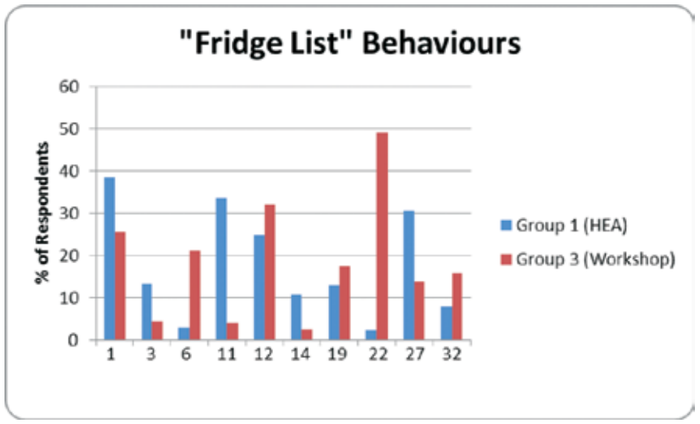
The frequencies of actions appearing on participants' reminder "fridge lists" were analysed (see Figure 6). These responses were later post-coded into 58 behavioural categories and can be found in Figure 6a.

In Group 1, the most frequently nominated activities were: Maximise thermal mass in the fridge/freezer 38.8%; Zone by closing doors 33.5%; Avoid standby power use 30.6%; and, draft proof doors, windows and vents 24.8%.

In Group 3, the most frequent behaviours for conserving energy were: Adjusting the temperature of heating/cooling by 1 degree (10% rule[4]) 49.0%; Draft proof doors, windows and vents 32.0%; Maximise thermal mass in the fridge/freezer 25.5%; and insulate hot water service pipes 21.1%.

Proportion of responders in Group 1 and Group 3 committing to behaviours that would appear on the "fridge list". The x axis represents codes for behaviours/devices that are described in Figure 6a.

FIGURE 6 FRIDGE LIST BEHAVIOURS



[4] 10% Rule - Adjusting the temperature of heating/cooling by one degree can save 10% on running costs

FIGURE 6B CATEGORIES OF BEHAVIOUR ASSESSED IN SURVEY 2 FOR ENERGY EFFICIENCY MEASURES REPORTED BY PARTICIPANTS

CATEGORY	DEFINITION
1	Maximise thermal mass in fridge/freezer
2	Have the ceiling insulation checked
3	Upgrade ceiling insulation
4	Increase insulation with floor coverings
5	Install underfloor insulation
6	Insulate hot water service pipes
7	Install a valve cosy
8	Use the window awnings
9	Install /Repair external blinds, awnings or shade sails
10	Plant trees and shrubs
11	Zone by closing doors
12	Draft proof doors, windows and vents
13	Found a better energy plan
14	Ring Energy Retailer
15	Check existing billing for, or enquire about discounts and concessions
16	Install a BI Directional Smart Meter
17	Use electricity during off peak time eg. weekends
18	Increase thermal mass in home
19	Install pelmets
20	Install screen doors to aid ventilation
21	Use reverse cycle air-conditioner instead of floor heat whenever possible
22	10% Rule- Adjusting the temperature of heating/cooling by one degree can save 10% on running costs
23	Install ceiling/pedestal fans
24	Upgrade/Repair/Service heating and cooling
25	Consider double glazing
26	Manage curtains and blinds
27	Avoid standby power use
28	Upgrade lighting
29	Install LED lighting

CATEGORY	DEFINITION
30	Install Solar skylights
31	Reduce number of/avoid use of appliances eg. Lights, fridges, freezers
32	Service/Repair/Replace broken appliances for better efficiency
33	Service/Repair/Replace broken fixtures or structures for better efficiency
34	Install Solar PV
35	Adjust appliance settings
36	Relocate appliances to better locations inside dwelling
37	Turn off second fridge/freezer
38	Defrost the fridge/freezer
39	Monitor fridge/freezer temperature
40	Shut fridge door quickly
41	Keep sides of fridge clear
42	Carry out a forensic electrical test on usage
43	Seal pet door
44	Fit low flow shower heads
45	Shower to <4 minutes
46	Wash in cold water
47	Dry washing on clothes line
48	Adopt recommendations from GVCE
49	Miscellaneous
50	Facilitate passive air flow
51	Install internal curtains, drapes or blinds
52	Use ceiling and pedestal fans
53	Install insulation/Repair insulation
54	Install carbon monoxide detector
55	Use electric throw blankets
56	Install a power saving device on an appliance
57	Install a fixture or structure for better efficiency
58	Window treatment

In general, the vast majority of participants could recall the list of 3 items at Survey 2 that they had specifically nominated as energy efficiency measures at Survey 1.

29% of all HEA people did at least one item from the fridge list and 19.4% of Workshop completed at least one item.

ADOPTION OF ENERGY SAVING MEASURES AND BEHAVIOURS

Separate to the Fridge List items, the project sought to identify other energy efficiency behaviours and activities that participants undertook as a result of information and interaction during the HEA or Workshop.

Participants were asked:

Has your household engaged in any other behaviours to conserve energy in the home since the Workshop/HEA?

Has your household installed any devices or made changes to the home to help conserve energy since the Workshop/HEA?

Since the Workshop/HEA has your household made any changes to the home that would have impacted your energy use?

The energy saving behaviours that participants reported doing were mostly low cost activities, such as draft proofing doors, windows and vents and the management of curtains, drapes or blinds.

Other energy saving activities were related to adjusting temperature settings to fridges, and heating/cooling appliances, using electricity during off peak times, avoiding stand-by power use, and reducing the number or use of appliances. The use of electric throw blankets was also commonly reported after being promoted in the Workshops and HEAs.

By-and-large, the most frequent self-reported behaviours were different to those frequently nominated by participants for their fridge list. Therefore, there is some suggestion that the goal setting activity of the fridge list may have enabled behaviours that were not already being undertaken by participants. This statement notwithstanding, there were behaviours that appeared in both analyses: increasing thermal mass in the refrigerator; zoning by closing doors; draft proofing; 10-percent rule; and avoid using standby power.

It is not unexpected that Workshop attendees undertook more energy efficiency retrofits than that of HEA participants, as the HEA participants received these upgrades via the free retrofit provided by the project. The opportunity therefore for the HEA participants to undertake easier and less expensive activities was diminished.

Difference between interventions was the frequency of adjusting heating and cooling temperatures by one degree. As with the fridge list analysis, the 10-percent rule was more frequently reported by Workshop participants than by those householders involved in the HEA. As noted above, this may be due to the possibility that the Workshop information was designed for general applicability.

The list of devices that participants reported installing was similar for the most frequent devices (i.e. draft proofing and installing internal window treatments). One difference associated with the interventions was the insulation of hot water service pipes which was more frequently reported by Workshop attendees as they had to purchase and self install whereas 515 HEA households had them installed for free as part of their retrofit.

FIGURE 7.1 UPTAKE OF ENERGY SAVING BEHAVIOURS

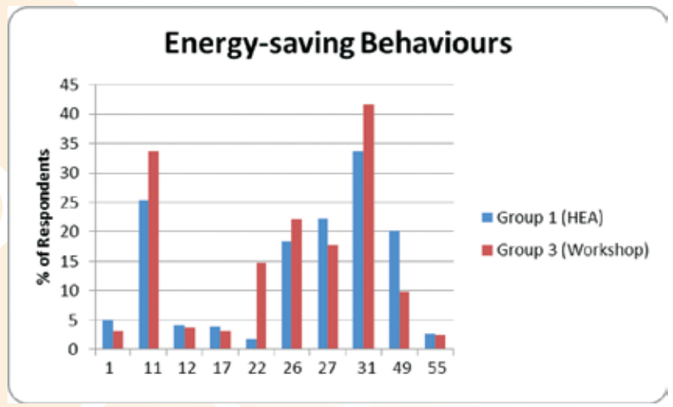
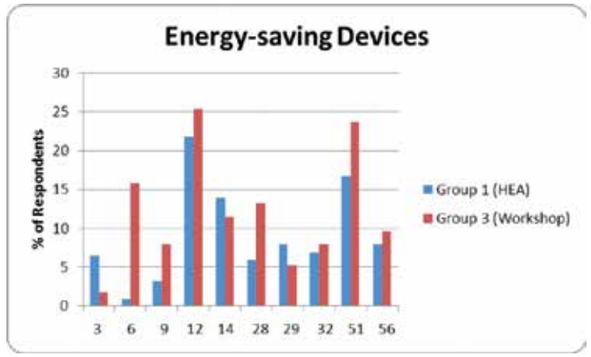


FIGURE 7.2 UPTAKE OF ENERGY SAVING DEVICES



RESULTS SUMMARY

Overall, the Workshop was a more effective engagement method to convey energy efficiency messages, alter beliefs and encourage behaviour change than the HEA. Both engagement methods helped address barriers to energy efficiency and whilst the Fridge List was an effective tool, better uptake of the pledged actions came from Workshop participants.

- Both groups showed some motivation and scope for improved energy efficiency.
- Both groups showed improvement in their key beliefs about household energy efficiency, comfort and capacity to save energy over time.
- Cost of energy efficiency upgrades was the biggest barrier across both groups to energy efficiency.
- The Workshop and the HEA reduced the effect of barriers.
- The impact of the Workshop had a greater effect than the HEA on key beliefs about household energy efficiency and ratings of comfort in the home.
- The Workshop had a higher level of positive impact than that of the HEA in increasing energy efficiency Empowerment, Interest and Knowledge.
- The Fridge List was an effective tool for goal setting and behaviour change.
- Cost of energy efficiency upgrades was the biggest barrier across both groups to energy efficiency.
- More HEA participants (29%) did at least one action from the Fridge List than Workshop participants (19.4%).
- Within groups, a number of barriers showed significant reductions from Survey 1 to Survey 2. These barriers included the cost of upgrades, rental property restrictions, a lack of information, problems understanding information, and hard to read information.
- HEAs and Workshops were both perceived by households as effective tools in reducing the effects of barriers.
- Zoning and avoiding power use ranked highest for both groups in the uptake of energy saving behaviours.
- Install curtain/blinds and draft proofing ranked highest for both groups in the uptake of energy saving devices.

THE EFFECT OF HOME ENERGY ASSESSMENT AND WORKSHOP INTERVENTIONS ON HOUSEHOLD ELECTRICITY CONSUMPTION

The annual median pre engagement kWh use per day for HEA participants was 10.2 and for Workshop participants 7.3.

FIGURE 8 MONTHLY AND ANNUAL MEDIAN DAILY ELECTRICITY CONSUMPTION HEA AND WORKSHOP GROUPS

	HEA	WORKSHOP
	PRE-ENGAGEMENT	PRE-ENGAGEMENT
	MEDIAN KWH PER DAY	MEDIAN KWH PER DAY
Jan	11.535	7.976
Feb	11.322	7.115
Mar	8.677	6.316
Apr	9.011	7.250
May	10.719	8.160
Jun	12.207	9.766
Jul	13.071	9.915
Aug	11.920	8.789
Sep	9.808	7.362
Oct	8.417	6.213
Nov	8.532	6.134
Dec	9.420	6.560
Annual Median	10.202	7.325

On an annual basis the HEA group exhibited a significant decrease of 0.612 kWh per day in consumption, the Workshop group exhibited a non-significant decrease of 0.038 kWh per day and the control group exhibited a significant decrease of 0.61 kWh per day, see Table B

- There were significant decreases in the HEA group power consumption in the warmer months January to March and November-December but no significant change at other times.
- For the Workshop group there was a significant reduction in January and near significant reduction in February and March then no significant changes until in September – October there were significant increases in consumption.

FIGURE 9 MONTHLY AND ANNUAL CHANGE IN AVERAGE DAILY POWER CONSUMPTION AND T-TEST FOR ZERO CHANGE P-VALUES

	HEA		WORKSHOP		CONTROL	
Month	Change	P-value	Change	P-value	Change	P-value
Jan	-2.328	0.000	-1.718	0.000	0.783	0.000
Feb	-1.179	0.001	-0.675	0.005	-0.545	0.000
Mar	-1.124	0.000	-0.458	0.005	-1.364	0.000
Apr	-0.577	0.012	-0.170	0.243	-1.631	0.000
May	0.080	0.744	-0.193	0.220	-1.022	0.000
Jun	-0.409	0.077	0.196	0.332	-1.047	0.000
Jul	-0.330	0.160	0.182	0.355	-0.829	0.000
Aug	-0.446	0.065	0.464	0.021	-0.831	0.000
Sep	-0.286	0.078	0.902	0.000	-0.749	0.000
Oct	-1.034	0.007	2.144	0.000	-0.251	0.022
Nov	-1.039	0.001	0.707	0.195	-0.093	0.343
Dec	-1.869	0.000	0.044	0.842	-0.122	0.178
Annual	-0.612	0.000	-0.038	0.539	-0.590	0.000

In Table C on an annual basis the difference in post-pre change between HEA and Control groups was negative but non-significant.

- On an annual basis the retrofit intervention had no significant effect relative to the Control group.
- On an annual basis the difference in post-pre change between Workshop and Control groups was positive and highly significant. That is, on an annual basis the Workshop intervention displayed significantly higher consumption relative.

FIGURE 10 MONTHLY AND ANNUAL CONTRASTS BETWEEN HEA AND WORKSHOP TREATMENT GROUPS AND THE CONTROL

MONTH	HEA VS CONTROL	P-VALUE	WORKSHOP VS CONTROL	P-VALUE
Jan	-3.335	0.0000	-2.670	0.0000
Feb	-0.431	0.0978	0.200	0.4610
Mar	0.954	0.0001	1.730	0.0000
Apr	0.808	0.0010	1.399	0.0000
May	0.752	0.0021	0.551	0.0215
Jun	0.400	0.0761	1.010	0.0001
Jul	0.283	0.2174	0.716	0.0070
Aug	0.104	0.6449	0.971	0.0001
Sep	0.181	0.3442	0.871	0.0003
Oct	-1.073	0.0003	-0.401	0.2327
Nov	-1.378	0.0000	-0.859	0.0094
Dec	-1.672	0.0000	-0.253	0.3785
Annual	-.0226	0.7780	.55180	0.0000

- Stronger beliefs that energy efficiency is too much hassle leads to increased power consumption.
- Language difficulties appear to imply lower power consumption. It is difficult to interpret this outcome.
- Stronger beliefs that a household knows what to do to conserve energy lead to decreased power consumption.
- Stronger beliefs that energy efficiency will restrict freedom leads to decreased power consumption. It is difficult to interpret this outcome.
- Installing an energy efficient heater/cooler leads to an average increase of 1.215 KwH in daily power consumption.
- Installing solar PV leads to an average decrease of 1.031 kWh in daily power consumption.
- Installing a heat pump leads to an average decrease of 5.730 kWh in daily power consumption.
- Installing solar HW leads to an average decrease of 2.260 kWh in daily power consumption.

FIGURE 11 KWH SAVINGS AND $ SAVINGS FOR HEA HOUSEHOLDS

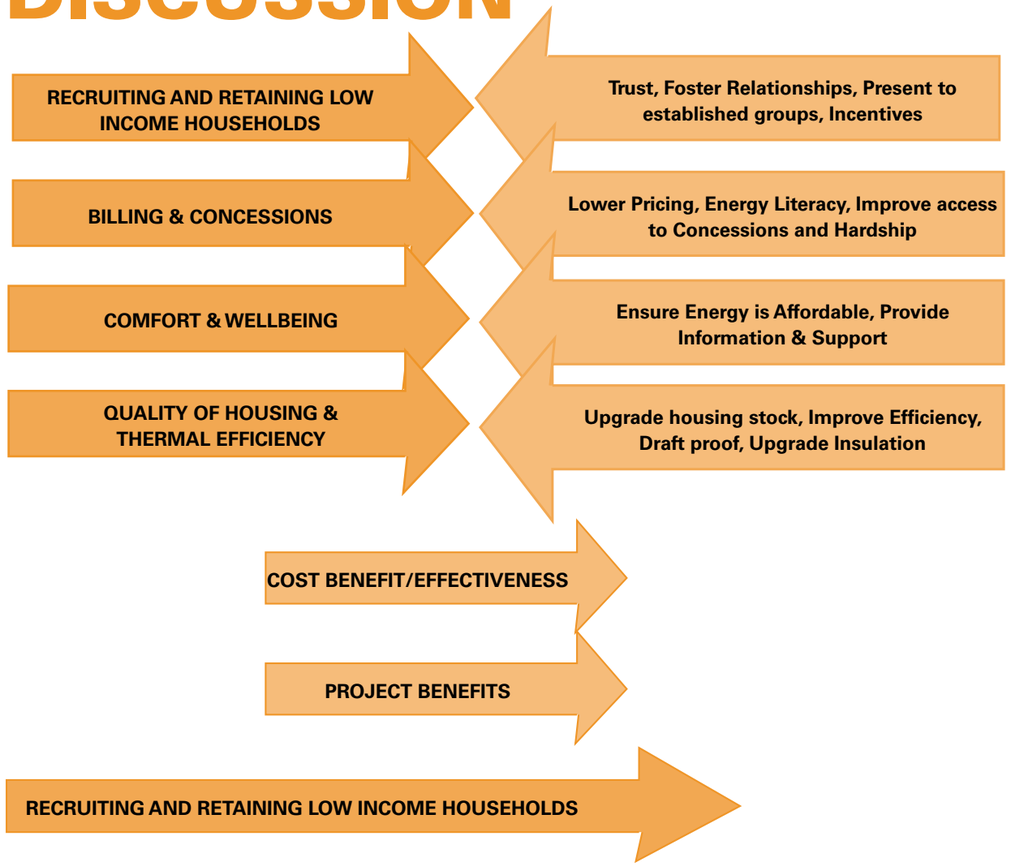
	ELECTRICITY SAVINGS	$ SAVINGS
Per household	.61 kWh per day	17cents per day
Per household	222.65 kWh per annum	$62.35 per annum
1032 Households	629.5 kWh per day	$176.27 per day
1032 Households	229775 (230 MW)	$64,337 per annum

*$ Savings calculated on electricity cost of 28cents per kWh

Based on household electricity savings achieved by this project: If all low income households were receiving the Victorian Government's Annual Electricity Concession of 17.5%, and assuming no further discounts were deducted or solar credits applied to the usage costs above, the saving to the state government would be$11,259 per year (17.5%x $64,337)or $30.85 per day (17.5%x $176.27).

"The Annual Electricity Concession is available to help ease cost of living pressures by providing concession cardholders with a discount of 17.5 per cent off household electricity bills. The concession is calculated based on the remaining account balance once any retailer discounts and/or solar credits have been applied." http://www.dhs.vic.gov.au

DISCUSSION



RECRUITMENT

This trial set out to test a variety of engagement methods to attract and retain a range of low income households in a project aimed at influencing efficient energy use, behaviours, comfort in the home and identifying and addressing barriers to energy efficiency.

"Low income household" is a broad term which relates to the project's test group who had to meet the project eligibility criteria to participate. The choice of Consortium partners reflected the diversity in the community and by design was a means to channel this diversity into the project. A Partnerships and Logistics Manager was employed at the start of the project to manage recruitment and foster partnerships.

During the project it became clear that GVCE had developed a winning formula to engage with older participants - the mean age of HEA participant's was 68 and Workshop participant's 73. The project found it challenging to attract and retain younger people and families, and although different methods were trialled, it was clear that the project was better able to recruit and retain older participants.

- The mean age of HEA participant's was 68 and Workshop participant's 73.
- The project became expert in recruiting, retaining and understanding the energy needs of older people in our community.

RECRUITING HOUSEHOLDS FOR HOME ENERGY ASSESSMENTS

WHAT WORKED

Gaining the endorsement of organisations, clubs or individuals to recruit clients was essential to foster trust amongst potential participants

Information sessions overviewing the HEA process and benefits were delivered to existing groups and proved the most successful method of recruitment. GVCE was able to capitalise and build on its community networks to host 41 information sessions. The information session, consisted of a 15 minute — 1 hour presentation designed and pitched to accommodate a range of audiences to receive the message either visually through the powerpoint presentation, "props" and handouts or orally via the presenter and discussion.

The first information session was hosted by Consortium partner Kelvingrove and proved very successful, resulting in 26 Home Energy Assessments.

Many of the Consortia offered opportunities to directly refer clients, host information sessions or champion the project in their networks. These referrals worked because the partner organisation and staff had an understanding and relevant resources (information packs) from the project. They were able to appropriately identify clients and then confidently promote the benefits.

Consortium partner Rural City of Wangaratta was a good example of this. The package care case managers attended a project information session and received updates during their staff meetings, these case managers were also encouraged to communicate directly with the Powerdown project staff. Case managers would inform and refer their clients to the project and for some cases were on site when the HEA occurred.

Greater Shepparton City Council, the Dame Pattie Menzies Centre, Rural Housing Network, Shepparton Villages and Family Care also referred their clients. The HEA value added to their existing client services. VicParks connected the project with their membership, which resulted in delivering Information sessions on site at caravan parks and residential village sites.

TABLE 29 REFERRAL BY CONSORTIUM PARTNER

REFERRING CONSORTIUM PARTNER	NUMBER OF HOUSEHOLDS	PERCENTAGE
City of Wangaratta	89	8.6
Dame Pattie Menzies	12	1.2
Family Care	24	2.3
Greater Shepparton City Council	30	2.9
GVCE	729	70.6
Homelab	11	1.1
Kelvingrove	26	2.5
Rural Housing Network	5	0.5
River Road Caravan park	2	0.2
Shepparton Villages	10	1.0
VicParks	92	8.9
Missing	2	0.2
Total	1032	100.0

Some staff from other referral agencies and partners received a HEA, again resulting in a deeper knowledge of the project benefits and energy efficiency strategies used by the project.

The positive key messages used at information sessions were;

- We will review your power bill.
- Help you be more comfortable.
- Help you use less energy.
- Help you save some money.

The project experienced moderate success via the mail out of a flyer with water rates notice to concession card holders by the local water authority and also moderate success through hosting "pop up shops".

The pop up shop was set up for 5 weeks next door to a Centrelink office in Shepparton and attracted 130 participants. The people signing up were families and singles who were younger than most of our other participants and there was also more cultural diversity. This recruitment method, whilst attracting high numbers resulted in a dropout rate of 30%. 91 participants from the pop up shops completed the project.

The water authority mailed out 3,722 flyers in water bills to low income households, from this, the project gained 58 participants with 8 people later dropping out. This means that 1% of the 3722 potential households participated and completed the HEA.

Referrals from other agencies worked when the participant was motivated to be involved.

- ✔ Building trust is crucial to effective recruitment.
- ✔ Information Sessions delivered to existing groups work.
- ✔ Using key messages — "We will review your power bill" "We will help you save money" are welcomed by households.
- ✔ Direct referrals from Consortium Partners, where trust already exists is effective form of recruitment.

WHAT DIDN'T WORK

A 6 week professional advertising campaign, costing $8352 exGST was rolled out in Shepparton in April 2015. The campaign comprised electronic billboard advertising with an estimated 480 000 views over the 6 weeks, 4 weeks of print ads (editorial), Facebook promotion, interactive SMS and flyers. Results from this advertising and separate radio and website enquiries yielded only 19 responses.

Letter drops were undertaken by LIEEP staff in targeted areas but were unsuccessful in attracting program participants.

Public information session- planning and advertising an information session where people could simply attend did not work, the project trialled using the local Council in the advertising and this did not work well either.

Referred participants who had limited knowledge about the program and not motivated to be a part of it quickly dropped off.

The project found it hard to attract participants who lived in caravans. Whilst these people attended Information Sessions, they were unlikely to have Home Energy Assessments.

- ✘ Advertising campaign didn't work.
- ✘ Letter drops didn't work.

RECRUITING HOUSEHOLDS FOR WORKSHOPS

WHAT WORKED

Originally the Victorian Caravan Parks Association (VicParks) partnership was primarily developed as a means to recruit HEA participants living permanently in caravans or relocatable housing at caravan parks or gated communities. The focus changed to Workshop recruitment when VicParks offered to connect GVCE with managers of residential villages. The result was a very successful roll out of Workshops whereby the management of each of the sites would promote the Workshop, collect registration forms, organise refreshments and provide the onsite venue. Over 400 people living in relocatable style dwellings attended. The processes and content for Workshops became very refined, with the delivery geared towards the particular kind of housing within the community. The project received exceptional feedback from participants and the level of participation and compliance increased as more Workshops were delivered. 84% of all compliant Workshop participants were recruited in this manner.

Of moderate success was contacting existing clubs and organisations who had an established group and offering to present a Workshop.

- ✔ The Victorian Caravan Parks Association championed the project to its members, who in turn supported and endorsed the delivery of Workshops to residents at their sites. 84% of Workshop households were recruited via this method.

WHAT DIDN'T WORK

Organising and promoting "public Workshops" was tested at Neighbourhood Houses and other venues with little success due to no or low numbers registering. A risk also associated with this approach for a trial project is that eligibility could not satisfactorily be tested until the event.

- ✘ Public Workshops didn't work.

RETAINING PARTICIPANTS

During the project there were often tensions between maintaining good customer relationships and collecting data and permissions. A range of circumstances such as moving, personal crisis physical or mental illness impacted on the participant's ability to stay in the project. Early in the project lengthy time delays between appointments, assessments and retrofits affected customer service."Drop out rates" from registrations in the first 767 cases was 17.5% and for the final 430 it was down to 6.7%.

WHAT WORKED

It was critical to establish processes and sufficient staff levels to manage the customer delivery aspects as well as the data collection obligations during the project

GVCE employed staff who interacted positively with clients and were flexible in their approach when entering over 1,000 homes.

An experienced works coordinator and scheduler was key for the maintenance of continuity and communication with customers.

Communicating effectively with clients and in a timely manner was key to retaining participants. After registering at an information session clients were contacted within 2-3 working days to make an appointment for the HEA.

During recruitment and engagement the trial goals and services to be provided were explained so as to help clients to form reasonable expectations of project deliverables. Staff ensured that activities within the project remained valuable, relevant and useful for the client.

Where there was inconvenience, a measure of empathy was displayed and any problems attended to within a timely manner. The offer of $25 grocery vouchers as recompense for completing activities and paperwork was well received.

Recording participant coaching, queries or complaints enabled reliable client information was maintained . The project manager ran a weekly report to ensure follow up to any outstanding queries or complaints.

- ✔ Employed and retained the "right people".
- ✔ Established processes.
- ✔ Effective and timely communication with participants.
- ✔ Incentives.
- ✔ Promoting the benefits of the project to participants.

WHAT DIDN'T WORK

Retention rates were compromised by the need to follow up on missing data, non-compliant paperwork and permissions. Whilst some households took the situation in good humour, others found it intrusive. It became quite awkward for Assessors to revisit homes and ask for photo identification and then go through a process of capturing the ID on a new form and re getting signatures and NMI's.

The process to collect data from participants at the commencement of either the Workshop or HEA interview presented a significant impediment to these engagement techniques. The first 20-30 minutes were consumed with data collection, which left a negative first impression. The trial design to collect data negatively impacted on the engagement process of holding a Workshop or conducting a HEA.

Waiting lengthy periods of time for Landlords to give permission for retrofit works resulted in participants disengaging from the project.

- ✘ Collection of data and permissions didn't work.
- ✘ Trial and study design was an impediment to maintaining positive customer relationships.

BILLING & CONCESSIONS

Victorian household electricity prices rose on average 90% between 2007-2014[5]. The project's Home Energy Assessors have witnessed the impact of rising energy prices on over 1000 low income households.

In 2012 low income households spent 4.3% of their income on dwelling energy costs whilst middle income households only spent 2.4% and high income households spent 1.1%[6].

Victoria has a percentage based concession arrangement which provides a 17.5% discount, Annual Electricity Concession (AEC, on usage charges after retailer discounts and solar feed in credits have been applied. Once bills exceed $2882 per year, eligible households then need to apply for the Excess Electricity Concession. The Department of Health and Human Services (DHHS) Concessions 2014-15 Summary[7] showed that since the 2011-12 period there has been an increase of 51,004 households receiving the Annual Electricity Concession. The cost of this concession to the government however has actually decreased by $7,543,607 over the same period. Based on the figures in the summary the average AEC (2014-15) received by households is $140.

This project identified that 243 (24%) of eligible households were not receiving one or more of the energy concessions they were entitled to. The lost savings to these 243 low income HEA households based on in the average AEC equates to $34,020 annually

The project aimed to raise awareness around concessions, discounts, grants and services available that assist households manage the cost of energy in their homes. The project actively promoted the Victorian Concessions Guide[8] published by DHHS which is "a guide to discounts and services for eligible households in Victoria". This booklet proved one of the most popular resources at Workshops and most participants had never sighted it before.

To support those in hardship the project raised awareness of the Utility Relief Grant Scheme (URGS) which assists eligible concession, health care or DVA Gold card holders in hardship to pay utility bills. It was evident from this trial that households were unaware of hardship programs and URGS. This lack of information is a certain barrier to energy affordability. For those who consider language or literacy a barrier accessing the Victorian Concession Guide is especially challenging.

Whilst there are mechanisms in place to assist in the affordability of energy, this study clearly showed that those concessional discounts and utility grants available from the Victorian State Government are under subscribed, resulting in a large number of those deemed most in need had not sought this assistance. In addition to this there was a reluctance/lack of confidence for households to contact their energy retailer or ask for assistance.

The Essential Services Commission[9] reported the rate of residential electricity disconnections increased by 6 per cent during 2012-13 on top of a 33 per cent increase observed in each of the preceding two years. Corresponding with the increase in electricity disconnections, overall participation in retailers' hardship programs increased by 29 per cent in 2012-13, from 18,879 customers (or 0.46 per cent) to 24,311 customers (0.57 per cent). Despite this rise the DHHS

[5]AER (Australian Energy Regulator) 2014, State of the energy market, December, p. 134.
[6] ABS 4670.0 - Household Energy Consumption Survey, Australia: Summary of Results, 2012
[7] http://www.dhs.vic.gov.au/about-the-department/documents-and-resources/reports-publications/state-concessions-and-hardship-programs-annual-reports
[8] http://www.dhs.vic.gov.au/for-individuals/financial-support/concessions/energy
[9] The Energy Retailers Comparative Performance Report – Customer Service 2012-13 http://www.esc.vic.gov.au/getattachment/983c8101-90be-4173-b57e-73ec365f2648/Energy-Retailers-Comparative-Performance-Report-Cu.pdf

Concessions summary 2014-15 showed a decrease of 15% of households receiving URGS for electricity and a decrease of 8% of households receiving URGS for gas.

This study did not collect data around number of households participating in hardship programs, but Home Energy Assessors cite that lack of information and confidence are barriers to accessing this program with their retailer.

Confusion over billing, tariffs and charges is rampant, causing customers to feel disempowered and stressed. Trial participants often found difficulty in differentiating the electricity retailer discount from the government concession which sometimes led to a false sense that they were actually receiving their concession, when in fact they weren't. Households did not necessarily want to change retailer, they just wanted to know if they were on a "good deal". The most commonly used retailer in this study is Origin, a legacy from being the default retailer when the state government privatised the electricity retail sector in 1994.

Participants were often wary and skeptical of "door knockers" and calls from energy retailers. Dealing with the cold callers often left people with a sense of stress and remorse particularly if they were coerced into signing up to a new retailer. Not being clear on their rights around cooling off periods was also highlighted by one of our assessors as a particular issue for some residents.

Disempowered low income households were not seeking better electricity pricing deals, despite increased opportunities from retailers. In 2014, *increased competition in electricity markets was also providing opportunities for consumers to switch electricity providers and save between 7 and 16 per cent on a better deal in states where market offers were available – or $93 to $247 on an annual bill*[10].

After having a HEA, 302 (29.5%) participants rang their energy retailer to register for a concession, seek discount or combine their gas and electricity bills. 67 HEA households changed their electricity retailer. 25 (40%) of workshop participants connected to the grid contacted their current electricity retailer to register for a concession, seek discount or combine gas and electricity bills. Seven Workshop households changed their retailer

This study showed that for residents living in some residential villages, tariffs and charges set by their embedded network managers were very competitive. Pricing data collected from 7 of the embedded network sites revealed that the daily service charge ranged from $1.0083 and $1.1648 per day with a flat tariff between 16.56 cents per kW hour and 18.92 cents per kW hour. (Not all embedded networks supplied tariff information)

"Bill shock" is often experienced by people in rental accommodation or those who have moved to a new home. Considerations around energy efficiency issues are seldom taken into account by those choosing rental properties and for many it is not until they have moved in and experienced Winter or Summer that low comfort levels and high energy costs become apparent. Poor quality and inefficient housing is directly related to higher energy costs. Of the 554,000 rented dwellings in Victoria, there was a higher rate of households with either no insulation or that did not know if they had insulation when compared with dwellings being purchased or dwellings owned outright. For rented dwellings, 20% had no insulation and a further 43% did not know if they had insulation(2009).[11] Poor insulation decreases comfort and increases heating and cooling costs.

Summary

- Electricity prices rose on average 90% in Victoria between 2007-2014.
- 24% of eligible households were not receiving their concession on their electricity bill.
- Billing was hard to understand.
- Access to information and support regarding concessions and hardship programs was limited.
- Consumers were reluctant to call energy retailers prior to the HEA or Workshop.
- Customers didn't want to change retailers, they just wanted the "best deal".
- After the HEA 302 participants rang their electricity retailer.
- 25 (40%) of workshop participants connected to the grid contacted their current electricity retailer to register for a concession, seek discount or combine gas and electricity bills.
- Seven Workshop households changed their retailer.
- Poor and inefficient housing stock decreases comfort and increases energy costs.

[10] http://www.aemc.gov.au/Major-Pages/Price-trends
[11] ABS 4602.2 - Household Water, Energy Use and Conservation, Victoria, Oct 2009

CASE STUDY

"Getting assistance with bills and obtaining better rates was the part most relevant and it was a totally pleasant experience".

— Gordon (Home Energy Assessment)

Gordon Esam, a local Shepparton man, undertook a Home Energy Assessment and a Retrofit after hearing about GV Community Energy's Powerdown project through word of mouth. Gordon felt "well respected throughout the process." He discussed how the process was well explained and conducted, "which was extremely important to me, as I am visually impaired." He was also delighted that Chris was able to ring his electricity retailer on his behalf, to negotiate a better deal. As a part of the retrofit, the project installed some ceiling vent covers and, as a result Gordon is looking forward to both "better comfort in Winter, and peace of mind from not losing the heat that I paid for."

COMFORT AND WELLBEING

The mean age of all participants in this study was 71, which has offered a unique opportunity to gain an insight into how older Victorians use energy. The median electricity use per day for HEA pre engagement was 10.2kWh and for Workshops was 7.3kWh per day, which is low compared to the average daily usage of: 13.2kWh for dwellings connected to both gas and electricity; 19.2kWh for dwellings connected to electricity only.[12]

The lower electricity use attributed to Workshop households is likely due to the age of their dwelling; 70% of their dwellings are 9 years or under, whereas for Group 1 only 25% are 9 years or under. It is probable that these dwellings are inherently more energy efficient due to their age.

Participants tended to be frugal and conserve energy which, in some instances, compromised health and wellbeing. Energy conservation is a frequent method being used in households to reduce energy use, often compromising the quality of life of those living in the household. People living in the project area in Victoria experience extreme temperature variations and having adequate heating and cooling to maintain internal ambient temperatures is critical to good health and wellbeing.

A study published in 'The Lancet', May 2015 showed that 6.5% of deaths in Australia are attributable to cold weather. *"Most of the temperature-related mortality burden was attributable to the contribution of cold. The effect of days of extreme temperature was substantially less than that attributable to milder but non-optimum weather. The biological processes that underlie cold-related mortality mainly have cardiovascular and respiratory effects."*[13]

It is imperative that there is continued investment into upgrading the energy efficiency of domestic housing stock, with an aspiration to ensure that all Australians are able to afford and use energy productively to maintain optimum temperatures within their homes. Aside from the health impacts of living in a cold/hot house and living frugally, are the social implications. People may not feel comfortable having visitors and visitors may be deterred if the home is uncomfortably hot or cold. An American study: *Social Isolation and Health, with an Emphasis on Underlying Mechanism*[14] states that "Social isolation is a potent but little understood risk factor for morbidity and mortality, and its negative consequences are most profound among the elderly, the poor, and minorities."

[12] Daily average electricity use. StVincent de Paul Society. Victorian Energy Prices Report-Jan 2016 Pg 7
[13] Mortality risk attributable to high and low ambient temperature: a multicountry observational study http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62114-0/abstract
[14] *Social Isolation and Health, with an Emphasis on Underlying Mechanism* http://muse.jhu.edu/article/168969

The following observations were made by Home Energy Assessors in the trial;

- To save on energy the heating is not being switched on.
- To save on energy the cooling is not being switched on.
- Some participants go to bed early and stay in bed late to avoid using heaters.
- Showers are made shorter or taken less often to minimise the use of hot water.
- Appliances are not being repaired or replaced.
- One person avoided using the kettle too often.
- Some participants expressed that their home is too cold for visitors, which is likely to impact on social connections and relationships.
- A Consortium partner revealed that 1/3 of her older aged clients were not maintaining a comfortable ambient temperature in their home which is known to contribute to poor health.

Whilst improvements to energy efficiency attitudes and beliefs have been realised as a result of this trial, it is difficult to measure the long term effects of these changes. Upgrading housing is the most reliable way to improve energy efficiency and ensure resident comfort, ambient temperature and wellbeing.

Results from HEAs revealed that 70% of homes had inadequate insulation. Upgrading insulation is one way of improving the energy efficiency of housing stock. In 2007 research from *Retrofitting houses with insulation: a cost–benefit analysis of a randomised community trial*[15] *concluded "from an environmental, energy and health perspective, the value for money of improving housing quality by retrofitting insulation is compelling."*

The Powerdown Project outcomes showed that there was an increase in comfort levels in households following participation in either the Workshop or the Home Energy Assessment. This is the result of households taking up low cost and behavioral change recommendations such as installing and managing curtains and blinds, zoning and draft proofing. For HEA participants, the project introduced, as part of the retrofit activities the supply of electric throw blankets, which cost between 1-3 cents an hour to run. Two hundred of these blankets were supplied and whilst adding to household electric usage, provided increased comfort to participants during the winter months when people are more at risk at becoming ill.

Information on draft proofing, zoning, running heating and cooling appliances efficiently has been effective in improving the comfort, and therefore the wellbeing of participants in this trial. Also contributing to the feeling of wellbeing has been the dissemination of information around the dangers carbon monoxide caused by gas appliances and the supply of 127 CO monitors to households.

This project has also achieved a reduction in stress and anxiety in some participants by being able to support them in renegotiating their electricity contract. In fact, 327 participants became empowered to independently ring their retailer, and the project staff assisted at least a further one hundred participants whilst in the home. Further to this was the feeling of wellbeing achieved by feeling included and supported in the project.

CASE STUDY

"Mrs Jones" is 72 and lives in a 90 year old weatherboard home, English is her second language. The home has 10 ft high ceilings and is very "difficult to heat". A combustion stove heats the kitchen area in the winter time and also serves to heat the hot water. There is a wood fueled heater in the lounge room and a reverse cycle split system. Mrs Jones cannot afford any increases to her electricity bill so does not use the split system, instead she goes to bed as early as 7pm in the winter and might stay in bed until 10am the next day just so she doesn't have to use electricity and stay warm. Mrs Jones was also not receiving her annual electricity concession. She apologised to the HCM for the house being cold.

The HCM made a number of recommendations including getting her daughter to ring the electricity retailer to get a concession and seek better pricing. Along with draft proofing measures, and an electric throw rug, Mrs Jones was encouraged to run her split system for 2 of the next 4 billing weeks and compare the extra cost against the cost of getting in wood.

[15] http://jech.bmj.com/content/63/4/271.abstract

Summary

- The Home Energy Assessment and Workshop positively impacted comfort levels of participants.
- In some households conserving energy by not using heating and cooling appliances is compromising health.
- The project aided wellbeing by supporting households to contact their energy retailer to get a better deal or concession.
- Low cost information and retrofits improve comfort.
- Poor housing stock effects comfort, health and wellbeing.
- Retrofitting/upgrading houses would positively impact the health.

QUALITY OF HOUSING & THERMAL EFFICIENCY

There was a significant variation in the thermal efficiency of building stock assessed under the Powerdown project ranging from "older" style caravans (pre 1980's) with canvas or colour bond annexes and shade cloth "flyovers", cement sheet cladded homes (formally public housing from the pre 1960's), solid brick veneer buildings and modern (less than 10 year old) colour bond cladded two bedroom units in either caravan parks or residential villages/communities.

In the HEA group there were 688 houses, 77 one or two story Units, 153 units- attached, 61 semi-detached one story dwellings, 15 Semi-detached greater than one story, 4 caravans, 1 improvised dwelling (missing type of dwelling on 33 cases). Of these 240 Group 1 homes were rented.

As part of the 1032 HEAs conducted under the Powerdown project, there were several retrofitting themes identified that compromised the thermal performance of the home and many combined items could be rectified for less than $200. More extensive and expensive retrofit works were identified as part of the HEA and these are also discussed below.

Caravans were inspected and while they were very efficient at utilising space, they were susceptible to extreme temperatures throughout the year due to inadequate insulation on floors, walls and ceiling and therefore relied on artificial heating/cooling to maintain comfortable inside temperatures. The thermal performance of these dwellings were a microcosm of larger homes where all the key design flaws applied in a similar manner in these vans. Due to site restrictions, it was difficult to undertake larger scale retrofits so works were normally of a minor nature and limited to draft proofing, CO monitors and CFL light globes. Caravans that had protection from direct sun exposure due to shading from trees, climbers or "flyovers" (a roof structure above the van with an air gap above the van roof) were significantly cooler than vans fully exposed to the sun. Domestic hot water was normally communal so no individual works were required.

Orientation of a building has a significant impact on the exposure of sun and subsequent unwanted heat gain in Summer and insufficient solar passive heating in winter. Buildings were predominantly orientated to face the road and carports, verandas and alfresco type outdoor living spaces were often situated on the northern aspect of buildings that prevented effective use of winter solar gain. The first line of defence for maintaining comfortable living conditions inside the house is to keep as much of the summer solar heat from entering the house. The installation of external retractable awnings and/or blinds over sun exposed windows (and even walls) and strategically placed deciduous trees and deciduous vines/climbers did help minimise the summer solar heat gain for many inspected homes. The ornamental tree Manchurian Pear was used and promoted as a suitable domestic shade tree.

The spacing and layout constraints for many urban homes has meant there is insufficient space for optimum shading from summer sun and access for winter solar gain. Regulatory access and spacing requirements between allotments also restrict retrofitting of eaves and awnings. Ironically, some north facing buildings had too much shade due to stylised oversized verandas that were often combined with a trellis and deciduous climbers/vines which prevent sufficient summer air flow and the "deep" veranda prevents winter solar heat gain. The use of deciduous trees was used to good effect. Buildings on older "1/4 acre" type subdivisions had greater opportunities to undertake external shade related retrofit work simply due to more space around the building, including awnings, verandas or strategically placed deciduous trees.

The external cladding and wall insulation used in most homes were generally unsuitable for the project climatic zone of northern Victoria, resulting in a greater reliance on artificial heating/cooling to maintain inside comfortable living conditions compared to "Best Management Practices" (BMP). Residents complained about the difficulties in maintaining reasonable comfort levels, even with artificial heating and cooling. These problems were mostly a legacy of

house designs not customised for the extreme seasonal fluctuations experienced in the study area. Most residents were not vocal in describing the poor thermal properties of their homes, and this was borne out in the surveys that described a moderate level of comfort and satisfaction. Interestingly, residents were very eager to accept the electric throw rugs, power-mates (thermostat controlled double adapter) and described the cold draughts (prior to the installation of door draught stoppers), went to bed early and got up late during the winter periods to reduce heating costs and finally, apologising for the cold home when the HEA Assessor arrived.

Draft proofing doors, windows, exhaust fans and permanent sealing of wall vents and winter sealing of air conditioner vents provided immediate benefits by contributing to more comfortable inside temperatures with little expense. These activities were undertaken by many participants and the $250 budget was able to complete most of these activities. Down lights that had swivel capacity (gimballed) also had an air gap around the fitting which allowed the free flow of air between the living space and the roof cavity. Free LED globes to replace halogen down light globes were used briefly in the project as part of the VEEC's installation, however not long after these light upgrades began, the Essential Services Commission ordered that this activity only be conducted by a qualified electrician. This did not include replacing the fitting so the air gap remained. A more expensive option was to replace the entire fitting with a sealed fixed LED fitting although this was not deployed in this project. When Halogen globes were replaced with LEDs, this enabled closer fitting bulk insulation around the light fitting. The Halogen globe does reach 250 -300 degrees and there must be at least a 200mm gap around the entire fitting. Many homes had an entire insulation batt missing from around each downlight, resulting in severely compromised ceiling insulation. In contrast, the LEDs operate at around 50 degrees so the air gap surrounding the fitting need only be 20mm. The "driver" which is connected to the 12volt light fitting must still be placed in open air and usually sits on top of the insulation or secured to a ceiling batten (to keep cool). In the past 6 months, LED fittings have arrived in Australia that can now be completely covered with bulk insulation (not blown in/ loose material) so long as the driver is placed in open air. These were not available at the time the retrofit works were done in this project.

Bulk insulation in roof cavities can provide an effective barrier to the transfer of extreme summer heat into living areas and more importantly help contain winter heat inside the living area. 70% of the ceilings inspected had substandard insulation with gaps of 5% or more. These gaps were mostly due to poor installation technique, but also due to material disturbed from electrical or plumbing works and the use of ceiling mounted electrical fittings such as halogen down lights that required an air space free of insulation.

Rectifying gaps in the ceiling bulk insulation is a critical issue that was recommended in over 70% of homes and this must be addressed in order to establish a reasonable level of comfort within the living zones of the house. It is, however important to address the summer solar heat gain (external shade, blinds and awnings, internal window furnishings, pelmets, glazing)as well as rectifying the bulk insulation, otherwise fixing the bulk insulation first may compound the summer heat problems. Upgrading insulation remains one of the most effective ways of improving internal ambient temperature, resulting in improved health benefits for residents.

Windows are the weakest thermal component of a home's protection from outside hot/cold conditions. While double glazing will provide a significant improvement in the thermal performance of windows, it is still the weakest aspect of any house where heat loss/gain is still rapid and significant. Double glazed windows were considered too expensive for the socioeconomic target audience of the LIEEP program, and the use of drapes/blinds combined with pelmets and active use of them and overnight venting of rooms to remove summer heat were considered cost effective solutions to achieve comfort levels for most residents. If double glazing was to be installed, then only windows that were protected from direct sun exposure were to be selected and north facing windows were not to have this type of glazing as it will compromise any winter solar gain.

Most houses had aluminium window frames and these allow rapid transfer of heat into /out of the house. Replacing these window frames with wood or aluminium thermo-break materials were considered too expensive for the clientele involved in this project and sufficient gains were to be achieved from the other recommended actions.

Summary

- Keep the house cool: Install retractable awnings to protect east/west walls and windows from direct exposure to summer sun.
- Eaves should be installed on northern aspects- especially on windows.
- Complete draft proofing in all houses including external doors and internal zoned doors.
- The inadequate condition of ceiling bulk insulation requires urgent review.
- Reinstating bulk insulation to achieve a 100% sealed coverage over the ceiling is required to achieve the optimum standard for inside comfort levels.
- Covering windows with drapes and/or blinds combined with pelmets should be addressed to keep Winter heat (especially overnight heat) from escaping out of the house.
- Use cross ventilation in the Summer evenings to remove build-up of hot air.

CASE STUDY

"The process was easy and the people were reassuring and easy to understand"

— Amanda (Home Energy Assessment)

Amanda came to the Powerdown Project via recruitment at the "pop up shop" in Shepparton during December 2014. She felt very comfortable with the people that visited her rental home during the program, which is important to her as a single mother who is renting. An important piece of information Amanda took from the HEA was to avoid stand-by and unnecessary power use. She has successfully been to able include her son, who has Aspergers, in her efforts to become more energy efficient with pleasing results. Her retrofit included 2 door draft seals, 1 exhaust fan cover, 1 ceiling vent cover, a HWS valve cosy and pipe lagging as well as some insulation on her manhole cover. By reducing drafts, heat loss and improving the efficiency of her hot water service, Amanda's comfort this upcoming Winter will be improved and her Winter energy bills should go down.

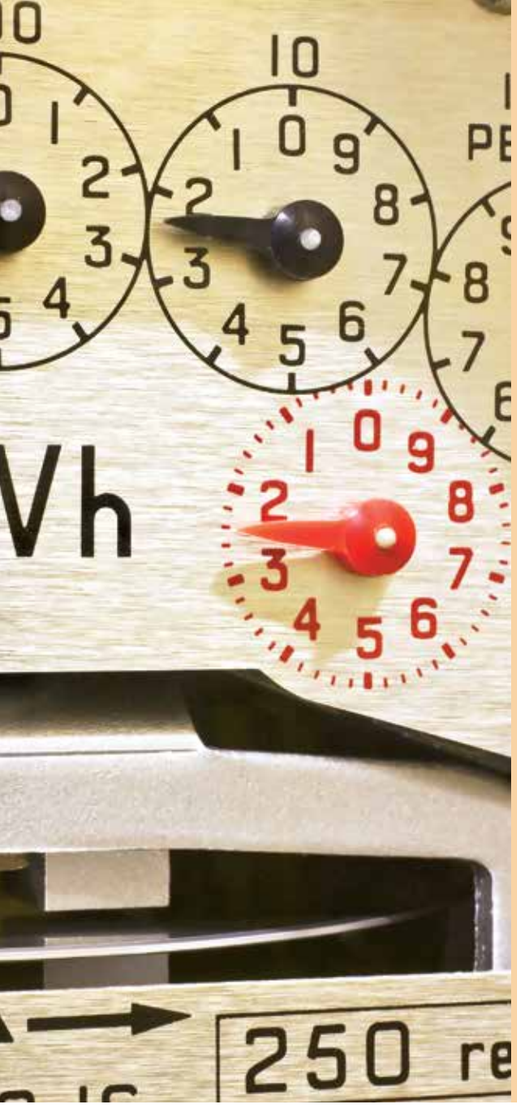
On visiting Amanda for her case study it is obvious she has many energy saving tips in practise, especially "cross ventilation" making the house very comfortable for a 30 plus degree day.

CASE STUDY

"Sarah" had a Home Energy Assessment in January 2014. Sarah had recently separated from her husband and lives with her 4 teenage children in the family home. Sarah had never had to manage or pay the utility bills and had limited understanding around consumption and cost of energy in the home.

Sarah said she was really shocked at the immediate difference in her power bill following the Home Energy Assessment and retrofitting. Compared to the same time last year, her daily usage cost was down by 20%, equating to $2 per day or a saving of $180 per quarter.

The Home Energy Assessment was carried out when 2 of the children were at home. Chris, the HCM involved "John" her 17 year old son in the Home Energy Assessment and she believes this was key to adopting energy saving behaviour in the home. Sarah said sharing the information and discussing the financial implications made the "kids less resistant" to change. Sarah searched for a word to describe how she now feels about energy use in the home, and I suggested "empowered", yes she said, that is exactly it!



CASE STUDY

"Mr Ryan" had had extremely high electrical consumption recorded at his premises since December 2012. In December 2013 at the time of his Home Energy Assessment he was over $5000 in arrears on his bill. The issue had been reported to the Ombudsman and MrRyan sought help from the Powerdown Project to review his billing, usage and metering.

The then Project Manager, who was an "A" Grade electrician, carried out an electrical audit of the premises to identify the cause of excessive energy consumption at the site.

The site consisted of 4 individual units of different sizes, the client occupied a smaller two bedroom unit (Unit 1). Two of the neighbouring properties were occupied by single tenants (Units 3 & 4) and the fourth, identified as Unit 2, had up to 4 occupants. The occupants of Unit 2 were local business owners of a café and used the premises for food preparation and laundering of staff uniforms.

GVCE carried out an electrical audit, including creating a log of meter readings from Units 1 & 2 over a 24 hour period. Readings taken from the clients Smart Meter indicated 23.3 kWh had been consumed compared to 7.7kWh for Unit 2. The project estimate for daily use for "Mr Ryan"was 8.86kWh, it was obvious that "Mr Ryan" was being metered and charged for electricity he wasn't using.

The inspection of the metering panel revealed that the numbering of the metres was out of sequence.

GVCE determined that units 1and 2 had been transposed resulting in the apparent excessive energy use and subsequent costs. The energy company indicated a complaint had been lodged against the same meter in July 2011. The project advised Mr Ryan to apply for his energy use data from his retailer and also lodge a service complaint with them. The Powerdown project supplied "Mr Ryan" with a written report, which he could use as evidence in his complaint. The eventual outcome for Mr Ryan was positive as he and the energy company came to a satisfactory agreement.

COST BENEFIT/EFFECTIVENESS ANALYSIS

The following section calculates the:

1. Cost levels for both HEAs and Workshops
2. kWh and $ savings attributable to the HEA
3. Cost benefit analysis of HEAs
4. Cost effectiveness analysis of HEAs

There is no cost benefit or cost effectiveness analysis for the Workshop as there was a non-significant decrease in kWh use as a result of the Workshop.

INCLUSION IN COST LEVELS

Level 1 –Direct cost

- Staff wages and travel costs relating to the delivery of HEA including retrofitting activities and Workshops.
- Payments to suppliers for products, including the value of donated products utilised in the project.
- For the HEA, Sub-contractor costs for retrofitting including the return to the project from VEECS.
- Cost of laptops and mobile phones for HEA Assessors is included however the phone calls and IT costs are not.

Level 2 – Trial Costs

Includes all Level 1 costs plus

- Direct cost of recruiting and participation of households for both engagement methods.
- Staff wages and travel costs to present at information sessions, media, advertising and flyers.
- Staff time to maintain participants.

Level 3 –Business costs

Includes Level 2 plus

- Business costs including rent, power, telephone, fax and internet infrastructure and usage.
- Business administration and management staff costs that are not related to participating in a government funded trial.

Level 4 – Participating in a government trial (Total Cost)

- Level 3 plus all costs which relate to reporting and compliance activities required by the department.
- The value of all in-kind carried out by the Consortium.

The average cost per participant for both engagement methods are shown below in Table 19.

COMMENTS

***The figures used in this report are actual figures to February 29th 2016 after which projected figures have been used in the calculations. This is due to the timing of final report in relation to the end of project activities.

TABLE 30 COST OF HEA AND WORKSHOPS

	COST LEVEL	AVERAGE COST PER PARTICIPANT	
		HEA & RETROFIT DELIVERY OF APPROACH	WORKSHOP DELIVERY OF APPROACH
Level 1	Direct cost	$558	$57
Level 2	Direct Cost plus participation, recruiting & retention costs	$590	$67
Level 3	Direct Cost, participation, recruiting & retention costs plus total Business costs	$929	$227
Level 4	Total Trial costs	$2,158	$809

Table 30 and 31 show the savings (kWh and $) and the cost benefit and the cost effectiveness as a result of the HEA.

TABLE 31 HEA ENERGY CONSUMPTION REDUCTION

HEA ENERGY CONSUMPTION REDUCTION
0.612 kWh per day

TABLE 32 HEA ENERGY COST REDUCTION

HEA ENERGY COST REDUCTION
$312.73 over 5 years

TABLE 33 COST EFFECTIVENESS AND COST BENEFIT RATIOS OF HEA

The cost benefit analysis is calculated on a kilowatt hour price of .28 cents over 5 years

LEVEL	COST LEVEL-DESCRIPTION	HEA COST EFFECTIVENESS RATIO OVER 5 YEARS	HEA COST BENEFIT RATIO OVER 5 YEARS
1	Direct cost	0.50	1.78
2	Direct Cost plus participation, recruiting & retention costs	0.53	1.89
3	Direct Cost, participation, recruiting & retention costs plus total Business costs	0.83	2.97
4	Total Trial costs	1.93	6.90

*It is acknowledged that the benefits of trial interventions may not be able to be fully captured due to the limitation of trial resources and timelines. Analysis of changes in electricity use over a longer period of time would provide insight into the whether the different approaches had a diminishing or long lasting effect on energy use.

** The cost analyses below relate to a trial project therefore costs in general are higher than an on-going programme would incur.

The cost and effectiveness benefit analyses below have not allowed for diminishing effect over the 5 years nor taken into account any increases in electricity tariffs over time. The kWh savings would remain level, however there would likely be increased monetary savings due to rising electricity prices; The 2008 Energy Use in the Australian Residential Sector 1986-2020 study showed that since 1990 the average energy consumption per Australian household has remained relatively constant apart from the influence of year-to-year climatic and weather variations that impact significantly on space conditioning energy demand. Projecting forward to 2020 there is expected to be about a 6% decline in energy consumption per household compared to 1990 levels.

COST EFFECT EFFECTIVENESS ANALYSIS

The cost effectiveness analysis demonstrates the ratio of the cost to deliver the energy savings compared to the kilowatts of electricity saved over five years. The assumption of five years was based on the minimum effective lifespan of energy saving products used and it should be noted that the analysis could not distinguish between energy savings made due to retrofits and those due to behaviour change. The continuation of change in behaviour is less predictable than the lifetime of the products hence five years was chosen although it is likely that savings would extend beyond this period. The cost effectiveness calculations were based on Level 2 costs as described in Table 19.

= **590** (Level 2 cost of HEA) ÷ .612(daily kWh savings)

= **964**

= **964** ÷ **1825** (365 days x 5 years)

COST EFFECTIVENESS RATIO = .53

COST BENEFIT ANALYSIS

The cost benefit analysis identifies the ratio of return on investment of the cost to deliver the monetary savings, based on kWh reduction, to participants over five years. An average electricity tariff of .28 cents per kilowatt hour has been used in the calculation. As previously mentioned, a high percentage of the participants in the Powerdown Project were low energy users: HEA households averaged 10.2 kWh per day; Workshop households averaged 7.3kWh per day. The opportunity for kWh reduction was low. Therefore the cost benefit analysis yielded a relatively low return (i.e. high cost to low benefit). Although the cost benefit ratio is high 1.89:1 for Level 2 cost as described in Table 19, it is important to understand the ratio will likely reduce as the cost of energy rises over the coming years.

$590 (Level 2 cost of HEA) ÷ **$312.73** ($ savings over 5 years)

COST BENEFIT RATIO = 1.89

Not measured in this project were the dollar savings to participants as a result of seeking concessions, accessing hardship plans and obtaining a better deal from energy retailers. Also not measured were gas savings; it is probable that the HEA draft proofing measures resulted in lower gas usage, especially considering 74% of households were connected to either natural or bottled (LPG) gas. It is probable that further improvement to the cost effectiveness and cost benefit ratios would be realised if these other savings had been measured.

The requirement of the funding agreement to deliver set numbers of compliant activity per milestone resulted in the targeted recruitment of a reliable demographic of participants. Retired people who own their home were soon identified as the most reliable to attend appointments, be interested in how to save energy and were willing to participate fully.

The project data shows that 73% of all participants in the Powerdown project were retired and 74.4% were either on Village contract (which represents home ownership), or owned their own home. The high rate of home ownership indicates a good level of financial literacy which infers an understanding of living within the household means.

Earlier in the recruitment process pop up shops were used as a tool to involve a more diverse group of participants, however many of those recruited through this method proved unreliable or unwilling to complete compliant paperwork. It was a disappointment to the staff of the project as helping families in the most need was high on their agenda. The tension between gathering reliable data and delivering an energy efficiency service to those most in need, impacted delivery outcomes and results. The total number of HEA household case files numbered 1197 and yet only 1032 households completed all components of the HEA and 1024 received of these received a retrofit. It is likely that those households with the most barriers to energy efficiency dropped out of the program. Because of project parameters including privacy, their data is not available for use or analysis.

PROJECT BENEFITS

CO BENEFITS

This project produced many benefits to participants, project staff, the Consortia and the community.

Both the Workshop and HEA approaches improved attitudes and beliefs around energy efficiency. Households also reported increased comfort in homes with many participants citing uptakes of energy behaviours and activities following the engagement. It is a reasonable assumption that for HEA households the free retrofits resulted in improved thermal comfort. The trial results also showed that both approaches helped to address barriers to energy efficiency. These outcomes cannot be quantified in the same way as the cost benefits and cost effectiveness can but are no less valid and in some ways more important.

As discussed in earlier sections the co benefits directly assisting households were:

- **Access to billing and concession information** provided by the project empowered 302 HEA and 25 Workshop participants who were connected to the grid, to contact their energy retailer to seek a discount, register for a concession or combine their gas and electricity bill. By seeking "a better deal" or changing retailers, *Households with typical electricity consumption (4800kWh) can save up to $610 - $830 per annum (depending on their network area) if switching from the worst standing offer to the best market offer.*[16]
- ***Increased health benefits as result of improved thermal comfort.*** *A study published in 'The Lancet', May 2015 showed that 6.5% of deaths in Australia are attributable to cold weather. "Most of the temperature-related mortality burden was attributable to the contribution of cold. The effect of days of extreme temperature was substantially less than that attributable to milder but non-optimum weather. The biological processes that underlie cold-related mortality mainly have cardiovascular and respiratory effects."*[17]
  People living in dwellings with optimum ambient temperature ranges decrease their risk of illness. It follows therefore that improving the efficiency and comfort of housing stock will result in better health outcomes and less strain on the public healthcare system which in 2011-12 *was estimated as costing $140.2 billion. This growth can be attributed in part to societal changes such as population ageing, and to increased prevalence of chronic conditions, diseases and risk factors.*[18]
  Improved health outcomes as result of raising awareness of the dangers of carbon monoxide poisoning caused by unflued gas appliances. Partnering with The Chase and Tyler Foundation www.chaseandtyler.org.au, GVCE was able to talk about and hand out safety flyers to both Workshop and HEA participants. The foundation gave a generous donation of 100 CO Monitors which became a retrofit option for HEAs and giveaways at Workshops.
- **Increased social benefits.** There were three key social outcomes of this project.

  1. The social and networking opportunities created between participants, staff and organisations offered professional development and links between people that didn't previously exist. An example was when a HEA information session was delivered at a Men's Shed and following that, members from this organisation went on to build pelmets as a HEA retrofitting option. GVCE was also able to offer professional advice around SolarPV to the Men's Shed.
  2. On visiting many households HCM's were often warmly welcomed and staff reported that their visits to socially isolated people were a valuable contributor to the client's sense of wellbeing. The benefit of a one on one interaction can be long lasting and more tailored to the client's needs.
  3. Social interaction has a positive effect on health. When people live in a comfortable dwelling they are more likely to feel confident around having visitors. An American study: *Social Isolation and Health, with an Emphasis on Underlying Mechanism*[19] *states that "Social isolation is a potent but little understood risk factor for morbidity and mortality, and its negative consequences are most profound among the elderly, the poor, and minorities."*
- **Environmental benefits.** Based on kWh savings to households attributable to 1032 Home Energy Assessments over the next 5 years, the result is a reduction 217 CO2 emissions.

OTHER BENEFITS

- Unexpected opportunities included:
  - Providing the learnings of the project to Powercor in the development of their on line customer portal.
  - The project was referenced by the Victorian Caravan Parks Association in submissions sent to 3 separate enquiries into the operation of electricity supplies to customers in caravan parks that operate as embedded network retailers. These enquiries were; Review of the General Exemption Order Issues Paper , Issues Paper Modernising Victoria's Energy Licence Framework 2015 and The Australian Energy Regulator – revision of Exempt Selling Guidelines. In each submission, VicParks cited their role in the Powerdown Project, and their willingness to assist with a project designed to increase energy efficiency and reduce energy costs for low income people, since this demographic is heavily represented in some residential parks.
  - The inclusion of the project in the Greater Shepparton City Council Sustainability Strategy 2014-2017.
  - Speaking at the 2014 VicParks Conference.
  - A member of a coalition of Victorian LIEEP projects where key learnings were presented to senior policy personnel from the Victorian Department of Economic Development, Jobs Training and Resources.
- The project forums, hosted by the department were an effective platform to exchange ideas and find solutions to trial problems. Of most value was the opportunity to foster collaborative approaches to data management and delivery between trials, research partners and CSIRO. Early on in the project there were considerable challenges regarding data collection and standards. At the second forum CSIRO provided much needed information, context and guidance around the data. The forum had a positive influence over working relationships between grant recipients, the department and CSIRO. GVCE will continue to benefit from the expertise, networking and business opportunities stemming from relationships formed with other grant recipients.
- Being a member of the LIEEP Reference Group for two terms proved valuable as a means of receiving information around the expectations of the department and CSIRO, which helped to align the focus for the Powerdown Project. The time spent proved to be a valuable investment and it is our belief that this project would have been disadvantaged had it not participated.
- The project's flexibility, processes and quality finance management allowed the expansion of service delivery outside the original geographic boundaries, leading to an over subscription of participant numbers.
- GVCE has increased its organisational capacity as a result of the refinement of skills and knowledge base of Powerdown project staff. This includes all areas of project management and delivery, including no and low cost energy efficiency measures, energy billing and concessions, addressing participant barriers, data management, scheduling and survey work.
- The development of key partner relationships in the Consortium which led to improved recruitment outcomes and increased the energy efficiency knowledge base of Consortia partners and other agencies involved in the project.
- An increased awareness of the challenges faced in many households who endure poor comfort levels and high energy costs.
- Financial savings-The project gained access to older people in the community who felt disempowered in regard to dealing with energy retailers. The project was able to assist them to upgrade their energy plans to the best available discounts and concessions.
- Established links to other services in the community such as Financial Counselling, HACC Services, Family Support organisations.
- GVCE has gained knowledge around embedded electricity networks and has developed positive relationship with electricity distributors and networks.

[16] SSt Vincent de Paul Victorian Energy Prices report- January 2016 Page 4
[17] Mortality risk attributable to high and low ambient temperature: a multicountry observational study http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62114-0/abstract
[18] "Australia's Health" http://www.aihw.gov.au/australias-health/2014/health-system/
[19] *Social Isolation and Health, with an Emphasis on Underlying Mechanism http://muse.jhu.edu/article/168969*

TRIAL OPERATIONS LEARNINGS & CHALLENGES

- Development and updating of the data collection software was challenging. The original program design had mapped out the data required for the HEAs and evolved to capture the CSIRO's database schema. The protracted time needed to get the GVCE customised webform up and running due to system limitations, changes to schema, complexity of implementing changes and updates along with user difficulties caused delays in the project. Whilst the first HEA was performed in November 2013, the database was not ready until mid-February 2014, which meant during March and April assessors spent time data entering previous assessments into the Webform. Throughout the project, staff experienced continual frustration with the webform as it was cumbersome and a difficult tool to use. It was challenging to incorporate all of the mandatory CSIRO schema requirements into the Webform as well as applying Schema updates after project activities had commenced. Changes to Webform were always complex, time consuming and almost always led to project down time. Assessors often had to use the original spreadsheet or older versions and make manual notes to capture all the data required. The project also experienced data loss due to changes and updates.
- The approved project design did not make provision for dedicated data management staff to assist in the development of software nor was there provision for sufficient resources to clean and check data. In the approved project plan Home Energy Assessors were tasked to perform the follow up survey (Survey 2). Due to the significant time required to do this activity, extra staff were employed. The cost to budget incurred by the project to manage data and survey participants was $105,935.
- Collection of electricity permission forms was problematic. To measure changes in energy use the project was required to collect consumption data relating to each participant. The project's approach was to get the participant to sign an eligibility and permission form which authorised GVCE to apply for the household usage data. This form would then be used to gather the data from electricity distributors rather than from the retailers. A similar authorisation process was implemented to gain electricity data from embedded network managers.
- The generic permission form being used by GVCE in the first 6 months of the project, did not meet the distributer's organisational or legal requirements. Each of the distributors went on to create their own unique form. The Powercor form required 2 forms of photo identification to be included in the application being attached and this requirement was introduced in July of 2014, by which time around 270 HEAs had been completed (and then needed to be revisited). Ausnet Services developed an "explicit consent form" and this was provided available in February 2015.
- Additional resources had to be assigned for staff wages and travel to revisit homes and also to cover extra administrative costs associated with scheduling revisits, writing letters and processing forms. Grocery vouchers ($25) were used as a conciliatory type incentive to mitigate the disruptive impact of duplicating paperwork to be filled out by participants.
  Maximising the amount of returned permission forms was critical to achieving project delivery outcomes and this was finely balanced with a need to ensure positive customer relationships were not compromised.
- The approved project plan had no consideration for attrition in HEA or workshop participant numbers. Incomplete paperwork, landlords not returning retrofit permissions, households missing retrofit appointments, illness, death, withdrawal from project and incomplete surveys all contributed to the challenge of retaining the maximum number of compliant participants.
- Duration of data collection. The period used to collect data from participants was variable depending on when the participant was engaged. Those who enrolled early in the project had a longer period of monitoring after engagement, and conversely, those who were engaged late in the project, had short monitoring periods. The monitoring period ranged from a maximum of 12 months and a minimum of 2 months. This meant the data for many participants did not cover the four seasons in a year. During analysis the process of normalising the electricity data was problematic.
- Experimental Design compromised the engagement techniques. One of the project's aim was to identify and address barriers, and in many cases the process to collect data created a significant barrier. The trial aspect of the project impeded the customer's experience as the eligibility, surveying, collection of data, privacy and paperwork were onerous on both staff and households.

Some examples

  - It was expected that at workshops, participants would fill out a Survey. For those with literacy, sight or cognitive issues this was an even larger hurdle, even with the use of visual and audio prompts as well as the offer of assistance.
  - The revisits to homes to complete paperwork and ensure compliance was intrusive.
  - Whilst different approaches were adopted to address cultural and language barriers, the project was not able to successfully engage with English as a second language (ESL) households.
- The type of dwellings included in this study were not randomly selected. As a consequence, there were differences in the type of homes between HEAs and workshops. Most workshop attendees came from gated communities and most of these came from one company, Lifestyle Communities. These dwellings were uniform in design and were less than 10 years old. In contrast, HEA dwellings were variable, some from gated communities and some from more conventional locations and the age of dwellings varied.
- Identifying the key motivators for change was an important aspect of the project. Both saving money and increasing comfort were key motivators to adopting energy efficient practices. In workshops the information was directed more towards comfort, as households who were part of an embedded network had no control over their billing. HEA households were more likely to be motivated by both saving money and comfort.

FUTURE PROJECTS

Investment in future energy efficiency and productivity programs is essential to building healthy resilient communities able to respond to the challenges of climate change. Upgrading housing stock and energy affordability are key to improving household comfort and lessening the demand on the health and welfare sectors. The following two program ideas have been developed by GV Community Energy from the learnings and outcomes of LIEEP.

GV Community Energy

PROJECT 1. — RETRONET

Project Aim — To develop a one stop service in Northern Victoria which will provide consumers and communities with professional services, advice and referral on current best practice energy efficient domestic technologies, products, suppliers, installation options and finance opportunities. Create demand and economic stimulus by retrofitting up to *222 homes with energy efficient technology and products in the Shepparton and Seymour districts.

This project also aims to expand the capacity of regional businesses to respond to increase demand within the domestic housing upgrade sector through knowledge and skill building as well as being a business stimulus via the project's energy upgrade and referral service.

Cost $1M

Benefits for the community include.

- ✔ Economic — creating jobs, stimulating business, increase demand for specialist knowledge, new technology and products.
- ✔ Social — Community based initiative, accessible, social cohesion via shared goals.
- ✔ Environmental — Reduce greenhouse gas emissions.
- ✔ Sustainability — Improved living conditions and comfort, long term improvements to housing stock and reduced energy use.

TABLE 1 STAFF REQUIREMENTS

POSITION	2 YEAR PROJECT SCENARIO 3
CEO Oversight	20%-2yrs
Project Manager	FT-2yrs
Finance Manager	3days-2yrs
Works Co-ordinator	FT-9 months
Field Officer/HEA	2.5 days- 9months
Field Officer/HEA	2.5 days-9 months
Trainer	FT-3months

*The number of homes in the project will be dependent on funding, budgets, community support and uptake.

PROJECT — RETRONET

TABLE 2 EFFICIENCY UPGRADE COSTS TO PROJECT PER OPTION

	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5
Client Grant	$2000	$2000	$2000	$2000	$2000
Co contribution (client)	0	$500	$1000	$1500	$2000
Matched (Project)	0	$500	$1000	$1500	$2000
Cost to project	$2000	$2500	$3000	$3500	$4000

The project looks to give an initial $2000 grant to households.

After the $2000 grant, the project will match dollar for dollar up to another $2000. Therefore the maximum project contribution per house is $4000 and in this case the total works value is $6000

This $4000 is returned directly back into the economy as well as $2000 contribution from the client, a return of 50%.

It is likely that some households will make a greater contribution as the project enable and support households in their decisions to purchase and install upgrades. The project aims to have a target for co contributing households, this maximises energy efficiency installations and economic stimulus.

HOUSE SPONSORSHIP

The project will aim to raise $100,000 in home sponsorships — $2000 per house.

TABLE 3. RETURN ON INVESTMENT BASED ON RETROFIT BUDGET OF $433,540

		HOUSEHOLDS RETROFITTED	PROJECT INVESTMENT	HOUSEHOLD/ SPONSORSHIP CONTRIBUTION	TOTAL RETROFIT INVESTMENT	% INCREASE ON PROJECT INVESTMENT FROM OTHER CONTRIBUTIONS
25%	Option 1	54		0		
75%	Option 5	81		$162,577		
Home Sponsorship		50		100 000		
TOTAL		185	$433,540	$262,577	$696,117	62%
100%	Option 1	217	$433,540	0	$433,540	0
Home Sponsorship		5		$10,000	$10,000	
TOTAL		222	$433,540	$10,000	$443,540	1%

- In the first option above $696,000 will go directly back into jobs and the economy.
- A minimum of 7 jobs will be supported directly out of the funding as well as the tradespeople and businesses engaged to do the work.
- Funding for a qualified trainer is included in the proposal as a means to upskill workers.
- Community and business buy in from home sponsorship.

PROJECT 2. ENERGY LITERACY

Cost Approx $350 per household

✔ One hour, one on one energy bill reviews for low income households.

✔ Conduct reviews in peoples homes.

✔ Review tariffs, concessions and discounts.

✔ Assist in renegotiating new contracts and pricing.

✔ Referral to financial hardship and counselling services.

This program will empower households to better manage and understand energy billing.

CONCLUSION

The Powerdown Project compared the effectiveness of Home Energy Assessments coupled with low cost retrofit activities against Workshops as a means to increase energy efficiency and comfort in low income households.

The Home Energy Assessment and retrofit resulted in an average saving of.61 kWh of electricity overall, whilst the Workshop did not produce kWh savings.

Data analysis and participant interaction clearly showed that most of the low income households in this trial were low energy consumers who prior to engagement relied on reducing energy use as a means to manage energy costs, which often had a negative impact on comfort and wellbeing. There was a small group of high energy users and this required customised assistance to address specific circumstances to reduce their electricity usage.

The project was successful in increasing the energy literacy of households who had a HEA. The one on one energy bill review interaction empowered participants (assisted or independently) to renegotiate energy bills to "get the best deal" and seek concessions where eligible.

TRIAL CONCLUSION:[20] This study examined attitudes and perceptions associated with the voluntary implementation of domestic energy-saving behaviours and adoption of energy efficient products. The Home Energy Assessment (HEA) and Workshop were evaluated with self-report measures to assess stability and change in factors that support or impede energy efficiency behaviours, and the efficacy of these two engagement methods on energy efficiency actions in the home.

Prior to the implementation of the HEA and Workshop, ratings about the energy efficiency of the household, capacity to achieve savings, comfort regarding heating and cooling levels, interest in energy efficiency and knowledge about energy efficiency suggested that, on average, participants were capable and interested in becoming more energy efficient. Further, participants showed some areas of similarity and difference on baseline measures. While, on average, Group 3 believed their households to be more energy efficient that participants in Group 1, higher average level of interest was apparent in Group 1. Because of these differences, analyses over time controlled for ratings at Time 1.

The analysis of key beliefs about household energy efficiency, comfort and capacity to save energy over time, revealed that both groups showed improvements. That is, irrespective of the type of intervention (e.g. retrofits or education via a workshop), beliefs became more supportive of energy efficiency, comfortable in their homes, empowered to save energy and knowledgeable about how to achieve it. The effect was stronger for the Workshop than for the HEA on perceptions of household energy efficiency and ratings of comfort in the home. Therefore, perhaps because of differences in housing contexts between groups, the activities undertaken in the Workshop, or the interaction between these and other household characteristics, individuals who had attended the workshop came to believe more strongly over time than HEA participants that their households were energy efficient and somewhat more comfortable.

This improvement in feelings of comfort over time in both intervention groups is noteworthy because it suggests that households can undertake reasonably low cost activities and feel more comfortable than they were before being engaged to save energy via the HEA and Workshop. It is not obvious from the data through which mechanisms the effect was achieved, but one possibility is that energy saving activities undertaken (e.g., zoning rooms, optimizing window coverings, etc.) resulted in material improvements to heating and cooling levels. Alternatively, the act of undertaking energy saving behaviours (e.g., reducing heating and cooling temperatures) might provide participants with a sense of wellbeing that is expressed as "feeling comfortable" in the home.

The interventions were successful in reducing participants' perception of the impact of a number of barriers to saving energy. The two highest impact barriers (cost of upgrades and living in a rental property) showed significant improvement over time for both interventions. Likewise, experiencing a lack of information as an impediment to saving energy was regarded as having less impact over time in the HEA and Workshop groups. The Workshop intervention was also successful in improving participants' perceptions of being supported by other household residents and problems involving language proficiency. Perhaps these outcomes resulted from the communal aspect of the Workshop approach in that all residents from participating households could potentially attend and language difficulties could be alleviated somewhat with the help of friends and family. If this speculation has merit, the Workshop intervention may be more successful at directly influencing household dynamics concerning energy use rather than just individual behaviour. This conclusion notwithstanding, it is worthwhile noting that participants did not strongly attribute any change in support from others in their households to either the Workshop or the HEA. Rather, when asked how much they thought the interventions had overcome this barrier, average ratings were quite low (refer to Figure 6.1).

[20] Jorgensen.Behaviourworks. Survey Analysis of GVCE Power Down. Low Income Energy Efficiency Project

An alternative explanation of the greater effect of the Workshop on household support and language difficulty is that HEA participants tended to exhibit average ratings that were quite low, indicating that the barriers were not regarded as very serious. This may have reduced the potential to achieve improvements from already desirable levels.

The participants own attributions of how much they believed the HEA or Workshop overcame barriers indicated that the interventions were viewed favourably. The participation in the Workshop was associated with increased empowerment, interest and knowledge. The explicit educational focus of the Workshop may have been responsible for these outcomes. Of note was that ratings of comfort were the least likely evaluation outcome to be attributed to the HEA or Workshop. Given that comfort ratings did improve over time, it is surprising that participants were unwilling on average to attribute, in large part, the change to either intervention.

When participants were asked to attribute the role of the interventions in overcoming the barriers of information deficits, lack of support from other householders and problems understanding the information, only the former barrier was significantly different between groups. Participants engaged in the Workshop were slightly more likely to attribute it to overcoming a lack of information. As noted above, the education function of the Workshop was most likely responsible for this difference in attributions to the interventions.

Attitudes towards energy savings in households were generally favourable on average for participants involved in the HEA and the Workshop. Oddly, however, the HEA was associated in diminishing these positive attitudes over time while participants in the Workshop tended to show improvement over time. These outcomes may be due to a statistical artefact – regression to the mean - that can operate in repeated measures designs where the same variables are evaluated over time. This explanation may be more likely than an alternative one suggesting that the HEA actually made energy saving more unpleasant than they had first believed. Nonetheless, it is worth reflecting on the activities of the HEA with the goal of providing as much support to householders when their living environments are subject to intrusive conditions or activities (e.g., installation activities, introduction of new devices, etc.).

Self-reported behaviours were subject to frequency analyses that provided some useful insights about the types of behaviours participants either wanted to commit to doing or said they had been engaged in. The behaviours committed to by participants in Survey 1 (i.e., those on their fridge lists), indicated that Workshop participants reported more frequently than HEA participants that they adjusted heating and cooling temperatures. Moreover, participants in the HEA were more likely to commit to zoning areas by closing doors. These differences are consistent with their respective interventions. That is, since the HEA involved providing strategies tailored to householders dwellings, it is unsurprising that zoning would emerge as an energy saving option. Likewise, without specific knowledge of participants' dwellings recommendations such as the 10-percent rule might be expected to have general applicability for participants. Apart from these differences, however, it should be noted that both interventions tended to be associated with similar types of behaviour (e.g., maximising thermal mass in the refrigerator, draft proofing, and avoiding standby power use) indicating that much can be achieved in targeting specific behaviours through the type of goal-setting activities apparent in either intervention.

Attendance at the Workshop was associated with higher rates of completing activities appearing on the fridge list. It is unclear how the Workshop approach might have operated to facilitate this outcome, but one possibility is that all residents of a particular household who attended the workshop may have been involved in completing the fridge list. Perhaps HEA participants had less support from other householders to complete the activities. In support of this speculation, Workshop participants showed significant improvement in the barrier regarding having support from other residents to save energy whereas HEA participants showed no significant change in this perception over time.

The energy saving behaviours that participants reported doing were mostly low cost activities, such as draft proofing doors, window and vents (Item 12 in Table 2), and the management of curtains, drapes or blinds (Item 51 in Table 2). Other energy saving activities were related to adjusting temperature settings to fridges, and heating/cooling appliances, using electricity during off peak times, avoiding stand-by power use, and reducing the number or use of appliances. The use of electric throw blankets was also commonly reported.

By-and-large, the most frequent self-reported behaviours were different to those frequently nominated by participants for their fridge list. Therefore, there is some suggestion that the goal setting activity of the fridge list may have enabled behaviours that were not already being undertaken by participants. This statement notwithstanding, there were behaviours that appeared in both analyses: increasing thermal mass in the refrigerator; zoning by closing doors; draft proofing; 10-percent rule; and avoid using standby power.

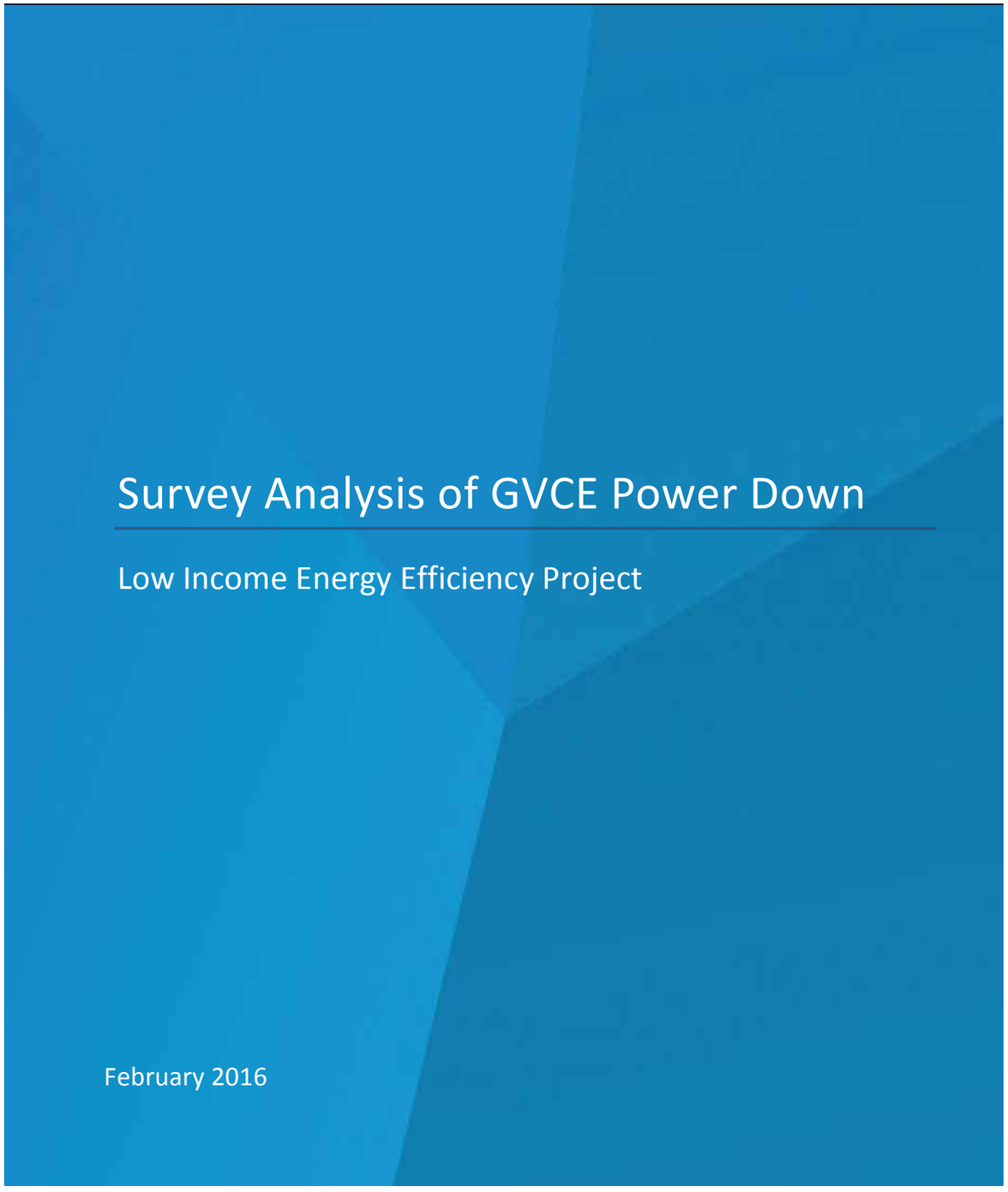
Different between interventions was the frequency of adjusting heating and cooling temperatures by one degree. As with the fridge list analysis, the 10-percent rule was more frequently reported by Workshop participants than by those householders involved in the HEA. As noted above, this may be due to the possibility that the Workshop information was designed for general applicability.

The list of devices that participants reported installing was similar for the most frequent devices (i.e., draft proofing and installing internal window treatments). One difference associated with the interventions was the insulation of hot water service pipes which was more frequently reported by Workshop attendees. It is unclear from the data why this outcome was apparent other than to speculate that the dwelling types and living arrangements made this behaviour attractive among Workshop participants. Alternatively, it may have been a behaviour given more emphasis in the Workshop than in the HEA.

In conclusion, the HEA and Workshop interventions were associated with significant changes in key beliefs, barriers, and attitudes related to energy efficiency and conservation. There were also notable outcomes concerning self-reported energy saving behaviours that have the potential to facilitate material savings in energy consumption. Of further note is that the interventions did not always have the same impact on outcome measures. There was some suggestion that the more social environment characteristic of the Workshop might have facilitated outcomes such as achieving support from other householders and assisting in overcoming language difficulties. The HEA on the other hand appeared to have had greater or lesser impact in areas that were associated with specific dwelling characteristics and living arrangements. Overall, however, the Workshop appeared to have been associated with stronger and more consistent changes on beliefs, barriers and attitudes relevant to motivating energy saving behaviours.

The Consortium Model was very successful, creating the catalyst for increased knowledge and awareness for members, their cohorts and clients. The Consortium developed into a motivated network of people who were genuinely committed to developing strategies to create opportunities to increase energy productivity, resulting in creating better financial, comfort and health and wellbeing outcomes for the low income households that they represent.

APPENDIX A — SURVEY ANALYSIS OF GVCE POWERDOWN



Survey Data Results

Synopsis of Survey Data Results

This survey examined attitudes and perceptions associated with the voluntary implementation of domestic energy-saving behaviours and adoption of energy efficient products.

Following the Workshop and Home Energy Assessment (HEA) interventions, participants were more supportive of energy efficiency, felt more comfortable in their homes, were more empowered to save energy and reported being more knowledgeable about how to achieve it. These effects were reported to a higher level in Workshop participants compared to HEAs and this is most likely due to the explicit educational focus of the Workshop.

The HEA and Workshop interventions were associated with changes in key energy efficiency beliefs, perceptions about high impact barriers to energy saving, and self-reported energy efficiency activities. These outcomes suggest that, following involvement in the interventions, participants were well-placed to reduce their households' energy consumption.

Introduction

The aim of this study was to examine attitudes and perceptions associated with the voluntary implementation of domestic energy use behaviours and/or products and to identify barriers that impact on adoption levels. Participants were allocated to one of two free engagement methods. Group 1 received a Home Energy Assessment (HEA) with Retrofit and access to an "Energy Coach" for up to 6 months after the Assessment. Group 2 attended an Energy Efficiency Workshop and also had access to the presenter as "Energy Coach" for 6 months after the Workshop. The two groups were assessed on a self-report questionnaire (Survey 1) regarding attitudes towards their energy consumption, factors that might restrict the ability of a household to reduce energy consumption (such as renting), and quality of life issues associated with energy use in general (e.g., to what extent does perceived energy reduction lower expected comfort levels). The two groups were interviewed again after 6 months (Survey 2) on a range of questions that repeated those presented in Survey 1, but also investigated the nature of behavioural changes adopted by each household since Survey 1.

From these two surveys, the aim of this report is to (1) assess the change in behaviours and attitudes toward energy conservation according to the interventions within the two groups, (2) gain a better understanding of factors that affect the uptake of energy saving initiatives and (3) suggest how these findings could be used to improve behavioural programmes to promote consumer awareness and willingness to adopt energy efficiency measures.

Overview of Survey Data Results

Prior to the HEA and Workshop interventions, the survey data indicated that participants in both groups were capable and interested in becoming more energy efficient. However, Workshop participants believed their households to be more energy efficient than did participants in the HEA group, but this latter group reported a higher level of interest in energy efficiency prior to the implementation of the interventions.

Taking these group differences into account, key beliefs about household energy efficiency, comfort and capacity to save energy over time, were examined over time to see whether there were changes that might be attributed to the Workshop and HEA interventions. Following both interventions, participants were more supportive of energy efficiency, felt more comfortable in their homes, were more empowered to save energy and reported being more knowledgeable about how to achieve it. Therefore, the HEA and the Workshop interventions were successful in influencing important beliefs for reducing energy consumption. Moreover, the improvement in feelings of comfort suggests that households can undertake reasonably low cost activities and feel more comfortable than they were before being engaged to save energy via the HEA and Workshop.

The interventions were successful in reducing participants' perception of the impact of what they considered to be the most important barriers to saving energy. For example, participants in both groups came to see the cost of upgrades, living in a rental property and lack of information as less significant barriers following the interventions. Furthermore, Workshop participants also reported being more empowered to save energy, more interested in energy efficiency and more knowledge about how to become efficient. Most likely, the explicit educational focus of the Workshop was successful in engaging participants in matters of energy efficiency for their households and was instrumental as a source of information for participants.

Both interventions were successful in assisting participants' undertake energy efficiency behaviours (e.g., maximising thermal mass in the refrigerator, draft proofing, and avoiding standby power use). At least 50% of participants reported having fulfilled their commitment when surveyed after the interventions, indicating that much can be achieved in targeting specific behaviours through goal-setting activities.

Behaviours that participants reported doing following their involvement in the interventions included reducing the use of appliances (e.g., lights), zoning by closing doors, avoid using standby power and managing curtains and blinds. The devices participants reported installing included draft proofing, window coverings, and insulation for hot water service pipes. The two most frequently reported behaviours (reducing appliance use and zoning) and devices (draft proofing and installing window coverings) in each group were the same.

In summary, the HEA and Workshop interventions were associated with changes in key energy efficiency beliefs, perceptions about high impact barriers to energy saving, and self-reported energy efficiency activities. These outcomes suggest that, following involvement in the interventions, participants were well-placed to reduce their households' energy consumption.

1. Preliminary Baseline Data (Survey 1).

1.1 Key Beliefs about Household Energy Efficiency.

There were several noteworthy factors that were identified from the initial scan of the data at baseline (Survey 1). The total number of participants in the sample for Survey 1 was 1021 individuals. Moreover, the two intervention groups (HEA and Workshop) had an uneven number of participants responding to Survey 1 (Group 1 n = 671; Group 3 n = 350) although missing data on questions of interest may have reduced these group sizes for any particular analysis presented in this report. For this reason, group sizes for specific analyses are reported where relevant.

The group trends for existing energy efficiency at Survey 1 (Q1), empowerment in energy consumption (Q2), lifestyle comfort with energy use (Q3), and interest in domestic energy conservation (Q4) and knowledge were broadly similar between intervention groups. There were statistically significant differences between groups on Questions 1 (t = 3.06, p < .01) and 4 (t = 3.63, p < .001) with Group 3 rating higher on average for being energy efficient but lower than Group 1 on interest in energy efficiency. However these differences between group means were small upon inspection (0.19 and 0.16 respectively). In general, both groups reported medium levels of current energy efficiency, and a high level of interest in conserving energy in the home. Therefore, both groups showed some motivation and scope for improved energy efficiency.

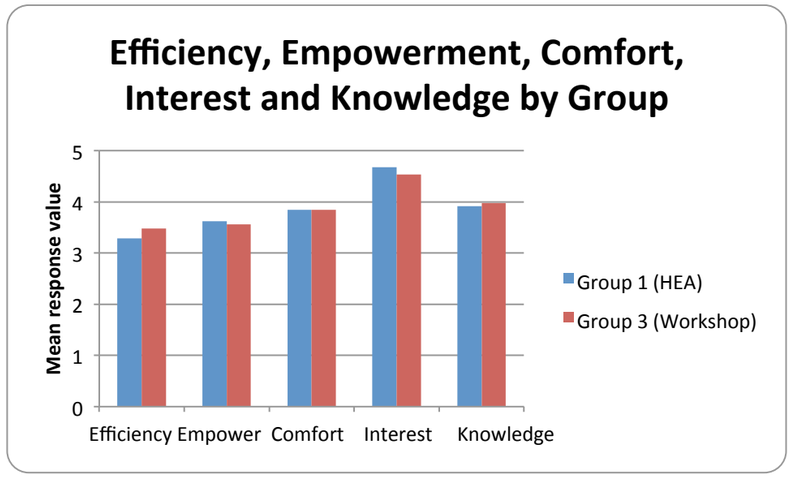


Figure 1.1 Mean ratings for beliefs regarding energy efficiency (Q1), empowerment (Q2), comfort (Q3), interest (Q4) and knowledge about energy efficiency (Q5): Group 1 (Blue) and Group 3 (Red).

1.2 Barriers to Energy Savings.

Factors that impeded energy conservation were associated with living in a rental property (Q6b), where participants in Group 1 rated more highly than Group 3 on this measure (Group 1 *n* = 346, *M* = 2.79, *SD* = 1.79; Group 3 *n* = 94, *M* =2.29, *SD* = 1.60, *t* = 2.45, *p* < .05). The lack of support from other people living in the home was also an impediment to the implementation of energy saving measures that differed between groups (Group 1 *n* = 405, *M* = 1.54, *SD* = 1.05; Group 3 *n* = 216, M = 2.10, *SD = 1.41*, *t* = 5.55, *p* < .001). Lack of information was reported more highly as a contributing factor to the use of domestic energy conservation behaviours in Group 3 than Group 1 (Group 1 *n* = 642, *M* = 2.45, *SD* = 1.21; Group 3 *n* = 283, *M* = 2.85, *SD* = 1.43, *t* = 4.43, *p* < .001). Group 3 had greater difficulty understanding the information they were given than Group 1 (Group 1 *n* = 571, *M* = 1.64, *SD* = 1.03; Group 3 *n* = 289, *M* = 2.46, *SD* = 1.45, *t* = 9.54, *p* < .001). Group 3 also found it more difficult to read the information they were given compared to Group 1 (Group 1 *n* = 526, *M* = 1.39 *SD* = .93; Group 3 *n* = 272, *M* = 1.95, *SD* = 1.36, *t* = 6.87, *p* < .001). Reports of language difficulties (i.e. proficiency with English) were generally low (between 1 and 1.5 on a scale ranging from 1 to 5), but were significantly different between groups. Group 3 reported more highly on this measure on average than Group 1 (Group 1 *n* = 518, *M* = 1.10 *SD* = .41; Group 3 *n* = 251, *M* = 1.39, *SD* = 1.03: *t* = 5.74, *p* < .001).

Figure 1.2 shows the mean scores on the variables. Average ratings tended to lie towards the positive end of the scale for most variables indicating that, on average, participants did not regard them to be too onerous for achieving energy savings. Cost of energy upgrades was regarded as the highest impact barrier on average, and these ratings did were not significantly different between groups.

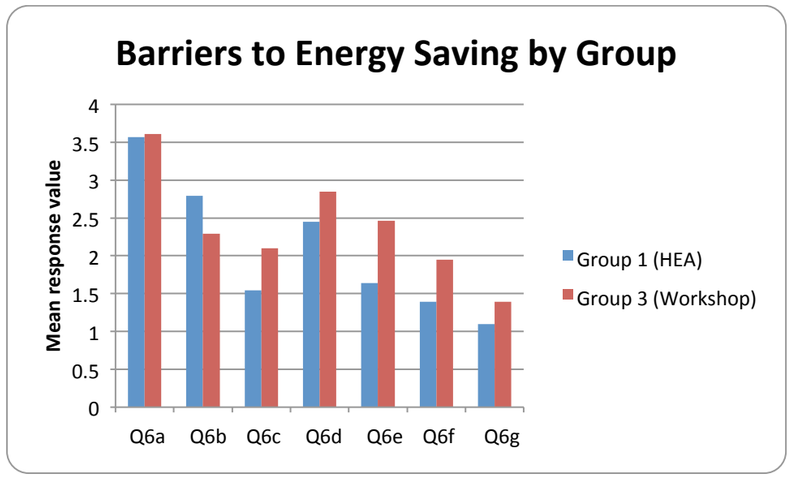


Figure 1.2 Mean ratings for barriers to saving energy. Cost of upgrades(Q6a), living in a rental property (Q6b), lack of support from other people living in the home (Q6c), lack of information (Q6d), problems understanding the information (Q6e), finding it hard to read (Q6f) and language difficulties (Q6g).

1.3 Attitudes towards Energy Savings.

Attitudes towards the impact of energy saving measures on quality of life (Survey 1, Q7-11) were consistently higher in Group 3 than Group 1 (see Figure 1.3). Moreover, Group 3 found on average that energy efficiency measures would restrict freedom and quality of life (see Table 1). Overall, Group 3 had a more negative response style to questions assessing attitudes to energy saving behaviours. However, mean scores on all attitude ratings tended toward the positive end of the scale suggesting that participants held reasonably supportive views regarding energy savings on average.

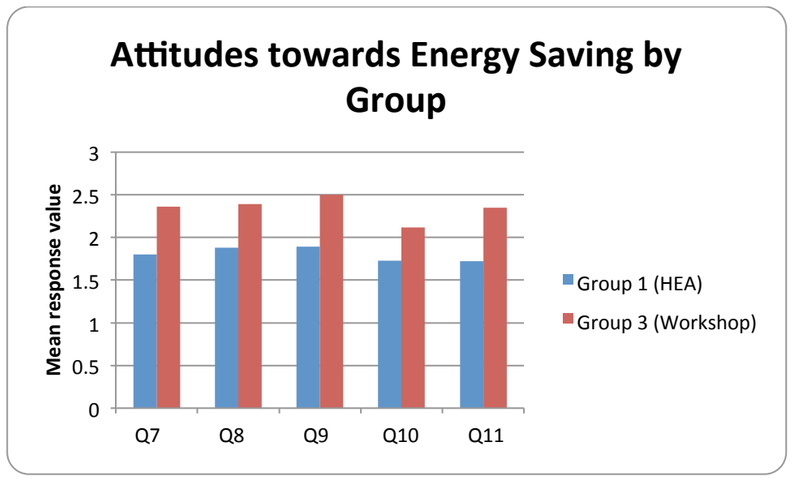


Figure 1.3 Mean ratings of attitudes towards saving energy. Energy efficiency is too much hassle (Q7), Energy efficiency means living less comfortably (Q8), will decrease my quality of life (Q9), restrict my freedom (Q10), energy efficiency is not very enjoyable (Q11).

Table 1. *Independent t-tests between Groups 1 and 3 on measures (7 to 11) assessing attitudes towards energy saving measures as assessed on Survey 1 (Energy efficiency: EE; Quality of Life: QOL).*

Measure	n (1, 3)	*M* (1, 3)	*SD* (1, 3)	*t*	*p*
7) EE is a Hassle	(649, 299)	(1.81, 2.36)	(.72, 1.04)	9.57	p<.001
8) Loss of comfort	(652, 294)	(1.88, 2.39)	(.73, 1.04)	8.59	p<.001
9) Decreased QOL	(650, 300)	(1.89, 2.50)	(.85, 1.17)	8.98	p<.001

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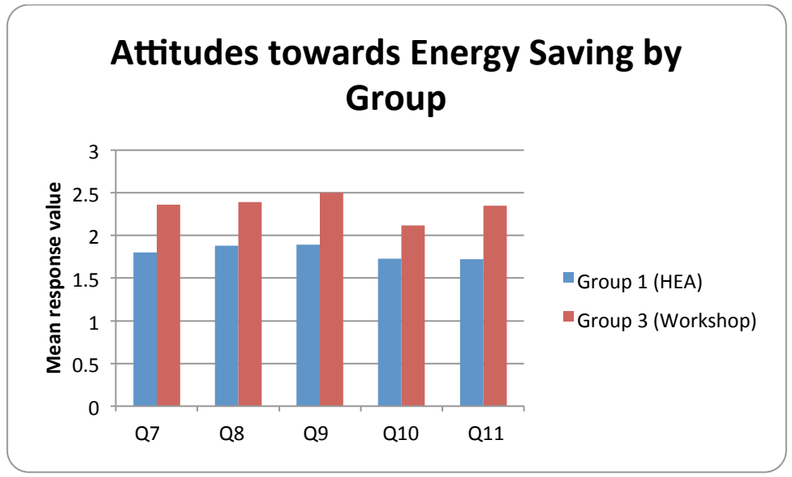

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9) Decreased QOL	(650, 300)	(1.89, 2.50)	(.85, 1.17)	8.98	p<.001
10) Restrict freedom	(654, 301)	(1.73, 2.12)	(.56, .96)	7.83	p<.001
11) EE not enjoyable	(652, 301)	(1.72, 2.35)	(.66, 1.04)	11.15	p<.001

1.4 The "Fridge List": Behaviours Participants Committed to Undertaking

The frequencies of actions appearing on participants' reminder "fridge lists" were analysed (see Figure 1.4). These responses were later post-coded into 58 behavioural categories for further analysis (see Table 2 for a list of the categories). Three responses per participant were combined into a single variable and frequencies were calculated for participants in Groups 1 and 3 (see Appendix 1). In Group 1, the most frequently nominated activities were: Maximise thermal mass in the fridge/freezer (Category 1, 38.8%); Zone by closing doors (Category 11, 33.5%); Avoid standby power use (Category 27, 30.6%); and, Draft proof doors, windows and vents (Category 12, 24.8%). In Group 3, the most frequent behaviours for conserving energy were: Adjusting the temperature of heating/cooling by 1 degree (Category 22, 49.0%); Draft proof doors, windows and vents (Category 12, 32.0%); Maximise thermal mass in the fridge/freezer (Category 1, 25.5%); and Insulate hot water service pipes (Category 6, 21.1%). There were a number of activities nominated by only a few participants and these can be seen by referring to the table in Appendix 1.

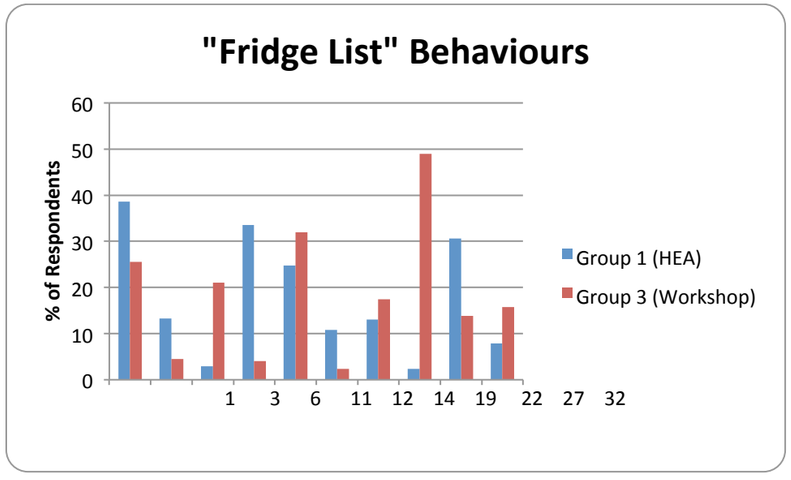

Figure 1.4 Proportion of responders in Group 1 (Blue) and Group 3 (Red) (*y* axis) committing to behaviours that would appear on the "fridge list". The *x* axis represents codes for devices that are described in Table 2.

Of those participants that were asked to recall the 'fridge list' of agreed energy saving measures on Survey 2, Group 1 reported that they recalled Item 1 by 90.1% of responders, Item 2 by 90.2% of responders, and Item 3 by 90.4% of responders. The results were much the same in Group 3, with 88.4% recalling Item 1, 93.8% recalling Item 2, and 93.5% recalling Item 3 at Survey 2. In general, the vast majority of participants could recall the list of 3 items at time 2 (on Survey 2) that they had specifically nominated as energy efficiency measures at Time 1 (on Survey 1).

At Survey 2, participants were asked whether they had completed the top three items on their fridge list. For Group 1 participants, 57.5%, 52.9% and 49.8% reported completing their first, second and third listed items respectively. For Group 3, 60%, 70.8% and 78.4% of participants reported completing their top three activities. Although self-reported completion of the nominated activities was higher among Group 3 participants, the reported frequency of doing the tasks were very similar. On a 5-point scale ranging from "never" to "always", the mean ratings of the three listed activities were 4.25, 4.22 and 4.29 for Group 1 and 4.02, 4.19 and 4.46 for Group 3.

Table 2. *Categories of behaviour assessed in Survey 2 for energy efficiency measures reported by participants.*

Category	Definition
1	Maximise thermal mass in fridge/freezer
2	Have the ceiling insulation checked
3	Upgrade ceiling insulation
4	Increase insulation with floor coverings
5	Install underfloor insulation
6	Insulate hot water service pipes
7	Install a valve cosy
8	Use the window awnings
9	Install /Repair external blinds, awnings or shade sails
10	Plant trees and shrubs
11	Zone by closing doors
12	Draft proof doors, windows and vents
13	Found a better energy plan
14	Ring Energy Retailer
15	Check existing billing for, or enquire about discounts and concessions
16	Install a BI Directional Smart Meter
17	Use electricity during off peak time eg. weekends
18	Increase thermal mass in home
19	Install pelmets
20	Install screen doors to aid ventilation
21	Use reverse cycle air-conditioner instead of floor heat whenever possible
22	10% Rule- Adjusting the temperature of heating/cooling by one degree can save 10% on running costs
23	Install ceiling/pedestal fans
24	Upgrade/Repair/Service heating and cooling
25	Consider double glazing
26	Manage curtains and blinds
27	Avoid standby power use
28	Upgrade lighting
29	Install LED lighting
30	Install Solar skylights
31	Reduce number of/avoid use of appliances eg. Lights, fridges, freezers
32	Service/Repair/Replace broken appliances for better efficiency
33	Service/Repair/Replace broken fixtures or structures for better efficiency
34	Install Solar PV
35	Adjust appliance settings
36	Relocate appliances to better locations inside dwelling
37	Turn off second fridge/freezer
38	Defrost the fridge/freezer
39	Monitor fridge/freezer temperature
40	Shut fridge door quickly
41	Keep sides of fridge clear
42	Carry out a forensic electrical test on usage
43	Seal pet door
44	Fit low flow shower heads
45	Shower to <4 minutes
46	Wash in cold water
47	Dry washing on clothes line
48	Adopt recommendations from GVCE
49	Miscellaneous
50	Facilitate passive air flow
51	Install internal curtains, drapes or blinds
52	Use ceiling and pedestal fans
53	Install insulation/Repair insulation
54	Install carbon monoxide detector
55	Use electric throw blankets
56	Install a power saving device on an appliance
57	Install a fixture or structure for better efficiency
58	Window treatment

2. Post Intervention Results (Survey 2)

There were 1343 participants for Survey 2 of which 1008 were in Group 1 and 335 were in Group 3. As in the previous section, group sizes are noted on an analysis-by-analysis basis where necessary.

2.1 Energy Saving Behaviours Adopted by each Group.

Participants were asked to identify any behaviours that household residents had undertaken to conserve energy since Survey 1. The interview enabled up to four responses to be provided by each participant. These responses were later post-coded into 58 behavioural categories for further analysis (see Appendix 2 for the full range of responses and their frequency by group). Table 2 shows the full range of response categories that could be reported as energy efficiency measures.

The most common energy saving behaviours reported by the two study groups after 6 months (i.e. at Survey 2) from the initial interview (i.e. at Survey 1) were fairly low cost behavioural changes such as reducing or avoiding the number of electrical appliances in use, partitioning living spaces for heating/cooling, and avoiding stand-by power use on appliances by turning off the power supply when an appliance was not in use. There were similar trends in cost saving measures between Group 1 and Group 3. Figure 2.1 shows the relative rate of energy saving measures instantiated by each group as a factor of total number of responses in each group (Behaviours 1 to 4).

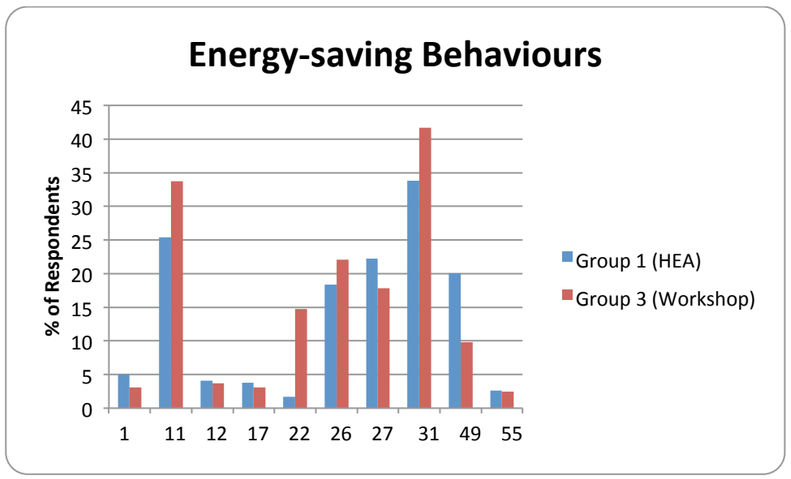

Figure 2.1. Relative response rate as a proportion of responders (*y* axis) for each category of energy saving behavioural changes reported (*x* axis) after 12 months post intervention (Survey 2) for Group 1 (Blue) and Group 3 (Red). Response categories of interest (from 1-58) are listed in Table 2.

It can be seen from Figure 2.1 (and Table 2) that despite the different interventions, Group 1 and Group 3 both engaged in energy saving measures. In both groups, limiting the number of energy using appliances (Category 31) and partitioning rooms to minimize heating/cooling costs (Category 11), were the most frequently reported measures used to reduce energy consumption. Group 3 reported higher rates of adjusting heating and cooling settings (Category 22).

In summary, both interventions appear to have been effective, in relatively equal measure in promoting energy efficiency behaviours that did not involve high expense changes to heating/cooling systems, home insulation, or appliance upgrades. There was also some suggestion that Group 3 participated in adopting a wider range of energy efficiency behaviours than those in Group 1.

2. 2 Energy Saving Measures Installed by Households

On Survey 2, in Group 1, 32% of responders indicated that they had installed devices or made changes to the home to conserve energy. In Group 3, 52% of responders reported structural changes to the home for the purpose of saving energy (see Appendix 3 for complete list of responses by group). Figure 2.2 shows the proportion of people who reported the installation of devices to save energy in the home in Survey 2. As can be seen from Figure 2.2, both groups engaged in structural home changes for energy efficiency. The most common energy efficiency device that was altered was draft proofing doors, window and vents (Item 12 in Table 2), and the installation of curtains, drapes or blinds (Item 51 in Table 2).

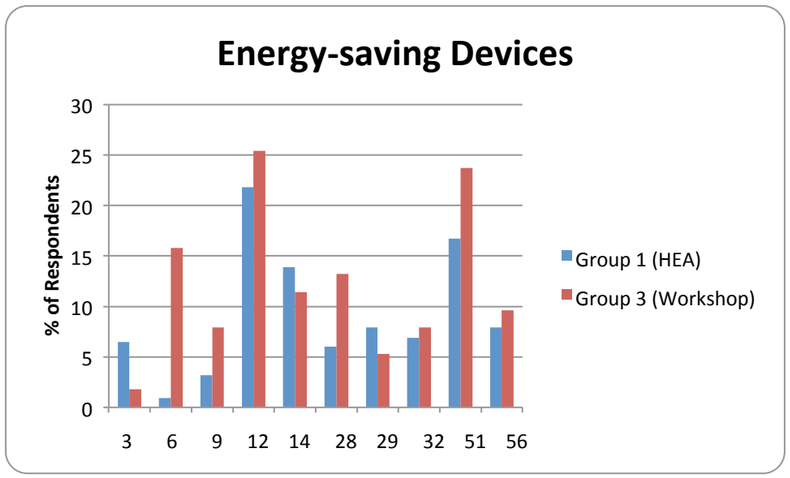

Figure 2. Proportion of responders in Group 1 (Blue) and Group 3 (Red) (*y* axis) reporting changes to the home by installing devices aimed at saving energy. The *x* axis represents codes for devices that are described in Table 2.

3. Change in Outcome Variables from Survey 1 to Survey 2

3.1 Change in Energy Efficiency Perceptions

A series of paired-sample t-tests and Analysis of Covariance (ANCOVA) were conducted to assess differences at Survey 2 that were unique to the interventions, and not attributable to group differences at Time 1 (Survey 1). These results are reported beneath each graph along with the relevant survey questions used in each analyses (e.g., Q1) from either Survey 1 (S1) or Survey 2 (S2).

It can be seen from Figures 3.1 to 3.5 that there was an overall increase from Survey 1 to Survey 2 in both groups perceived energy efficiency (Figure 3.1), empowerment (Figure 3.2), and knowledge of energy conservation (Figure 3.5). There was no significant change in either groups reported level of interest in conserving energy (Figure 3.4), and slightly opposing trends in comfort levels (increase in Group 3, and a decrease in Group 1, Figure 3.3).

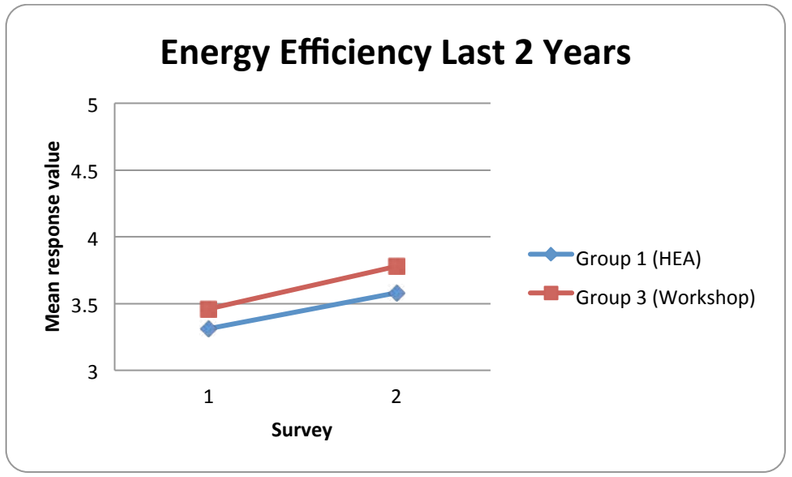

Figure 3.1. Mean values at Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding perceived **energy efficiency changes over preceding 2 years** (Q 1 Survey 1 and Q 1 Survey 2). Analysis of Covariance (ANCOVA) showed that when group differences at Time 1 were controlled for, significant differences were shown at Time 2 between groups: Mean Square (*MS*) = 5.57, *F* (1,807) = 7.52, *p* = .006. Paired t-test for Group 1 (*n* = 550, *M* = 3.31, 3.57, *SD* = .94, .95, *t* = 5.21, *p* < .001. Paired t-test for Group 3, *n* = 260, *M* = 3.46, 3.78, *SD* = .84, .74, *t* = 5.42, *p* < .001.

In both Groups, the perceived level of efficiency and empowerment was generally much lower than heating/cooling comfort, interest in conserving energy, or knowledge of energy conserving measures. Differences between groups that were specific to the intervention type (and not differences at Survey 1), were evident in reported levels of efficiency and comfort, with a greater increase on both measures in Group 3 than Group 1.

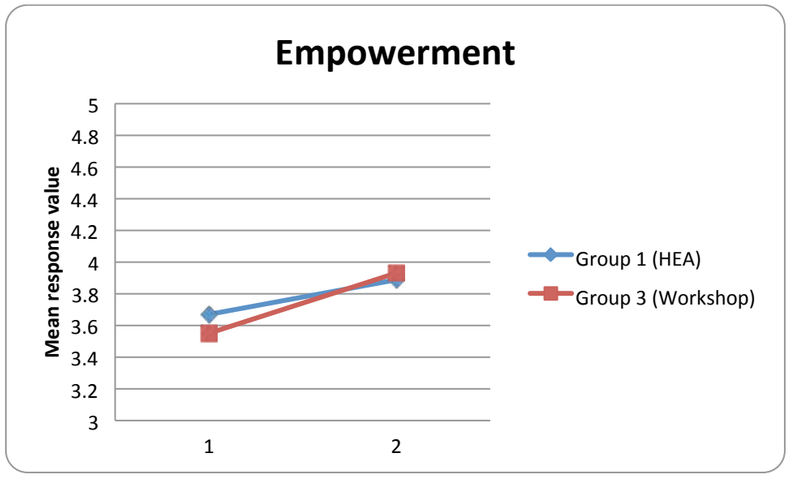

Figure 3.2. Mean values from Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding perceived **empowerment regarding energy consumption** (Q2, S1, Q2, S2). ANCOVA: *MS* = 1.03, *F* (1,862) = 1.34, *p* = .25 (ns). Paired t-test for Group 1 (*n* = 580, *M* = 3.67, 3.89, *SD* = 1.08, .96, *t* = 4.29, *p* < .001. Paired t-test for Group 3 (*n* = 285, *M* = 3.55, 3.93, *SD* = .93, .84, *t* = 6.17, *p* < .001.

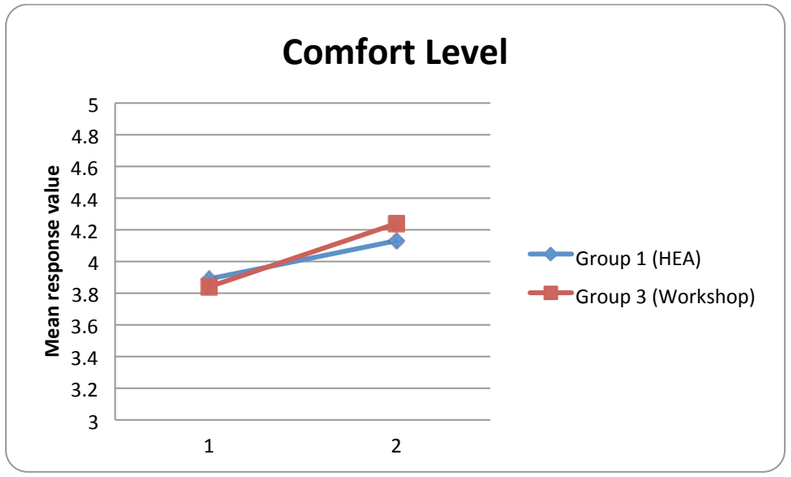

Figure 3.3. Mean with standard error at Survey 1 (T1) and Survey 2 (T2) between Group 1 and Group 3 regarding perceived **comfort level with regard to heating, cooling and lighting** (Q3, S1, Q3, S2). ANCOVA: *MS* = 2.96, *F* (1,864) = 4.73, *p* = .03. Paired t-test for Group 1 (*n* = 579, *M* = 3.89, 4.13, *SD* = 1.05, .87, *t* = 5.48, *p* < .001. Paired t-test for Group 3 (*n* = 288, *M* = 3.84, 4.24, *SD* = .94, .82, *t* = 6.56, *p* < .001.

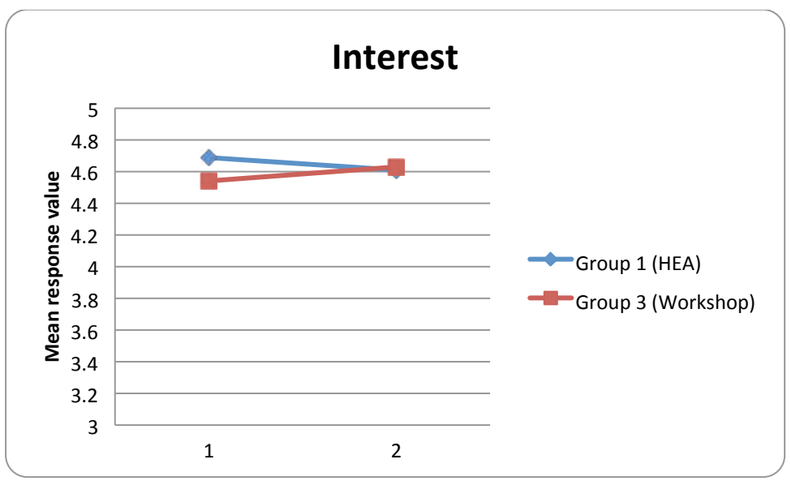

Figure 3. 4. Mean with standard error at Survey 1 (T1) and Survey 2 (T2) between Group 1 and Group 3 regarding level of **interest in conserving energy** (Q4, S1, Q4, S2). ANCOVA: *MS* = .63, *F* (1,862) = 1.45, *p* = .23 (ns). Paired t-test for Group 1 (*n* = 574, *M* = 4.69, 4.61, *SD* = .59, .68, *t* = 2.40, *p* = .02. Paired t-test for Group 3 (*n* = 291, *M* = 4.54, 4.63, *SD* = .74, .68, *t* = 1.80, *p* = .07 (ns).

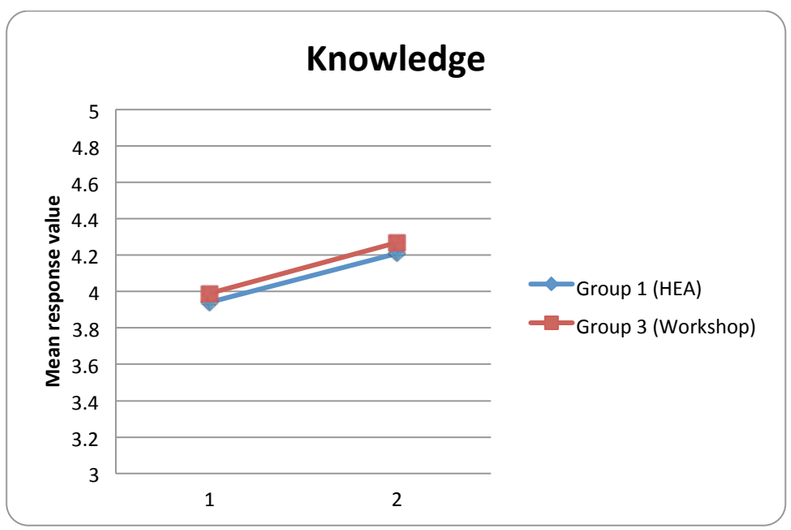

Figure 3. 5. Mean with standard error at Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding **knowledge of energy conserving in the home** (S1, Q5, S2, Q5). ANCOVA: *MS* = .63, *F* (1,863) = 1.73 *p* = .19 (ns). Paired t-test for Group 1 (*n* = 577, *M* = 3.94, 4.21, *SD* = .71, .62, *t* = 7.4, *p* < .001. Paired t-test for Group 3 (*n* = 289 *M* = 3.99, 4.27, *SD* = .78, .61, *t* = 5.52, *p* < .001.

4. Self-Reported Change in Energy Efficiency Perceptions and as a result of the HEA or Workshop.

In Survey 2 participants were asked to rate the extent to which the HEA or Workshop improved levels of perceived empowerment (Q6), heating/cooling comfort (Q7), interest in conserving energy (Q8), and knowledge of energy conserving measures (Q9). Independent t-tests were run to assess differences between Groups regarding these questions.

On Questions 6 to 9 on Survey 2, differences between Group 1 and 3 were shown for Questions 6, 8 and 9 (see Figure 4.1). On Question 6, Group 3 reported a higher level of empowerment than Group 1: *t* = 2.21, *p* = .027, *F* (1162, 576.76) = 5.24, *p* = .022. On Question 8, Group 3 reported a greater level of interest in saving energy than Group 1: *t* = 4.28, *p* < .001, *F* (1162, 615.60) = 10.13, *p* = .001. On Question 9, Group 3 also reported a greater level of knowledge of energy saving measures: *t* = 1.93, *p* = .04, F (1161, 585.91) = 5.00, *p* = .03. In contrast, a significant difference in participants' ratings of comfort levels was not observed between Groups 1 and 3.

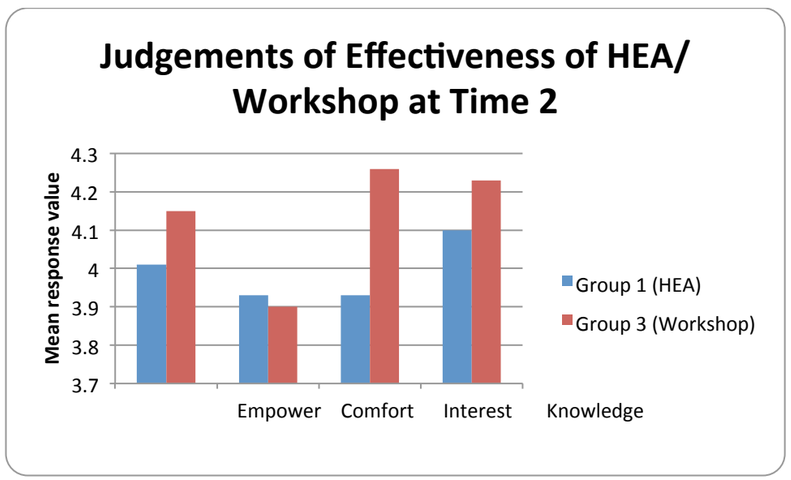

Figure 4. 1 Mean values for Questions at Time 2 regarding the **efficacy of the HEA in increasing perceived empowerment** (Q6), comfort with heating/cooling (Q7), interest in conserving energy (Q8), and knowledge of energy saving measures in the home (Q9).

Differences between perceptions regarding the effectiveness of the HEA/Workshop were also examined after controlling for baseline levels of empowerment, comfort, interest and knowledge (Questions 2 to 5 in Survey 1). This analysis took into account the possibility that participants who reported being very empowered (comfortable, interested, or knowledgeable) at Time 1 might have judged the HEA and Workshop as less effective than participants who reported low levels of empowerment at Time 1. Similarly, participants might have been more likely to attribute to the HEA and Workshop any growth in their feelings of empowerment at Time 2 if they had felt disempowered at Time 1. The results reported in Figure 2 show that Group 3 attributed perceived increase in empowerment in energy consumption to the HEA/Workshop to a greater extent than did participants in Group 1 (F (1, 853) = 4.57 p = .03.). However there was no difference between groups in attribution to the HEA or Workshop of comfort level with regard to heating (F (1, 839) = .32, p = .57). Moreover, there was a relatively higher and significant attribution of interest regarding energy efficiency to the interventio in Group 3 compared to Group 1 (F (1,854) = 23.44 p < .001). Group 3 attributed a perceived change in their knowledge of energy efficiency measures to the intervention to a greater extent than did participants in Group 1 (F (1,856) = 4.48 p = .03).

All of these results closely mirror the differences in the previous analysis in which initial levels of empowerment, comfort, interest and knowledge were not taken into account. Therefore, differences between groups in judgements about the effectiveness of the HEA or Workshop were not due to initial differences in these states.

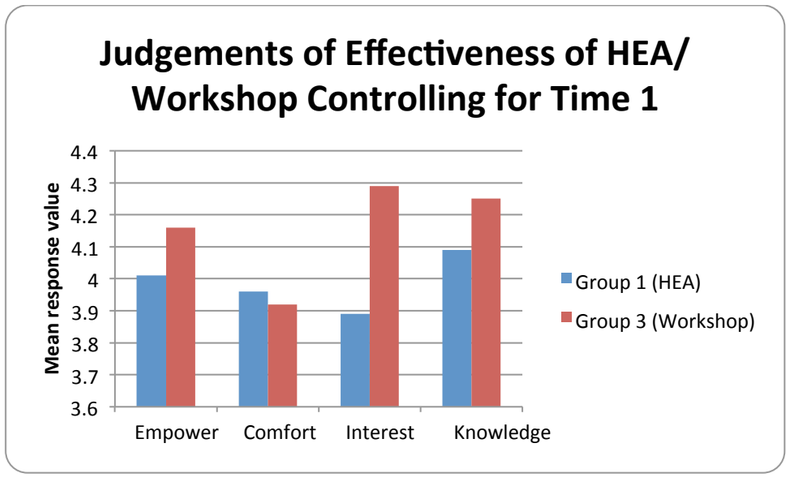

Figure 4. 2 Mean values for efficacy of the HEA in increasing perceived empowerment (Q6), comfort with heating/cooling (Q7), interest in conserving energy (Q8), and knowledge of energy saving measures in the home (Q9) controlling for Time 1 levels of empowerment (Q2), comfort (Q3), interest (Q4) and knowledge (Q5).

5. Changes in Barriers to the Adoption of Energy Saving Behaviours

As discussed in section 2.1, participants in Survey 1 variously reported barriers to energy saving measures, such as limitations to changes due to renting a property, cost of measures, and support from others living in the household. Of interest to the current report is the extent to which those barriers were overcome, or persistent at time 2 (Survey 2), and as a function of the HEA or Workshop. In order to compare Groups the Survey 2 accounting for differences at Survey 1, ANCOVA was conducted comparing the various parts of Question 6 in Survey 1 and Questions 19 to 25 on Survey 2. As in previous ANCOVA analysis, any differences between groups at baseline are controlled so that between-group differences at Time 2 can be attributed to the effect of the interventions. Further, paired- sample t-tests were conducted to examine changes within each group over time (i.e. from Survey 1 to Survey 2). Figures 5.1 to 5.7 show the mean responses of Group 1 and Group 3 on Survey 1 and Survey 2. Statistical results are shown below each graph.

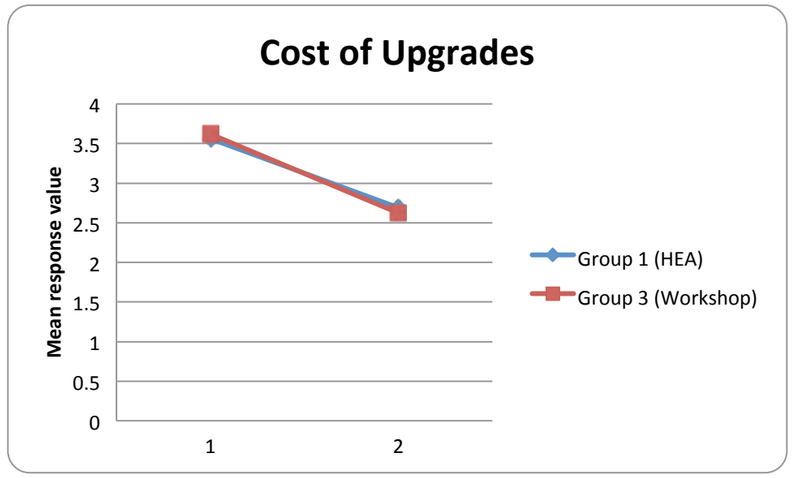

Figure 5.1. Mean response Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding **cost of upgrades as a barrier to energy efficiency** (S1, Q 6a, S2 Q19). (Group 1 n = 566, Group 3 n = 277). ANCOVA: MS = 1.17, F (1,840) = .50, p = .48 (ns). Paired t-test for Group 1 (n = 566, M = 3.56, 2.69, SD = 1.34, 1.57, t = 5.48, p < .001. Paired t-test for Group 3 (n = 277, M = 3.62, 2.62, SD = 1.25, 1.57, t = 8.53, p < .001.

Results of between-group differences indicated that, after controlling for group differences in Survey 1, having a lack of support from other household residents (Figure 5.3), problems understaninding energy efficiency information (Figure 5.5), and difficulties in reading the information (Figure 5.6) showed significant group differences

at Time 2. In all these instances, Group 3 was significantly, albeit slightly, lower on average ratings of the barriers compared with Group 1. That is, for Group 3 at Time 2, these barriers were considered to have a reasonably low impact on impeding energy saving.

Within groups, a number of barriers showed significant reductions from Time 1 to Time 2. These barriers included the cost of upgrades, rental property restrictions, a lack of information, problems understanding information, and hard to read information. Moreover, in Survey 1 prior to the interventions, the barriers "cost of upgrades" and "living in a rental property" were seen as moderate- to high-impact impedements to energy saving.

Exceptions to improvements in the perceptionof barriers were for Group 1 where ratings concerning support from other household residents and language difficulties remained relatively unchanged over time (see Figure 5.3). Nonetheless, for the most part, both groups showed a significant reduction in the effect of obstacles to energy efficiency reduction from Survey 1 to Survey 2 (Figures 5.1 to 5.5).

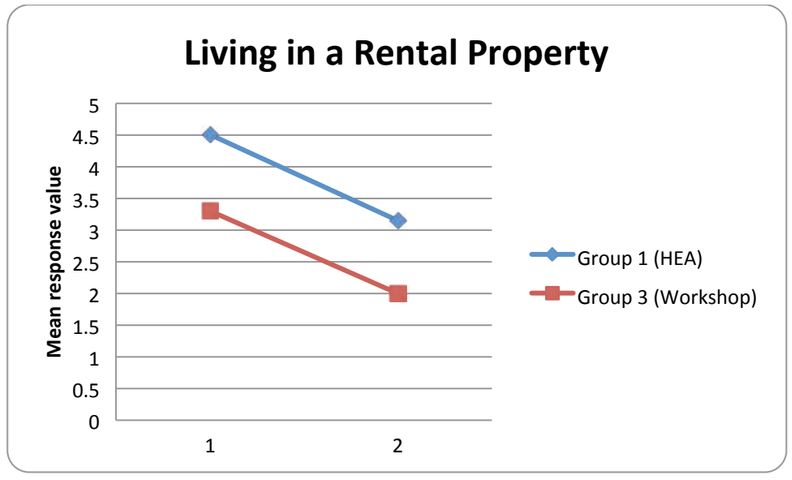

Figure 5.2. Mean response Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding **living in a rental property as a barrier to energy efficiency** (S1, Q6b, S2 Q20). (Group 1 *n* = 80, Group 3 n = 10). ANCOVA: *MS* = 8.20, *F* (1,87) = 2.82, *p* = .10 (ns). Paired t-test for Group 1 (*n* = 80, *M* = 4.51, 3.15 *SD* = 1.03, 1.76, *t* = 6.15, *p* < .001. Paired t-test for Group 3 (*n* = 10, *M* = 3.30, 2.00, *SD* = 1.64, 1.05, *t* = 2.33, *p* = .05

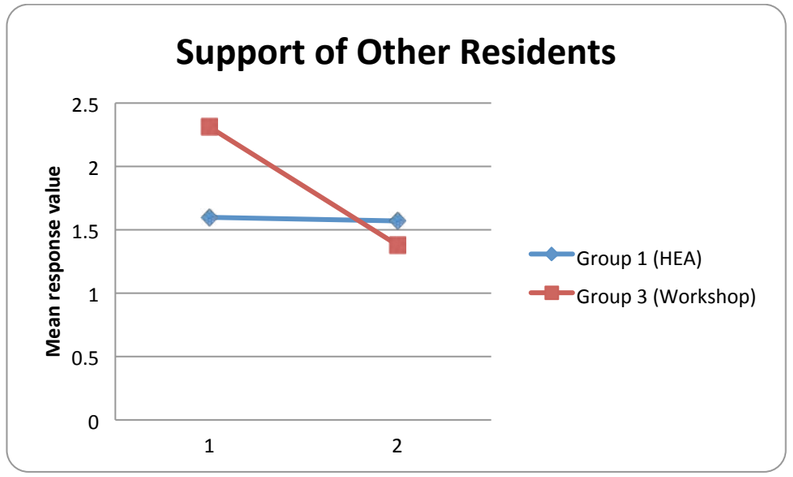

Figure 5.3. Mean response Survey 1 (T1) and Survey 2 (T2) between Group 1 and Group 3 regarding **lack of support from others in the home** as a barrier to energy efficiency (S1, Q6c, 2 Q21). (Group 1 *n* = 238, Group 3 n = 77 ANCOVA: *MS* = 7.86 *F* (1, 312) = 7.08, *p* = .008. Paired t-test for Group 1 (*n* = 238, *M* = 1.60, 1.57, *SD* = 1.10, 1.14, *t* = .34, *p* = .73 (ns). Paired t-test for Group 3 (*n* = 77, *M* = 2.31, 1.38, *SD* = 1.44, 0.93, *t* = 5.38, *p* < .001

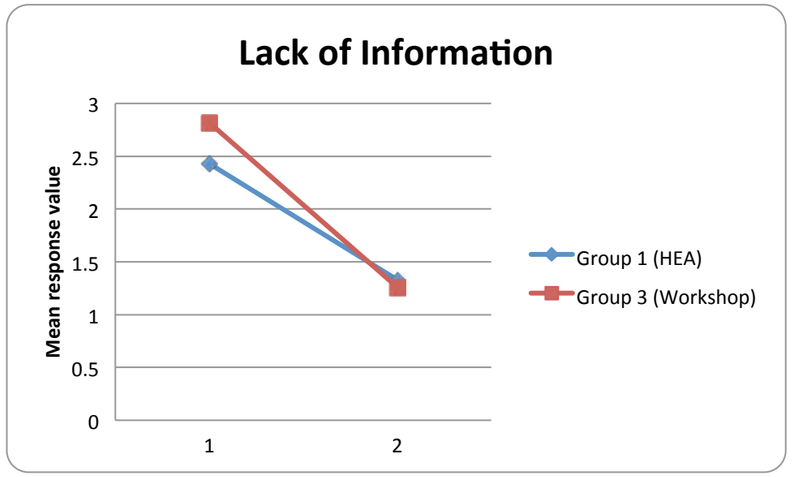

Figure 5.4. Mean response Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding **lack of information** as a barrier to energy efficiency (S1, Q6d, S2, Q22). (Group 1 *n* = 561, Group 3 n = 234 ANCOVA: *MS* = 1.45, *F* (1, 792) = 2.26, *p* = .13 (ns). Paired t-test for Group 1 (*n* = 561, *M* = 2.43, 1.33, *SD* = 1.21, .82, *t* = 18.93, *p* < .001. Paired t-test for Group 3 (*n* = 234, *M* = 2.82, 1.26, *SD* = 1.43, .75, *t* = 15.71, *p* < .001

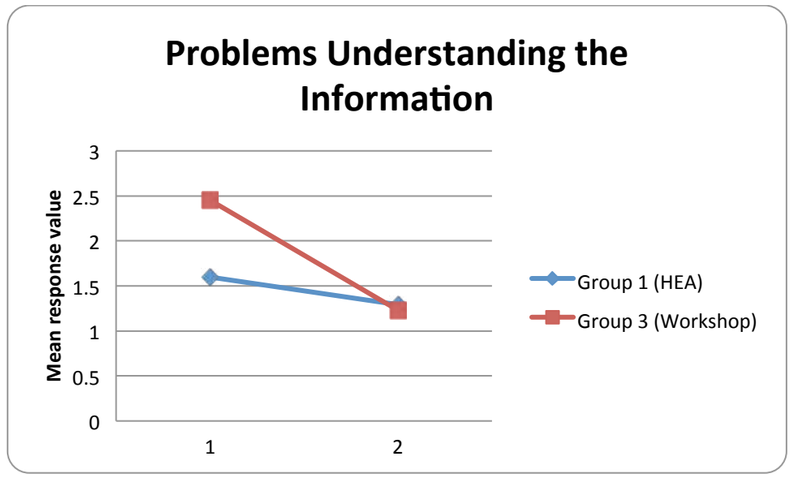

Figure 5.5. Mean response Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding **problems understanding the information** they had received as a barrier to energy efficiency (S1, Q6e, S2, Q23). (Group 1 *n* = 497, Group 3 n = 247). ANCOVA: *MS* = 2.32, *F* (1, 741) = 4.29, *p* = .04. Paired t-test for Group 1 (*n* = 497, *M* = 1.60, 1.29, *SD* = 1.01, .76, *t* = 6.15, *p* < .001. Paired t-test for Group 3 (*n* = 247, *M* = 2.45, 1.23, *SD* = 1.47, .70, *t* = 11.97, *p* < .001

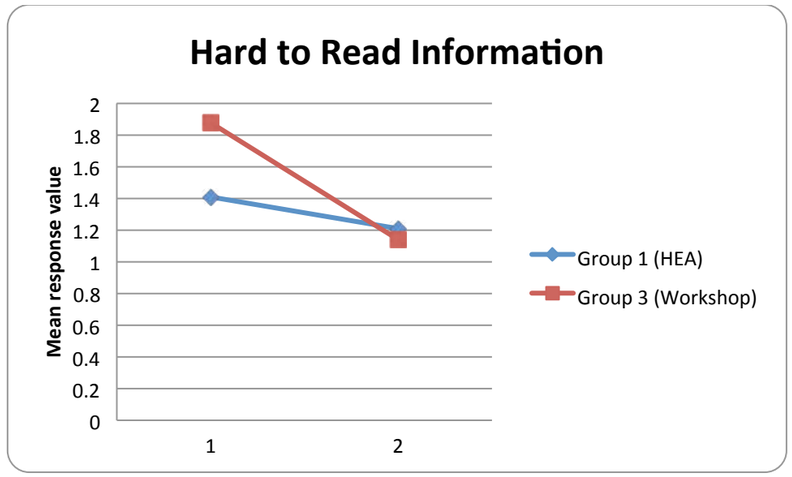

Figure 5.6. Mean response Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding finding it **hard to read the information** they had received as a barrier to energy efficiency (S1, Q6f, S2, Q24). (Group 1 *n* = 449, Group 3 n = 231). ANCOVA: *MS* = 3.24, *F* (1, 677) = 9.15, *p* = .003. Paired t-test for Group 1 (*n* = 449, *M* = 1.41, 1.21, *SD* = .96, .68, *t* = 4.56, *p* < .001. Paired t-test for Group 3 (*n* = 231 *M* = 1.88, 1.14, *SD* = 1.31, .49, *t* = 8.39, *p* < .001.

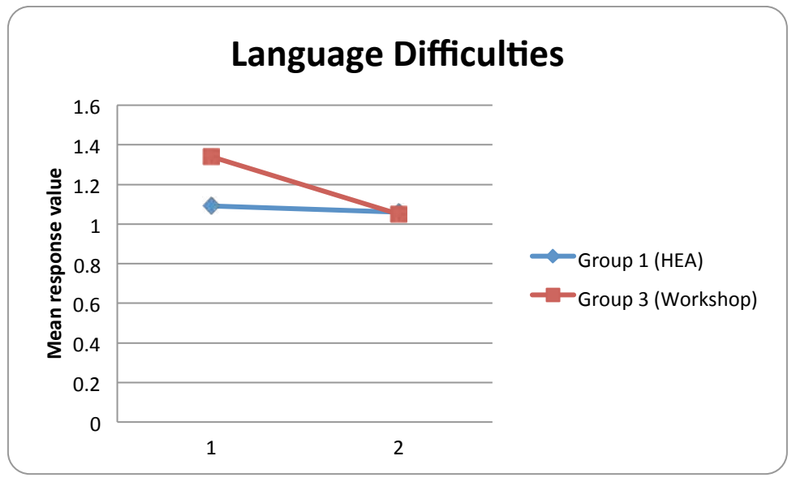

Figure 5.7. Mean response Survey 1 (T1) and Survey 2 (T2) between group 1 and Group 3 regarding **language difficulties** as a barrier to energy efficiency (S1, Q6g, S2, Q25). (Group 1 *n* = 437, Group 3 n = 214). ANCOVA: *MS* = .18, *F* (1, 648) = 1.37, *p* = .24 (ns). Paired t-test for Group 1 (*n* = 437, *M* = 1.09, 1.06, *SD* = .40, .40, *t* = 1.43, *p* = .15 (ns). Paired t-test for Group 3 (*n* = 214, *M* = 1.34, 1.05, *SD* = .98, .27, *t* = 4.18, *p* < .001

6. Perceived Effectiveness of the HEA in Reducing Barriers

Participants in Groups 1 and 3 were asked questions on Survey 2 in relation to the extent to which the HEA or Workshop overcame barriers in energy saving that included: home support (Q26), lack of information (Q 27), and problems understanding the information (Q28). Independent t-tests on these measures at Time 2 (Survey 2) showed that responses indicated that these barriers were overcome in greater measure for Group 1 than Group 3 (see Figure 6.1).

In sum, Figure 6.1 shows that Group 1 and 3 were effective tools for overcoming obstacles to energy efficiency behaviours, specifically with regard to the provision of information related to energy efficiency. Both groups rated highly that the HEA or Workshop helped overcome the barriers of lack of information and understanding of information highly. Response values were slightly higher for Group 3 than Group 1.

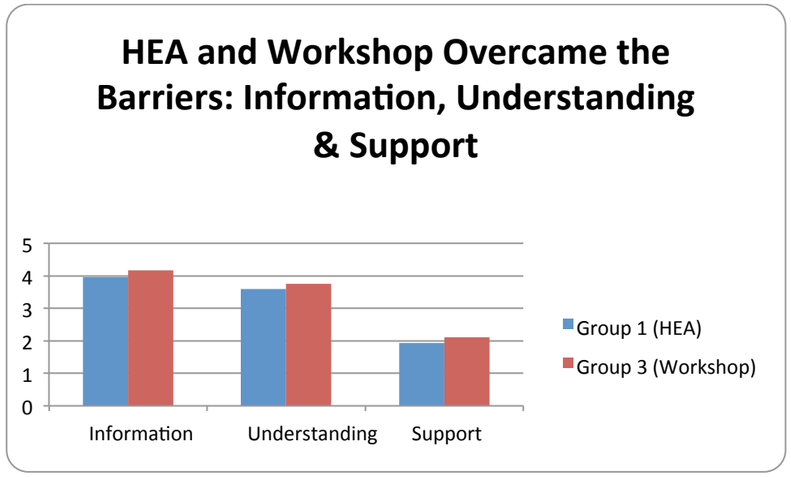

Figure 6.1 Mean responses to Q 26 to 28 on Survey 2. Reported extent to which the HEA helped overcome barriers to lack of information $t = 2.94$, $p = .003$, lack of understanding of the information (ns), and household support (ns).

7. Beliefs about Energy Efficiency

In Survey 1 and 2, questions were asked regarding psychological factors associated with the implementation of energy efficiency behaviours. These included questions that examined perceptions such as a decreased quality of life and freedom resulting from the implementation of energy efficiency actions, or that reducing energy consumption would be too much of a hassle (Q 7 to 11 on Survey 1; Q 30- to 34 on Survey 2). ANCOVA was used to compare responses on these measures between groups at Survey 2, accounting for differences between groups at Survey 1. Results are shown in Figures 7.1 to 7.5. Statistical analyses are reported below each graph.

There were no significant between-group intervention effects at Time 2 after controlling for differences at baseline. Instead most significant differences occurred within groups from Time 1 to Time 2. That is, both groups demonstrated changes in their average ratings of the following attitude variables: energy efficiency is a hassle (Figure 7.1); energy efficiency will mean living less comfortably (Figure 7.2); energy efficiency will restrict freedom (Figure 7.4); and, energy efficiency is not very enjoyable (Figure 7.5). In contrast, only Group 1 demonstrated a change in the belief that energy efficiency would decrease quality of life (see Figure 7.3) as the analysis showed no significant change for Group 3.

The direction of the above changes highlighted that Group 1 means tended to increase over time whereas Group 3 means trended downward or remained the same. This pattern of results is consistent with the statistical phenomenon of "regression to the mean." This statistical artifact can occur when a sample is drawn non-randomly from the population and where the measured variables at Time 1 and Time 2 are imperfectly correlated. Both these characterstics are apparent in this instance. In such circumstances low (high) scores at Time

1 tend to increase (decrease) at Time 2 giving the false impression that attitudes became more postive over time in Group 3 and deteriorated in Group 1.

Another observation regarding the ratings of the various beliefs was that both group means were reasonably low (about 2.5 or less) indicating that they represented, on average, reasonably 'positive' views regarding energy efficiency (i.e. the rating scale ranged from 1 "strongly disagree" to 5 "strongly agree"). Given this, achieving improvements in already relatively 'positive' beliefs represents a limitation on the amount of improvement that the interventions might have reasonably achieved.

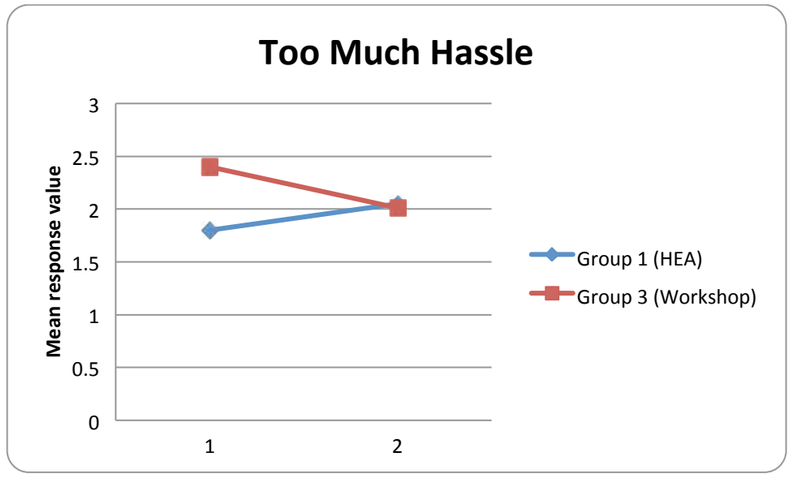

Figure 7.1. Responses (Group 1 and 2) to the question that '**Energy efficiency is too much of a hassle**' (S1, Q 7, S2, Q30 2). (Group 1 $n = 570$, Group 3 n = 252) ANCOVA: $MS = 1.08$, $F(1, 819) = 2.00$, $p = .16$ (ns). Paired t-test for Group 1 ($n = 570$, $M = 1.80, 2.05$, $SD = .71, .70$, $t = 6.31$, $p < .001$. Paired t-test for Group 3 ($n = 252$, $M = 2.40, 2.01$, $SD = 1.04, .79$, $t = 5.03$, $p < .001$.

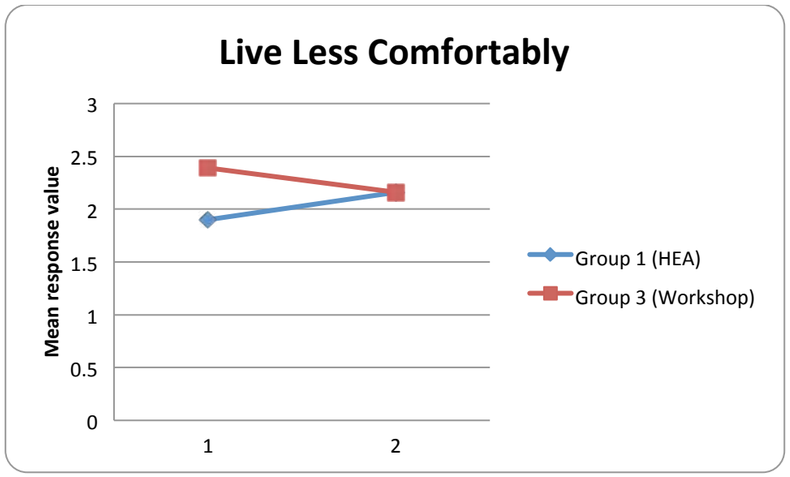

Figure 7.2. Responses (Group 1 and 2) to the question that '**Energy efficiency means I have to live less comfortably**' (S1, Q8, S2, Q31) on a scale of 1 to 5 at Time 1 and 2. (Group 1 *n* = 572, Group 3 n = 249). ANCOVA: *MS* = .25, *F* (1, 818) = .37, *p* = .54 (ns). Paired t-test for Group 1 (*n* = 572, *M* = 1.90, 2.16, *SD* = .73, .80, *t* = 6.29, *p* < .001. Paired t-test for Group 3 (*n* = 249, *M* = 2.39, 2.16, *SD* = 1.04, .87, *t* = .2.69, *p* < .01.

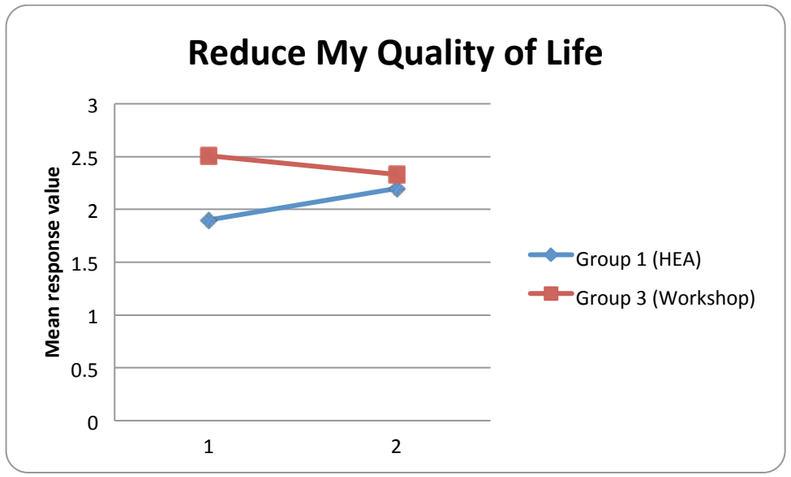

Figure 7.3. Responses (Group 1 and 2) to the question that '**Energy efficiency will reduce my quality of life**' (S1, Q9, S2, Q32). (Group 1 *n* = 564, Group 3 n = 254). ANCOVA: *MS* = .75, *F* (1, 815) = .91, *p* = .34 (ns). Paired t-test for Group 1 (*n* = 564, *M* = 1.90, 2.20, *SD* = .86, .86, *t* = 6.13, *p* < .001. Paired t-test for Group 3 (*n* = 254, *M* = 2.51, 2.33, *SD* = 1.18, 1.02, *t* = 1.89, *p* = .06 (ns).

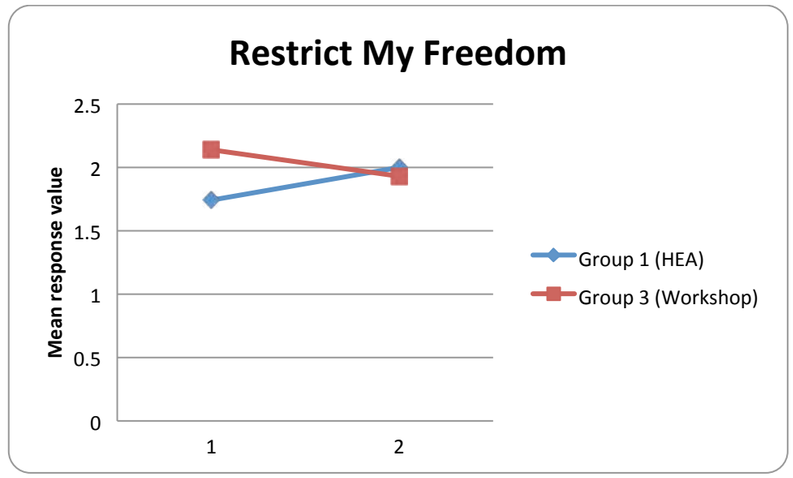

Figure 7.4. Responses (Group 1 and 2) to the question that '**Energy efficiency will restrict my freedom**' on a scale of 1 to 5 at Time 1 and 2 (S1 Q10, S2, Q33). (Group 1 *n* = 570, Group 3 n = 257). ANCOVA: *MS* = 2.20, *F* (1, 824) = 5.14, *p* = .43 (ns). Paired t-test for Group 1 (*n* = 570 *M* = 1.74, 2.00, *SD* = .57, .66, *t* = 7.60, *p* < .001. Paired t-test for Group 3 (*n* = 257, *M* = 2.14, 1.93, *SD* = .97, .67, *t* = 2.98, *p* < .01

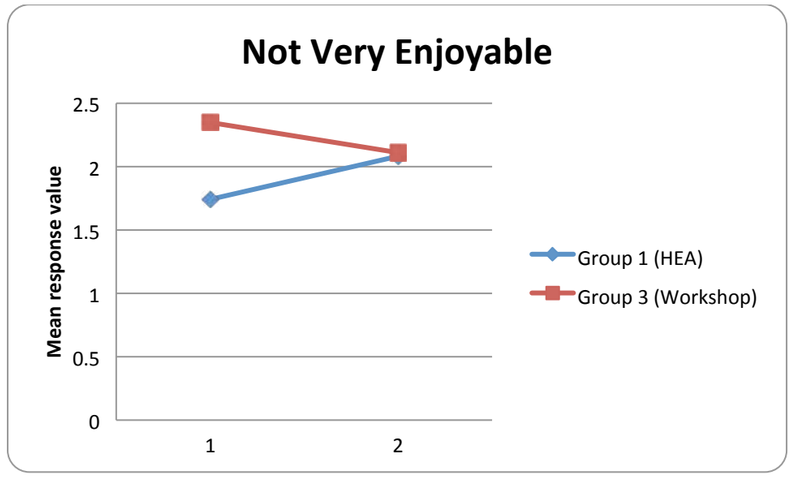

Figure 7.5. Responses (Group 1 and 2) to the question that '**Energy efficiency is not very enjoyable**' on a scale of 1 to 5 at Time 1 and 2 (S1, Q11, S2, Q33). (Group 1 *n* = 567, Group 3 n = 256). ANCOVA: *MS* = .11, *F* (1, 820) = .24, *p* = .63 (ns). Paired t-test for Group 1 (*n* = 567 *M* = 1.74, 2.08, *SD* = .68, .66, *t* = 8.88, *p* < .001. Paired t-test for Group 3 (*n* = 256, *M* = 2.35, 2.11, *SD* = 1.04, .70, *t* = .3.40, *p* = .001

8. Conclusion

This study examined attitudes and perceptions associated with the voluntary implementation of domestic energy-saving behaviours and adoption of energy efficient products. The Home Energy Assessment (HEA) and Workshop were evaluated with self-report measures to assess stability and change in factors that support or impede energy efficiency behaviours, and the efficacy of these two engagement methods on energy efficiency actions in the home.

Prior to the implementation of the HEA and Workshop, ratings about the energy efficiency of the household, capacity to achieve savings, comfort regarding heating and cooling levels, interest in energy efficiency and knowledge about energy efficiency suggested that, on average, participants were capable and interested in becoming more energy efficient. Further, participants showed some areas of similarity and difference on baseline measures. While, on average, Group 3 believed their households to be more energy efficient that participants in Group 1, higher average level of interest was apparent in Group 1. Because of these differences, analyses over time controlled for ratings at Time 1.

The analysis of key beliefs about household energy efficiency, comfort and capacity to save energy over time, revealed that both groups showed improvements. That is, irrespective of the type of intervention (e.g. retrofits or education via a workshop), beliefs became more supportive of energy efficiency, comfortable in their homes, empowered to save energy and knowledgeable about how to achieve it. The effect was stronger for the Workshop than for the HEA on perceptions of household energy efficiency and ratings of comfort in the home. Therefore, perhaps because of differences in housing contexts between groups, the activities undertaken in the Workshop, or the interaction between these and other household characteristics, individuals who had attended the workshop came to believe more strongly over time than HEA participants that their households were energy efficient and somewhat more comfortable.

This improvement in feelings of comfort over time in both intervention groups is noteworthy because it suggests that households can undertake reasonably low cost activities and feel more comfortable than they were before being engaged to save energy via the HEA and Workshop. It is not obvious from the data through which mechanisms the effect was achieved, but one possibility is that energy saving activities undertaken (e.g., zoning rooms, optimizing window coverings, etc.) resulted in material improvements to heating and cooling levels. Alternatively, the act of undertaking energy saving behaviours (e.g., reducing heating and cooling temperatures) might provide participants with a sense of wellbeing that is expressed as “feeling comfortable” in the home.

The interventions were successful in reducing participants’ perception of the impact of a number of barriers to saving energy. The two highest impact barriers (cost of upgrades and living in a rental property) showed significant improvement over time for both interventions. Likewise, experiencing a lack of information as an impediment to saving energy was regarded as having less impact over time in the HEA and Workshop groups. The Workshop intervention was also successful in improving participants’ perceptions of being supported by other household residents and problems involving language proficiency. Perhaps these outcomes resulted from the communal aspect of the Workshop approach in

that all residents from participating households could potentially attend and language difficulties could be alleviated somewhat with the help of friends and family. If this speculation has merit, the Workshop intervention may be more successful at directly influencing household dynamics concerning energy use rather than just individual behaviour. This conclusion notwithstanding, it is worthwhile noting that participants did not strongly attribute any change in support from others in their households to either the Workshop or the HEA. Rather, when asked how much they thought the interventions had overcome this barrier, average ratings were quite low (refer to Figure 6.1).

An alternative explanation of the greater effect of the Workshop on household support and language difficulty is that HEA participants tended to exhibit average ratings that were quite low, indicating that the barriers were not regarded as very serious. This may have reduced the potential to achieve improvements from already desirable levels.

The participants own attributions of how much they believed the HEA or Workshop overcame barriers indicated that the interventions were viewed favourably. The participation in the Workshop was associated with increased empowerment, interest and knowledge. The explicit educational focus of the Workshop may have been responsible for these outcomes. Of note was that ratings of comfort were the least likely evaluation outcome to be attributed to the HEA or Workshop. Given that comfort ratings did improve over time, it is surprising that participants were unwilling on average to attribute, in large part, the change to either intervention.

When participants were asked to attribute the role of the interventions in overcoming the barriers of information deficits, lack of support from other householders and problems understanding the information, only the former barrier was significantly different between groups. Participants engaged in the Workshop were slightly more likely to attribute it to overcoming a lack of information. As noted above, the education function of the Workshop was most likely responsible for this difference in attributions to the interventions.

Attitudes towards energy savings in households were generally favourable on average for participants involved in the HEA and the Workshop. Oddly, however, the HEA was associated in diminishing these positive attitudes over time while participants in the Workshop tended to show improvement over time. These outcomes may be due to a statistical artefact – regression to the mean - that can operate in repeated measures designs where the same variables are evaluated over time. This explanation may be more likely than an alternative one suggesting that the HEA actually made energy saving more unpleasant than they had first believed. Nonetheless, it is worth reflecting on the activities of the HEA with the goal of providing as much support to householders when their living environments are subject to intrusive conditions or activities (e.g., installation activities, introduction of new devices, etc.).

Self-reported behaviours were subject to frequency analyses that provided some useful insights about the types of behaviours participants either wanted to commit to doing or said they had been engaged in. The behaviours committed to by participants in Survey 1 (i.e., those on their fridge lists), indicated that Workshop participants reported more frequently than HEA participants that they adjusted heating and cooling temperatures. Moreover, participants in the HEA were more likely to commit to zoning areas by closing doors. These differences are consistent with their respective interventions. That is, since the HEA involved providing strategies tailored to householders dwellings, it is unsurprising that zoning would emerge as an energy saving option. Likewise, without specific knowledge of participants’ dwellings recommendations such as the 10-percent rule might be expected to

have general applicability for participants. Apart from these differences, however, it should be noted that both interventions tended to be associated with similar types of behaviour (e.g., maximising thermal mass in the refrigerator, draft proofing, and avoiding standby power use) indicating that much can be achieved in targeting specific behaviours through the type of goal-setting activities apparent in either intervention.

Attendance at the Workshop was associated with higher rates of completing activities appearing on the fridge list. It is unclear how the Workshop approach might have operated to facilitate this outcome, but one possibility is that all residents of a particular household who attended the workshop may have been involved in completing the fridge list. Perhaps HEA participants had less support from other householders to complete the activities. In support of this speculation, Workshop participants showed significant improvement in the barrier regarding having support from other residents to save energy whereas HEA participants showed no significant change in this perception over time.

The energy saving behaviours that participants reported doing were mostly low cost activities, such as draft proofing doors, window and vents (Item 12 in Table 2), and the management of curtains, drapes or blinds (Item 51 in Table 2). Other energy saving activities were related to adjusting temperature settings to fridges, and heating/cooling appliances, using electricity during off peak times, avoiding stand-by power use, and reducing the number or use of appliances. The use of electric throw blankets was also commonly reported.

By-and-large, the most frequent self-reported behaviours were different to those frequently nominated by participants for their fridge list. Therefore, there is some suggestion that the goal setting activity of the fridge list may have enabled behaviours that were not already being undertaken by participants. This statement notwithstanding, there were behaviours that appeared in both analyses: increasing thermal mass in the refrigerator; zoning by closing doors; draft proofing; 10-percent rule; and avoid using standby power.

Different between interventions was the frequency of adjusting heating and cooling temperatures by one degree. As with the fridge list analysis, the 10-percent rule was more frequently reported by Workshop participants than by those householders involved in the HEA. As noted above, this may be due to the possibility that the Workshop information was designed for general applicability.

The list of devices that participants reported installing was similar for the most frequent devices (i.e., draft proofing and installing internal window treatments). One difference associated with the interventions was the insulation of hot water service pipes which was more frequently reported by Workshop attendees. It is unclear from the data why this outcome was apparent other than to speculate that the dwelling types and living arrangements made this behaviour attractive among Workshop participants. Alternatively, it may have been a behaviour given more emphasis in the Workshop than in the HEA.

In conclusion, the HEA and Workshop interventions were associated with significant changes in key beliefs, barriers, and attitudes related to energy efficiency and conservation. There were also notable outcomes concerning self-reported energy saving behaviours that have the potential to facilitate material savings in energy consumption. Of further note is that the interventions did not always have the same impact on outcome measures. There was some suggestion that the more social environment characteristic of the Workshop might have facilitated outcomes such as achieving support from other householders and assisting in overcoming language difficulties. The HEA on the other hand appeared to have had greater or lesser impact in areas that were associated with specific dwelling characteristics and living arrangements. Overall, however, the Workshop appeared to have been associated with stronger and more consistent changes on beliefs, barriers and attitudes relevant to motivating energy saving behaivours.

Appendix 1: Frequency of all energy conservation behaviours committed to by participants in Groups 1 and 3.

Fridge List multiple response			Group		
			Group 1 HEA	Group 3 Workshop	Total
Behaviour	Maximize thermal mass in fridge/freezer	Count	255	63	318
		% within $fridge	80.2%	19.8%	
		% within Group	38.6%	25.5%	
		% of Total	28.1%	6.9%	35.1%
	Have the ceiling insulation checked	Count	9	20	29
		% within $fridge	31.0%	69.0%	
		% within Group	1.4%	8.1%	
		% of Total	1.0%	2.2%	3.2%
	Upgrade ceiling insulation	Count	88	11	99
		% within $fridge	88.9%	11.1%	
		% within Group	13.3%	4.5%	
		% of Total	9.7%	1.2%	10.9%
	Increase insulative floor coverings	Count	1	0	1
		% within $fridge	100.0%	0.0%	
		% within Group	0.2%	0.0%	
		% of Total	0.1%	0.0%	0.1%
	Install underfloor insulation	Count	5	1	6
		% within $fridge	83.3%	16.7%	
		% within Group	0.8%	0.4%	
		% of Total	0.6%	0.1%	0.7%
	Insulate hot water service pipes	Count	19	52	71
		% within $fridge	26.8%	73.2%	
		% within Group	2.9%	21.1%	
		% of Total	2.1%	5.7%	7.8%
	Install a valve cosy	Count	0	3	3
		% within $fridge	0.0%	100.0%	
		% within Group	0.0%	1.2%	
		% of Total	0.0%	0.3%	0.3%
	Use the window awnings	Count	13	0	13
		% within $fridge	100.0%	0.0%	
		% within Group	2.0%	0.0%	
		% of Total	1.4%	0.0%	1.4%
	Install/repair external blinds, awnings or shade sails	Count	64	9	73
		% within $fridge	87.7%	12.3%	
		% within Group	9.7%	3.6%	
		% of Total	7.1%	1.0%	8.0%
	Plsnt tree's and shrubs	Count	14	1	15
		% within $fridge	93.3%	6.7%	
		% within Group	2.1%	0.4%	
		% of Total	1.5%	0.1%	1.7%
	Zone by closing doors	Count	221	10	231
		% within $fridge	95.7%	4.3%	
		% within Group	33.5%	4.0%	
		% of Total	24.4%	1.1%	25.5%
	Draft proof doors, windows and vents	Count	164	79	243
		% within $fridge	67.5%	32.5%	
		% within Group	24.8%	32.0%	
		% of Total	18.1%	8.7%	26.8%
	Find a better energy plan	Count	6	0	6
		% within $fridge	100.0%	0.0%	
		% within Group	0.9%	0.0%	
		% of Total	0.7%	0.0%	0.7%
	Ring energy retailer	Count	71	6	77
		% within $fridge	92.2%	7.8%	
		% within Group	10.8%	2.4%	
		% of Total	7.8%	0.7%	8.5%
	Check existing billing for, or enquire about discounts and concessions	Count	24	7	31
		% within $fridge	77.4%	22.6%	
		% within Group	3.6%	2.8%	
		% of Total	2.6%	0.8%	3.4%
	Install a bi-directional smart meter	Count	1	0	1
		% within $fridge	100.0%	0.0%	
		% within Group	0.2%	0.0%	
		% of Total	0.1%	0.0%	0.1%
	Use electricity during off-peak, e.g. weekends	Count	9	4	13
		% within $fridge	69.2%	30.8%	
		% within Group	1.4%	1.6%	
		% of Total	1.0%	0.4%	1.4%
	Increase thermal mass in	Count	1	0	1

home	% within $fridge	100.0%	0.0%	
	% within Group	0.2%	0.0%	
	% of Total	0.1%	0.0%	0.1%
Install pelmets	Count	86	43	129
	% within $fridge	66.7%	33.3%	
	% within Group	13.0%	17.4%	
	% of Total	9.5%	4.7%	14.2%
Install screen doors to aid ventilation	Count	6	0	6
	% within $fridge	100.0%	0.0%	
	% within Group	0.9%	0.0%	
	% of Total	0.7%	0.0%	0.7%
Use reverse cycle air-conditioner instead of floor heater whenever possible	Count	15	0	15
	% within $fridge	100.0%	0.0%	
	% within Group	2.3%	0.0%	
	% of Total	1.7%	0.0%	1.7%
10% Rule- Adjusting the temperature of heating/cooling by 1% can save on running costs	Count	15	121	136
	% within $fridge	11.0%	89.0%	
	% within Group	2.3%	49.0%	
	% of Total	1.7%	13.3%	15.0%
Install ceiling/pedestal fans	Count	28	6	34
	% within $fridge	82.4%	17.6%	
	% within Group	4.2%	2.4%	
	% of Total	3.1%	0.7%	3.7%
Upgrade/repair/service heating and cooling	Count	58	5	63
	% within $fridge	92.1%	7.9%	
	% within Group	8.8%	2.0%	
	% of Total	6.4%	0.6%	6.9%
Consider double glazing	Count	3	0	3
	% within $fridge	100.0%	0.0%	
	% within Group	0.5%	0.0%	
	% of Total	0.3%	0.0%	0.3%
Manage curtains and blinds	Count	12	9	21
	% within $fridge	57.1%	42.9%	
	% within Group	1.8%	3.6%	
	% of Total	1.3%	1.0%	2.3%
Avoid dstandby power use	Count	202	34	236
	% within $fridge	85.6%	14.4%	
	% within Group	30.6%	13.8%	

	% of Total	22.3%	3.7%	26.0%
Upgrade lighting	Count	41	3	44
	% within $fridge	93.2%	6.8%	
	% within Group	6.2%	1.2%	
	% of Total	4.5%	0.3%	4.9%
Install LED lighting	Count	59	8	67
	% within $fridge	88.1%	11.9%	
	% within Group	8.9%	3.2%	
	% of Total	6.5%	0.9%	7.4%
Reduce number of/avoid use of appliances e.g. Lights, fridges, freezers	Count	40	31	71
	% within $fridge	56.3%	43.7%	
	% within Group	6.1%	12.6%	
	% of Total	4.4%	3.4%	7.8%
Service/repair/replace broken appliances for better efficiency	Count	52	39	91
	% within $fridge	57.1%	42.9%	
	% within Group	7.9%	15.8%	
	% of Total	5.7%	4.3%	10.0%
Service/repair/replace broken fixtures or structures for better efficiency	Count	25	2	27
	% within $fridge	92.6%	7.4%	
	% within Group	3.8%	0.8%	
	% of Total	2.8%	0.2%	3.0%
Install Solar PV	Count	2	2	4
	% within $fridge	50.0%	50.0%	
	% within Group	0.3%	0.8%	
	% of Total	0.2%	0.2%	0.4%
Adjust appliance settings	Count	77	6	83
	% within $fridge	92.8%	7.2%	
	% within Group	11.7%	2.4%	
	% of Total	8.5%	0.7%	9.2%
Relocate appliances to better locations inside dwelling	Count	5	1	6
	% within $fridge	83.3%	16.7%	
	% within Group	0.8%	0.4%	
	% of Total	0.6%	0.1%	0.7%
Turn off second fridge/freezer	Count	19	0	19
	% within $fridge	100.0%	0.0%	
	% within Group	2.9%	0.0%	
	% of Total	2.1%	0.0%	2.1%
Defrost the fridge/freezer	Count	3	0	3

	% within $fridge	100.0%	0.0%	
	% within Group	0.5%	0.0%	
	% of Total	0.3%	0.0%	0.3%
Monitor fridge/freezer temperature	Count	21	5	26
	% within $fridge	80.8%	19.2%	
	% within Group	3.2%	2.0%	
	% of Total	2.3%	0.6%	2.9%
Shut fridge door quickly	Count	0	1	1
	% within $fridge	0.0%	100.0%	
	% within Group	0.0%	0.4%	
	% of Total	0.0%	0.1%	0.1%
Keep sides of fridge clear	Count	2	4	6
	% within $fridge	33.3%	66.7%	
	% within Group	0.3%	1.6%	
	% of Total	0.2%	0.4%	0.7%
Carry out a forensic electrical test on usage	Count	1	0	1
	% within $fridge	100.0%	0.0%	
	% within Group	0.2%	0.0%	
	% of Total	0.1%	0.0%	0.1%
Seal pet door	Count	2	0	2
	% within $fridge	100.0%	0.0%	
	% within Group	0.3%	0.0%	
	% of Total	0.2%	0.0%	0.2%
Fit low floor shower heads	Count	2	0	2
	% within $fridge	100.0%	0.0%	
	% within Group	0.3%	0.0%	
	% of Total	0.2%	0.0%	0.2%
Shower< 4 minutes	Count	3	1	4
	% within $fridge	75.0%	25.0%	
	% within Group	0.5%	0.4%	
	% of Total	0.3%	0.1%	0.4%
Wash in cold water	Count	0	16	16
	% within $fridge	0.0%	100.0%	
	% within Group	0.0%	6.5%	
	% of Total	0.0%	1.8%	1.8%
Dry washing on clothes line	Count	2	1	3
	% within $fridge	66.7%	33.3%	
	% within Group	0.3%	0.4%	

	% of Total	0.2%	0.1%	0.3%
Adopt recommendations from GVCE	Count	3	0	3
	% within $fridge	100.0%	0.0%	
	% within Group	0.5%	0.0%	
	% of Total	0.3%	0.0%	0.3%
Miscellaneous	Count	59	53	112
	% within $fridge	52.7%	47.3%	
	% within Group	8.9%	21.5%	
	% of Total	6.5%	5.8%	12.3%
Facilitate passive air flow	Count	4	4	8
	% within $fridge	50.0%	50.0%	
	% within Group	0.6%	1.6%	
	% of Total	0.4%	0.4%	0.9%
Install internal curtains, drapes, or blinds	Count	52	14	66
	% within $fridge	78.8%	21.2%	
	% within Group	7.9%	5.7%	
	% of Total	5.7%	1.5%	7.3%
Use ceiling fans and pedestal fans	Count	13	3	16
	% within $fridge	81.3%	18.8%	
	% within Group	2.0%	1.2%	
	% of Total	1.4%	0.3%	1.8%
Install sisalation/repair sisalation	Count	18	0	18
	% within $fridge	100.0%	0.0%	
	% within Group	2.7%	0.0%	
	% of Total	2.0%	0.0%	2.0%
Install carbon monoxide detector	Count	4	0	4
	% within $fridge	100.0%	0.0%	
	% within Group	0.6%	0.0%	
	% of Total	0.4%	0.0%	0.4%
Use electric throw blankets	Count	12	2	14
	% within $fridge	85.7%	14.3%	
	% within Group	1.8%	0.8%	
	% of Total	1.3%	0.2%	1.5%
Install a power saving device on an appliance	Count	9	2	11
	% within $fridge	81.8%	18.2%	
	% within Group	1.4%	0.8%	
	% of Total	1.0%	0.2%	1.2%
Install a fixture or structure	Count	4	0	4

	for better efficiency	% within $fridge	100.0%	0.0%	
		% within Group	0.6%	0.0%	
		% of Total	0.4%	0.0%	0.4%
	Window treatment	Count	1	2	3
		% within $fridge	33.3%	66.7%	
		% within Group	0.2%	0.8%	
		% of Total	0.1%	0.2%	0.3%
Total		Count	660	247	907
		% of Total	72.8%	27.2%	100.0%

Percentages and totals are based on respondents.

Appendix 2: Frequency of all energy conservation behaviours reported by participants in Groups 1 and 3.

Energy Conservation Behaviour multiple response			Group		Total
			Group 1 HEA	Group 3 Workshop	
Behaviours	Maximize thermal mass in fridge/freezer	Count	17	5	22
		% within $behaviours	77.3%	22.7%	
		% within Group	5.0%	3.1%	
		% of Total	3.4%	1.0%	4.3%
	Have the ceiling insulation checked	Count	0	1	1
		% within $behaviours	0.0%	100.0%	
		% within Group	0.0%	0.6%	
		% of Total	0.0%	0.2%	0.2%
	Upgrade ceiling insulation	Count	1	0	1
		% within $behaviours	100.0%	0.0%	
		% within Group	0.3%	0.0%	
		% of Total	0.2%	0.0%	0.2%
	Install underfloor insulation	Count	1	0	1
		% within $behaviours	100.0%	0.0%	
		% within Group	0.3%	0.0%	
		% of Total	0.2%	0.0%	0.2%
	Insulate hot water service pipes	Count	0	2	2
		% within $behaviours	0.0%	100.0%	
		% within Group	0.0%	1.2%	
		% of Total	0.0%	0.4%	0.4%
	Zone by closing doors	Count	87	55	142
		% within $behaviours	61.3%	38.7%	
		% within Group	25.4%	33.7%	
		% of Total	17.2%	10.9%	28.1%
	Draft proof doors, windows and vents	Count	14	6	20
		% within $behaviours	70.0%	30.0%	
		% within Group	4.1%	3.7%	
		% of Total	2.8%	1.2%	4.0%
	Ring energy retailer	Count	1	0	1
		% within $behaviours	100.0%	0.0%	
		% within Group	0.3%	0.0%	

	% of Total	0.2%	0.0%	0.2%
Use electricity during off-peak, e.g. weekends	Count	13	5	18
	% within $behaviours	72.2%	27.8%	
	% within Group	3.8%	3.1%	
	% of Total	2.6%	1.0%	3.6%
Use reverse cycle air-conditioner instead of floor heater whenever possible	Count	1	0	1
	% within $behaviours	100.0%	0.0%	
	% within Group	0.3%	0.0%	
	% of Total	0.2%	0.0%	0.2%
10% Rule- Adjusting the temperature of heating/cooling by 1% can save on running costs	Count	6	24	30
	% within $behaviours	20.0%	80.0%	
	% within Group	1.7%	14.7%	
	% of Total	1.2%	4.7%	5.9%
Upgrade/repair/service heating and cooling	Count	1	2	3
	% within $behaviours	33.3%	66.7%	
	% within Group	0.3%	1.2%	
	% of Total	0.2%	0.4%	0.6%
Manage curtains and blinds	Count	63	36	99
	% within $behaviours	63.6%	36.4%	
	% within Group	18.4%	22.1%	
	% of Total	12.5%	7.1%	19.6%
Avoid dstandby power use	Count	76	29	105
	% within $behaviours	72.4%	27.6%	
	% within Group	22.2%	17.8%	
	% of Total	15.0%	5.7%	20.8%
Upgrade lighting	Count	2	1	3
	% within $behaviours	66.7%	33.3%	
	% within Group	0.6%	0.6%	
	% of Total	0.4%	0.2%	0.6%
Reduce number of/avoid use of appliances e.g. Lights, fridges, freezers	Count	116	68	184
	% within $behaviours	63.0%	37.0%	
	% within Group	33.8%	41.7%	
	% of Total	22.9%	13.4%	36.4%
Service/repair/replace broken appliances for better efficiency	Count	1	0	1
	% within $behaviours	100.0%	0.0%	
	% within Group	0.3%	0.0%	
	% of Total	0.2%	0.0%	0.2%
Adjust appliance settings	Count	7	3	10

	% within $behaviours	70.0%	30.0%	
	% within Group	2.0%	1.8%	
	% of Total	1.4%	0.6%	2.0%
Turn off second fridge/freezer	Count	3	2	5
	% within $behaviours	60.0%	40.0%	
	% within Group	0.9%	1.2%	
	% of Total	0.6%	0.4%	1.0%
Monitor fridge/freezer temperature	Count	1	0	1
	% within $behaviours	100.0%	0.0%	
	% within Group	0.3%	0.0%	
	% of Total	0.2%	0.0%	0.2%
Keep sides of fridge clear	Count	0	1	1
	% within $behaviours	0.0%	100.0%	
	% within Group	0.0%	0.6%	
	% of Total	0.0%	0.2%	0.2%
Shower< 4 minutes	Count	0	1	1
	% within $behaviours	0.0%	100.0%	
	% within Group	0.0%	0.6%	
	% of Total	0.0%	0.2%	0.2%
Wash in cold water	Count	1	1	2
	% within $behaviours	50.0%	50.0%	
	% within Group	0.3%	0.6%	
	% of Total	0.2%	0.2%	0.4%
Dry washing on clothes line	Count	1	0	1
	% within $behaviours	100.0%	0.0%	
	% within Group	0.3%	0.0%	
	% of Total	0.2%	0.0%	0.2%
Adopt recommendations from GVCE	Count	3	0	3
	% within $behaviours	100.0%	0.0%	
	% within Group	0.9%	0.0%	
	% of Total	0.6%	0.0%	0.6%
Miscellaneous	Count	69	16	85
	% within $behaviours	81.2%	18.8%	
	% within Group	20.1%	9.8%	
	% of Total	13.6%	3.2%	16.8%
Facilitate passive air flow	Count	1	1	2
	% within $behaviours	50.0%	50.0%	
	% within Group	0.3%	0.6%	

		% of Total	0.2%	0.2%	0.4%
	Use ceiling fans and pedestal fans	Count	5	0	5
		% within $behaviours	100.0%	0.0%	
		% within Group	1.5%	0.0%	
		% of Total	1.0%	0.0%	1.0%
	Use electric throw blankets	Count	9	4	13
		% within $behaviours	69.2%	30.8%	
		% within Group	2.6%	2.5%	
		% of Total	1.8%	0.8%	2.6%
	Install a power saving device on an appliance	Count	2	1	3
		% within $behaviours	66.7%	33.3%	
		% within Group	0.6%	0.6%	
		% of Total	0.4%	0.2%	0.6%
Total		Count	343	163	506
		% of Total	67.8%	32.2%	100.0%

Percentages and totals are based on respondents.

Appendix 3: Frequency of all energy conservation devices installed by participants in Groups 1 and 3.

Devices Installed multiple response			Group		Total
			Group 1 HEA	Group 3 Workshop	
Devices	Maximize thermal mass in fridge/freezer	Count	0	1	1
		% within $devices	0.0%	100.0%	
		% within Group	0.0%	0.9%	
		% of Total	0.0%	0.3%	0.3%
	Have the ceiling insulation checked	Count	0	1	1
		% within $devices	0.0%	100.0%	
		% within Group	0.0%	0.9%	
		% of Total	0.0%	0.3%	0.3%
	Upgrade ceiling insulation	Count	14	2	16
		% within $devices	87.5%	12.5%	
		% within Group	6.5%	1.8%	
		% of Total	4.2%	0.6%	4.8%
	Increase insulative floor coverings	Count	1	1	2
		% within $devices	50.0%	50.0%	
		% within Group	0.5%	0.9%	
		% of Total	0.3%	0.3%	0.6%
	Insulate hot water service pipes	Count	2	18	20
		% within $devices	10.0%	90.0%	
		% within Group	0.9%	15.8%	
		% of Total	0.6%	5.5%	6.1%
	Install a valve cosy	Count	0	1	1
		% within $devices	0.0%	100.0%	
		% within Group	0.0%	0.9%	
		% of Total	0.0%	0.3%	0.3%
	Install/repair external blinds, awnings or shade sails	Count	7	9	16
		% within $devices	43.8%	56.3%	
		% within Group	3.2%	7.9%	
		% of Total	2.1%	2.7%	4.8%
	Plsnt tree's and shrubs	Count	4	1	5
		% within $devices	80.0%	20.0%	
		% within Group	1.9%	0.9%	

	% of Total	1.2%	0.3%	1.5%
Zone by closing doors	Count	1	0	1
	% within $devices	100.0%	0.0%	
	% within Group	0.5%	0.0%	
	% of Total	0.3%	0.0%	0.3%
Draft proof doors, windows and vents	Count	47	29	76
	% within $devices	61.8%	38.2%	
	% within Group	21.8%	25.4%	
	% of Total	14.2%	8.8%	23.0%
Install pelmets	Count	4	4	8
	% within $devices	50.0%	50.0%	
	% within Group	1.9%	3.5%	
	% of Total	1.2%	1.2%	2.4%
Install ceiling/pedestal fans	Count	6	0	6
	% within $devices	100.0%	0.0%	
	% within Group	2.8%	0.0%	
	% of Total	1.8%	0.0%	1.8%
Upgrade/repair/service heating and cooling	Count	30	13	43
	% within $devices	69.8%	30.2%	
	% within Group	13.9%	11.4%	
	% of Total	9.1%	3.9%	13.0%
Consider double glazing	Count	2	0	2
	% within $devices	100.0%	0.0%	
	% within Group	0.9%	0.0%	
	% of Total	0.6%	0.0%	0.6%
Avoid dstandby power use	Count	1	0	1
	% within $devices	100.0%	0.0%	
	% within Group	0.5%	0.0%	
	% of Total	0.3%	0.0%	0.3%
Upgrade lighting	Count	13	15	28
	% within $devices	46.4%	53.6%	
	% within Group	6.0%	13.2%	
	% of Total	3.9%	4.5%	8.5%
Install LED lighting	Count	17	6	23
	% within $devices	73.9%	26.1%	
	% within Group	7.9%	5.3%	
	% of Total	5.2%	1.8%	7.0%
Reduce number of/avoid use	Count	4	0	4

of appliances e.g. Lights, fridges, freezers	% within $devices	100.0%	0.0%	
	% within Group	1.9%	0.0%	
	% of Total	1.2%	0.0%	1.2%
Service/repair/replace broken appliances for better efficiency	Count	15	9	24
	% within $devices	62.5%	37.5%	
	% within Group	6.9%	7.9%	
	% of Total	4.5%	2.7%	7.3%
Service/repair/replace broken fixtures or structures for better efficiency	Count	2	1	3
	% within $devices	66.7%	33.3%	
	% within Group	0.9%	0.9%	
	% of Total	0.6%	0.3%	0.9%
Install Solar PV	Count	10	4	14
	% within $devices	71.4%	28.6%	
	% within Group	4.6%	3.5%	
	% of Total	3.0%	1.2%	4.2%
Seal pet door	Count	1	0	1
	% within $devices	100.0%	0.0%	
	% within Group	0.5%	0.0%	
	% of Total	0.3%	0.0%	0.3%
Fit low floor shower heads	Count	3	0	3
	% within $devices	100.0%	0.0%	
	% within Group	1.4%	0.0%	
	% of Total	0.9%	0.0%	0.9%
Miscellaneous	Count	7	1	8
	% within $devices	87.5%	12.5%	
	% within Group	3.2%	0.9%	
	% of Total	2.1%	0.3%	2.4%
Install internal curtains, drapes, or blinds	Count	36	27	63
	% within $devices	57.1%	42.9%	
	% within Group	16.7%	23.7%	
	% of Total	10.9%	8.2%	19.1%
Use ceiling fans and pedestal fans	Count	0	2	2
	% within $devices	0.0%	100.0%	
	% within Group	0.0%	1.8%	
	% of Total	0.0%	0.6%	0.6%
Install sisalation/repair sisalation	Count	1	0	1
	% within $devices	100.0%	0.0%	
	% within Group	0.5%	0.0%	

	% of Total	0.3%	0.0%	0.3%
Use electric throw blankets	Count	1	2	3
	% within $devices	33.3%	66.7%	
	% within Group	0.5%	1.8%	
	% of Total	0.3%	0.6%	0.9%
Install a power saving device on an appliance	Count	17	11	28
	% within $devices	60.7%	39.3%	
	% within Group	7.9%	9.6%	
	% of Total	5.2%	3.3%	8.5%
Install a fixture or structure for better efficiency	Count	9	2	11
	% within $devices	81.8%	18.2%	
	% within Group	4.2%	1.8%	
	% of Total	2.7%	0.6%	3.3%
Window treatment	Count	0	2	2
	% within $devices	0.0%	100.0%	
	% within Group	0.0%	1.8%	
	% of Total	0.0%	0.6%	0.6%
Total	Count	216	114	330
	% of Total	65.5%	34.5%	100.0%

Percentages and totals are based on respondents.

APPENDIX B — THE EFFECT OF HOME ENERGY ASSESSMENT AND WORKSHOP INTERVENTIONS ON HOUSEHOLD ELECTRICITY CONSUMPTION

BehaviourWorks AUSTRALIA

The Effect of Home Energy Assessment and Workshop Interventions on Household Electricity Consumption

Low Income Energy Efficiency Project

March 2016

The Effect of Home Energy Assessment and Workshop Interventions on Household Electricity Consumption

Synopsis of Consumption Data Results

The Home Energy Assessments (HEAs) proved successful in reducing electricity consumption by 6% with a bias in the warmer months of the year suggesting that the behaviours and activities had greatest effect on energy efficiency for cooling homes.

The Workshop could not be considered an effective method on its own to assist households to save energy as it is a complex and protracted process for the translation from education about energy efficiency to then result into actual behaviour in the home. The provision of support in making these changes in their home may help although these Workshops were not designed to provide this comprehensive level of service.

Participant beliefs about energy efficiency were assessed to see if they were associated with energy savings and the following clear findings were obtained:

- Weaker beliefs that energy efficiency is too much hassle were associated with decreased electricity consumption.
- Stronger beliefs that a household knows what to do to conserve energy was associated with decreased electricity consumption.

Workshop participants displayed a greater shift in their beliefs that energy efficiency would produce energy savings and improved comfort levels compare to HEA participants.

Overview of Consumption Data Results

Home Energy Assessments (HEAs) and Workshop interventions were evaluated for their effects on household electricity consumption. The HEA proved successful in reducing electricity consumption, especially in the warmer months of the year, whereas the Workshops had no significant change in the consumption of electricity.

The electricity consumption of groups of households were examined to identify reductions in consumption over time and to attribute these savings to participation in the Home Energy Assessment (HEA) and Workshop interventions. There were three groups of interest in this study: The Home Energy Assessment (HEA) group whose homes were retro fitted with energy saving items; the Workshop group who participated in an educational workshop focussing on energy saving activities they could apply in their homes; and a control group who received no intervention at all. The control group was drawn from households similar to households in the intervention groups in terms of electricity consumption.

Changes in electricity consumption between the pre and post intervention periods were examined by comparing households within each month.

The analysis showed that the HEA group succeeded in reducing electricity consumption in every month except May. The HEA reduced electricity consumption in the warmer months of the year, and suggest that the activities targeted by the HEA may be more effective on hotter than on cooler days.

The specific interventions in the HEA group and their effects on power consumption were examined to ascertain which ones were most effective in producing electricity savings in households. The following actions were associated with decreases in energy consumption:

- Installing Solar PV leads to an average decrease of 1.031 kWh in daily power consumption.
- Installing a heat pump leads to an average decrease of 5.730 kWh in daily power consumption.
- Installing solar HW leads to an average decrease of 2.260 kWh in daily power consumption.

Participant beliefs about energy efficiency were assessed to see if they were associated with energy savings. The analysis produced some clear findings for the following beliefs:

- Weaker beliefs that energy efficiency is too much hassle were associated with decreased electricity consumption.
- Stronger beliefs that a household knows what to do to conserve energy was associated with decreased electricity consumption.

The Workshop group did not fare as well with electricity consumption reductions only being observed in January, February and March followed in August to November with sizable increases. Overall, the Workshop attendees had no significant variation in total electricity consumption. The Workshop could not be considered an effective method (on its own) to assist households to save energy as it is a complex and protracted process for the translation from education about energy efficiency to then result into actual behaviour in the home. The provision of support in making these changes in their home may help although these Workshops were not designed to provide this comprehensive level of service.

The Workshop participants displayed a greater shift in their beliefs about energy efficiency producing energy savings and improved comfort levels compare to HEA participants.

Univariate Data screening

The first thing to note is the severe skew in the data (see the histogram in Figure 1 below) and a significant number of outliers with values in the ranges (0, 1), (50, 150) and some extreme outliers between 150 and 500. Clearly the extreme outliers are problematic since 150 kWh per day amounts to a cost of around $42 per day (based on 28 cents per kWh) or $1260 per month. It is doubtful that a typical household could sustain such a cost, and as these outliers relate to just three households (project ID 711185, 7141062, 7141137), their data was deleted from the subsequent analyses.

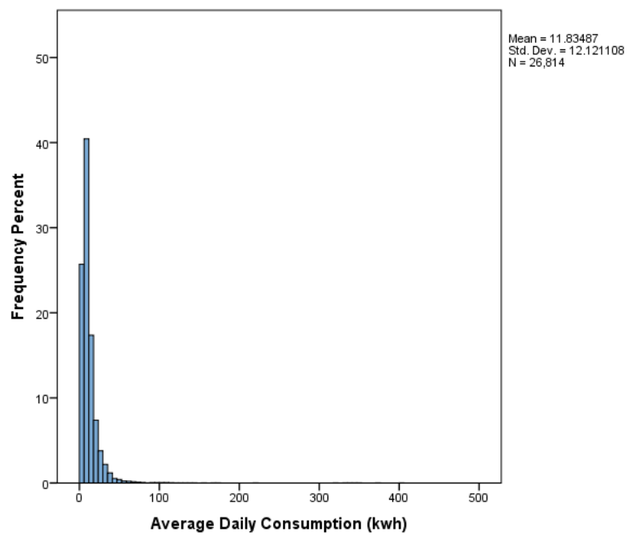

Figure 1: Histogram of average daily consumption

The cases with values between 0 and 1 in Figure 2 are most likely due to households being temporarily vacant or, in the case of zero values, having had power temporarily disconnected. In any case power consumption below 1 kWh per day does not seem to be typical and were deleted from the analyses reported here.

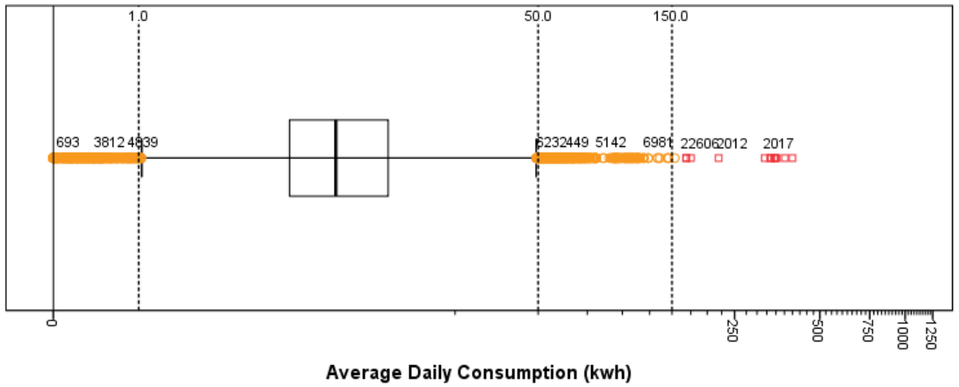

Figure 2: Log scale box plot of average daily consumption.

It is a little more difficult to justify deletion of the cases between 50 and 150 kWh/day and these values were retained in the analysis following similar analyses of other electricity interventions (Sayeef et al., 2013). Most cases (97%) have values between 1 and 50 kWh/day so deleting cases beyond this range would not have a significant biasing effect on results.

Bivariate Data screening

In addition to this univariate approach to identifying unusual or outliers in the data, it was also necessary to check for bivariate outliers since the analysis sought to compare post and pre intervention measures and their differences. To facilitate this, scatter plots of the post vs pre measures were examined for unusual or overly influential points. This was followed up by regressing post measures on pre measures for each treatment group and using a standard bivariate data cleaning method (see for example, Garbin 2016 and Tukey 1997 for detailed descriptions).

Data Overview

After deleting the cases discussed in the last section, and filtering bivariate outliers, the revised histogram below still shows a severe right skew which has implications for any analysis requiring even approximate normality of the data.

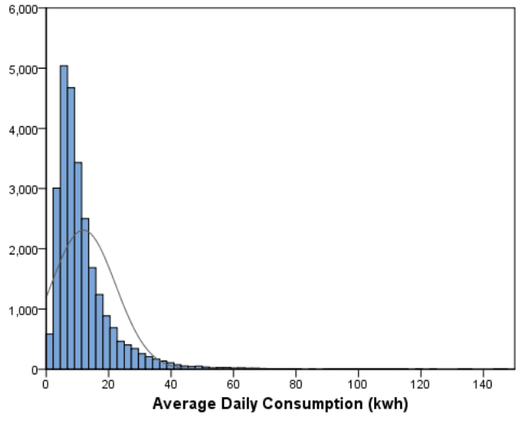

Figure 3: Revised histogram of daily consumption

However this analysis is concerned with the differences between post and pre measures and so it is more important that they are approximately normal as is seen to be the case in Figure 4 below. The observed symmetry and approximate normality is sufficient for analysis to proceed.

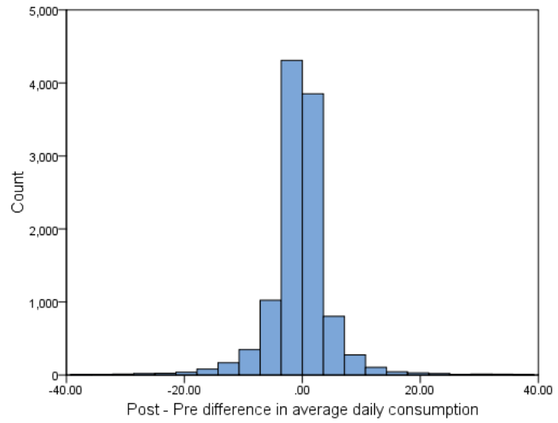

Figure 4: Histogram of post to pre differences in mean daily consumption daily consumption

Data Normalization

Consumption data were available in raw (as measured) format and in normalized format. The normalization was carried out using degree day data (HDD18 and CDD24) which purports to adjust electricity consumption values to those that would be observed in a typical year. The following quote is taken from the BizEE (2016) website and points out some of the pitfalls that users of degree day adjustments may fall into.

> *Degree-day-based monitoring and targeting is a central part of many energy management programmes, but degree days are commonly used in ways that can easily lead to inaccurate, misleading results. If you are using the popular degree-day-based methods, it's important that you have an understanding of the sources of inaccuracy, and a sense for the reliability of the figures on which you base decisions. Otherwise you will frequently find yourself chasing excess consumption that doesn't really exist, and highlighting improvements that haven't really be made.*

When compared with the raw data, the normalised data exhibited far more variability both within time and between postal areas and between households when one would expect to see more consistency both over time and space. It was therefore, decided to use the raw measurement data in all analyses.

Analysis

The analysis addresses the following questions.

1. What, if any, change in household electricity consumption results from each of the levels of engagement (i.e., the retrofit program and the workshop program).
2. What, if any, change in household electricity consumption results from specific activities/interventions undertaken in the retrofit program (e.g., lighting upgrades, drought seals, ceiling insulation, etc.)
3. What belief/attitude variables explain any change from pre-workshop-intervention consumption to post-workshop intervention consumption?
4. For households with “above average bulk insulation” is the consumption lower than those households with “below standard” ceiling insulation?
5. For households with insulation having an R value of 2 or more, is the consumption lower than those households with insulation of a lower value?

Groups in the Study

There are three groups of interest in this study: The Home Energy Assessment (HEA) group whose homes were retro fitted with energy saving items; the Workshop group who participated in an educational workshop(s) focussing on energy saving activities they could apply in their homes; and a control group who received no intervention at all. The control group was drawn from households thought to be similar to households in the intervention groups. No other matching information is available for the control group however and this should be kept in mind when interpreting results in later sections.

Control group Issues

The data for the Control group consists of observations taken between July 2011 and March 2014. The HEA group data consists of observations taken between January 2014 and December 2015 while the Workshop group data has observation from July 2014 to October 2015. As can be seen there is very little overlap between the control group collection period and the collection periods of the two intervention groups. This presents two problems; (1) the lack of contemporaneous data in the control group makes it difficult to make a justifiable choice about which of its observations should be assigned as pre-measures and/or post measures, and (2) even if the first problem is solved, any comparisons made with the intervention groups may be biased due to very different weather conditions at the time and or place that the control observations were made. The issue of assigning control group observation to pre and post was resolved by simply taking the mid-point date for each case as the break point. Thus any statistical comparisons involving the control group should be viewed carefully.

Changes in Consumption over Time

The first three questions refer to changes in electricity consumption between the pre and post intervention measures. Also, since there is a great deal of seasonal variation in electricity consumption, it is prudent to examine changes and make comparisons within each month. To this end the data was organised on an annual basis for each month such that the intervention fell somewhere in the following eleven months. For example the pre intervention data for January consists of observations in a given January for which there are matched post intervention observations in the following January. Since the intervention dates vary throughout the study period, the actual intervention may have occurred between February and the following December. With the data in this form the difference between pre and post intervention observations could be calculated and analysed.

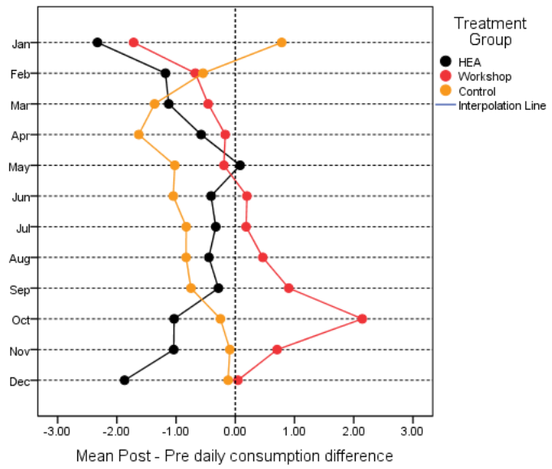

Figure 5: Monthly mean changes in in average daily electricity consumption (kWh) for each treatment group.

The chart in Figure 5 displays the monthly means of the pre-post differences in average daily consumption (kWh) with colours used to identify the two treatment groups and the control. The important aspects of this chart are (1) a negative value represents a decrease in average daily electricity consumption from the given month to same month a year later, (2) a positive value represents an increase in average daily electricity consumption from the given month to same month a year later, (3) The distance of a point below (or above) zero can be assessed for statistical significance and, (4) the distances between points for a given month may be assessed for statistical significance.

The HEA group received the retrofit intervention and it appears that it succeeded in reducing power consumption in every month except May (see Figure 5). The workshop group did not fare as well with power consumption reductions only being observed in January, February and March followed in August to November with sizable increases. The control group exhibited an increase for January followed by decreases or little change for the remainder of the year.

To assess the statistical significance of these annual changes, standard t-tests for the hypothesis of zero change were carried out on the pre-post consumption differences within each month for each group. The results are displayed in **Error! Reference source not found.** where bolded p-values denote overall significance at the 5% level[1].

Table 1: Monthly and annual change in average daily power consumption and t-test for zero change p-values

	HEA		Workshop		Control	
Month	Change	p-value	Change	p-value	Change	p-value
Jan	-2.328	**0.000**	-1.718	**0.000**	0.783	**0.000**
Feb	-1.179	**0.001**	-0.675	0.005	-0.545	**0.000**
Mar	-1.124	**0.000**	-0.458	0.005	-1.364	**0.000**
Apr	-0.577	0.012	-0.170	0.243	-1.631	**0.000**
May	0.080	0.744	-0.193	0.220	-1.022	**0.000**
Jun	-0.409	0.077	0.196	0.332	-1.047	**0.000**
Jul	-0.330	0.160	0.182	0.355	-0.829	**0.000**
Aug	-0.446	0.065	0.464	0.021	-0.831	**0.000**
Sep	-0.286	0.078	0.902	**0.000**	-0.749	**0.000**
Oct	-1.034	0.007	2.144	**0.000**	-0.251	0.022
Nov	-1.039	**0.001**	0.707	0.195	-0.093	0.343
Dec	-1.869	**0.000**	0.044	0.842	-0.122	0.178
Annual	-0.612	**0.000**	-0.038	0.539	-0.590	**0.000**

Thus there were significant decreases in the HEA group power consumption in the warmer months January to March and November-December but no significant change at other times. For the Workshop group there was a significant reduction in January and near significant reduction in February and March then no significant changes until in September – October there were significant increases in consumption.

On an annual basis the HEA group exhibited a significant decrease of 0.612 kWh per day in consumption, the Workshop group exhibited a non-significant decrease of 0.038 kWh per day and the control group exhibited a significant decrease of 0.590 kWh per day.

The HEA and Workshop groups were also compared to the control group within each month using MANOVA special contrasts and the results are in Table 2. The average HEA group consumption was significantly lower than that of the control group in January, March and October-December. The Workshop group consumption as significantly lower than that of the control group in January alone. However, it was significantly higher in March, April, June, August and September. It is not clear why this is the case but as mentioned earlier, extreme caution should be used when making comparisons to the control group.

Table 2: Monthly and annual Contrasts between HEA and workshop treatment groups and the control.

Month	HEA vs Control	P-value	Workshop vs Control	P-value
Jan	-3.335	**0.0000**	-2.670	**0.0000**
Feb	-0.431	0.0978	0.200	0.4610
Mar	0.954	**0.0001**	1.730	**0.0000**
Apr	0.808	0.0010	1.399	**0.0000**
May	0.752	0.0021	0.551	0.0215
Jun	0.400	0.0761	1.010	**0.0001**
Jul	0.283	0.2174	0.716	0.0070
Aug	0.104	0.6449	0.971	**0.0001**
Sep	0.181	0.3442	0.871	**0.0003**
Oct	-1.073	**0.0003**	-0.401	0.2327
Nov	-1.378	**0.0000**	-0.859	0.0094
Dec	-1.672	**0.0000**	-0.253	0.3785
Annual	-.0226	0.7780	.55180	**0.0000**

[1] The p-values should be compared to the Bonferonni adjusted value of 0.05/12 = 0.0042 in order to preserve the overall type I error rate at 5%

On an annual basis the difference in post-pre change between HEA and Control groups was negative but non-significant. That is, on an annual basis the retrofit intervention had no significant effect relative to the control group. On an annual basis the difference in post-pre change between Workshop and Control groups was positive and highly significant. That is, on an annual basis the workshop intervention displayed significantly higher consumption relative to the control group.

Financial Savings

Financial savings can be calculated from the differences shown in Tables 1 and 2 by applying a standard tarrif. The St Vincent de Paul Society's Victorian Tariff Tracking Project (Mauseth Johnston, 2015) data which monitors electricity retailer market offers indicates that, for January 2014, the average market offer for 14 Victorian retailers was $0.28. Applying this figure to the consumption changes provides an estimate of average daily savings or expenditures for each month.

The savings for the HEA that were statistically significant at $p < .001$ shown in Table 1 ranged from $0.29 (November) to $0.66 (January) per day on average. For the Workshop, there were fewer statistically significant months, and the financial savings per day on average were $0.48 (January). There were also two months where consumption increase for an average financial expenditure $0.25 (September) and $0.60 (October). Consumption in the control group exhibited reductions in consumption over time ranging from $0.15 (February) to $0.46 (April). In the month of January, consumption increased in the control group by $0.22 per day on average.

When consumption savings are calculated relative to the control group consumption (rather than pre-post differences within groups) as in Table 2, the average daily financial savings attributed to the HEA ranged from $0.12 in March to $0.93 in January. In the Workshop group, the reduction in household consumption post intervention during January amounted to $0.75 per day on average. However, the increased average daily consumption ranged from a low of $0.24 in September to a high of $0.48 in March.

Causes of Change

In this section demographic and household factors along with the specific interventions in the HEA group and their effects on power consumption are examined.

The effect of interventions in the HEA group

The list of broad intervention types are displayed in **Error! Reference source not found.** along with the number of households affected. Each item has a binary coding (zero (No) or one (Yes)) which allows their effect on power usage to be assessed using multiple regression.

Table 3: List of Intervention types and numbers of participants

Intervention Type	No	Yes
Renovation carried out	1010	45
Extension carried out	1029	26
Energy Saving Appliance	1038	17
Energy Efficient Heater/Cooler	946	109
Draught Prevention	1050	5
Decommission Elec Floor Heater	1052	3
Internal Window Treatment	1040	15
External Window Treatment	1036	19
Solar PV	961	94
Solar HW	1036	19
Nat Gas	1047	8
Heat Pump	1050	5
Upgrade Insulation	1042	13
Upgrade Lighting	993	62
Pergola Shade	1046	9

To assess the impact of the interventions, a step-wise regression was performed using post-pre intervention change in average daily power consumption as the dependent variable and the intervention binaries as independent variables. A successful intervention is one for which the coefficient of its binary is both significant and negative.

The step-wise regression results in

Table 4 show that only five of the fifteen interventions had a significant effect of average daily power consumption. Solar PV, Heat Pump and Solar HW all show significant negative effects while Energy efficient H/C and Extension both show significant positive effects.

The interpretation is as follows:

- Installing an Energy Efficient Heater/Cooler leads to an average increase of 1.215 KwH in daily power consumption.
- Installing Solar PV leads to an average decrease of 1.031 kWh in daily power consumption.
- Installing a heat pump leads to an average decrease of 5.730 kWh in daily power consumption.
- Installing solar HW leads to an average decrease of 2.260 kWh in daily power consumption.
- Carrying out an extension leads to an average increase of 1.72 kWh in daily power consumption.

Table 4: Results of step-wise regression of Post-Pre change in daily consumption against intervention binaries.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	-0.692	0.079		-8.775	0.000
Energy Efficient Heater/Cooler	1.215	0.280	0.100	4.339	0.000
Solar PV	-1.031	0.306	-0.079	-3.367	0.001
Heat Pump	-5.730	1.818	-0.073	-3.152	0.002
Solar HW	-2.260	0.704	-0.076	-3.210	0.001
Extension	1.720	0.615	0.065	2.795	0.005

The excluded variables did not exhibit even mild statistical significance from which it can be concluded that those interventions were not successful in reducing power consumption.

Impact of survey belief/attitude items in the Workshop group

The survey belief and attitude items and their mean scores are listed in Table 5. Each of these questions is scored on a 1 to 5 scale and are used in a step-wise regression analysis to assess their impact on post to pre workshop daily power consumption.

Table 5: Survey belief items.

Beliefs about household energy efficiency and conservation	Mean
1. On a scale of 1-5 how energy efficient has your household become over the last 2 years?	3.59
2. On a scale of 1-5, how empowered does your household feel in relation to its energy consumption?	3.58
3. On a scale of 1-5, how comfortable does your household feel? (heating/cooling/lighting/etc)	3.87
4. On a scale of 1-5, how interested is your household in conserving energy in the home?	4.55
5. My household knows what to do to conserve energy in the home.	4.03
What effect do the following barriers have on your household conserving energy? (1=no effect, 5 = large effect)	
6a. Cost of energy efficiency upgrades	3.65
6b. Living in a rental property	2.20
6c. Lack of support from other people living in the home	2.07
6d. Lack of information	2.77
6e. Problems understanding the information	2.39
6f. Finding it hard to read	1.87
6g. Language difficulties	1.38

To what extent do you agree with the following statement (1 = strongly disagree, 5 = strongly agree)	
7. Energy efficiency is too much hassle.	2.31
8. Energy efficiency means I have to live less comfortably.	2.37
9. My quality of life will decrease when I reduce my energy use.	2.49
10. Energy efficiency will restrict my freedom.	2.07
11. Energy efficiency is not very enjoyable	2.33

The step-wise regression results in Table 6 show that only four belief/attitude item had any impact on power consumption. The interpretations are:

- Stronger beliefs that energy efficiency is too much hassle leads to increased power consumption.
- Language difficulties appear to imply lower power consumption. It is difficult to interpret this outcome.
- Stronger beliefs that a household knows what to do to conserve energy lead to decreased power consumption.
- Stronger beliefs that energy efficiency will restrict freedom leads to decreased power consumption. It is difficult to interpret this outcome.

Table 6: Results of step-wise regression of Post-Pre change in daily consumption against belief/attitude scores.

	Unstandardized Coefficients		Standardized Coefficients		
Variables Retained	B	Std. Error	Beta	t	Sig.
(Constant)	2.854	1.025		2.785	0.006
7. Energy efficiency is too much hassle.	0.756	0.208	0.358	3.644	0.000
6g. Language difficulties	-0.586	0.147	-0.312	-3.993	0.000
5. My household knows what to do to conserve energy …	-0.698	0.216	-0.261	-3.235	0.001
10. Energy efficiency will restrict my freedom.	-0.477	0.229	-0.203	-2.087	0.038

The effect of above average insulation and R2.0 or greater insulation

Since better insulation should lead to lower power consumption throughout the year, two binary variables "Above average insulation" and "Insulation R value 2.0 or above were included. To assess the effect of insulation type a multivariate regression of pre and post daily consumption on these two binary variable. A negative coefficient indicates that the insulation type (above average or Greater than R2.0) has a downward effect of power consumption. The parameter estimates from this multivariate regression are in Table 7 and show that the coefficient of "above average" Insulation is not significant in either the pre of post measures and that the R2.0 or above coefficients are significant and negative for both measures. That is, having insulation with a was a R value of 2 or more reduced average daily power consumption.

Table 7: Parameter estimates from multivariate regression of Insulation (above average) and Insulation R2.0 and above

Parameter Estimates

						95% Confidence Interval	
Dependent Variable	Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Pre intervention Avg Daily kWh	Intercept	13.589	.587	23.131	.000	12.436	14.741
	RValue2OrAbove	-1.323	.674	-1.963	.050	-2.645	-.001
	Insulation	-.694	.610	-1.137	.256	-1.891	.503
Post intervention Avg Daily kWh	Intercept	12.895	.517	24.958	.000	11.881	13.908
	RValue2OrAbove	-1.254	.593	-2.116	.035	-2.417	-.091
	Insulation	-.672	.537	-1.253	.211	-1.725	.381

Conclusion

The following conclusions can be drawn with respect to the research questions posed in this study:

What, if any, change in household electricity consumption results from each of the levels of engagement (i.e., the retrofit program and the workshop program).

There were significant decreases in the HEA group power consumption in the warmer months January to March and November-December but no significant change at other times. For the Workshop group there was a significant reduction in January and near significant reduction in February and March then no significant changes until in September – October there were significant increases in consumption.

The HEA and Workshop groups were also compared to the control group within each month using MANOVA special contrasts and the results are in Table 2. The average HEA group consumption was significantly lower than that of the control group in January, March and October-December. The Workshop group consumption as significantly lower than that of the control group in January alone. However, it was significantly higher in March, April, June, August and September.

What, if any, change in household electricity consumption results from specific activities/interventions undertaken in the retrofit program (e.g., lighting upgrades, drought seals, ceiling insulation, etc.).

The following actions were associated with changes in energy consumption:

- Installing an Energy Efficient Heater/Cooler leads to an average increase of 1.215 KwH in daily power consumption.
- Installing Solar PV leads to an average decrease of 1.031 kWh in daily power consumption.
- Installing a heat pump leads to an average decrease of 5.730 kWh in daily power consumption.
- Installing solar HW leads to an average decrease of 2.260 kWh in daily power consumption.
- Carrying out an extension leads to an average increase of 1.72 kWh in daily power consumption.

What belief/attitude variables explain any change from pre-workshop-intervention consumption to post-workshop intervention consumption?

Four belief/attitude items had any impact on power consumption:

- Stronger beliefs that Energy efficiency is too much hassle leads to increased power consumption.
- Language difficulties appear to imply lower power consumption. It is difficult to interpret this outcome.
- Stronger beliefs that a household knows what to do to conserve energy lead to decreased power consumption.
- Stronger beliefs that Energy efficiency will restrict freedom leads to decreased power consumption. It is difficult to interpret this outcome.

For households with "above average bulk insulation" is the consumption lower than those households with "below standard" ceiling insulation?

Household with “above average” insulation did not demonstrate lower consumption on either the pre of post measures.

For households with insulation having an R value of 2 or more, is the consumption lower than those households with insulation of a lower value?

Having insulation with a was a R value of 2 or more reduced average daily power consumption.

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Low income earners finally

> The project has delivered the "opportunity for residents to save money and be more comfortable in their unit.
>
> — Ed McNair
> Shepparton Villages

> We were able to increase comfort and improve the health and wellbeing of clients.
>
> — HEA Assesor

> This project has delivered cost saving benefits to residents in caravan parks" and "improved relationship between park owners and residents.
>
> — Elizabeth White- Vic Parks

I appreciated that I was given a Carbon monoxide monitor as I
be caused by Gas appliances such as Heaters. (I have mine chec
cycle Air Conditioners). The provision of draft excluders for the
insulation around the door frames should result in some saving of

I am extremely grateful that I was provided with a Sunbeam brand
not know that they existed until I saw one at the demonstration. I
serious problems with the joints in my body – especially torn tendor
"Throw" rug is so large, it reaches from my feet to my shoulders and
considerable relief from discomfort and pain.

I would like to express my appreciation to GV Community Energy and its team – and also to the Federal Government for providing the funds to make the scheme possible, through the Low Income Energy Efficiency Program. Also, as an ex-teacher, I was pleased to hear that on-going follow up and research will take place and I would be interested in receiving the findings of any such research.

Thank you to all those involved.

New office bearers elected

> I enjoyed empowering households, witnessing light bulb moments when participants understood an energy efficiency concept or behaviour that would lead to improved comfort and savings.
>
> — HEA Assessor

Learn how to save on power costs at a free public meeting

As reported in the last Waranga Ne
the Rushworth and District Lions C
is sponsoring a free public meeting at
Rushworth Senior Citizens rooms at 7
next Tuesday 5 May about how to re
power costs in your home.

It is stressed that the people runni
meeting, representatives of GV Comm
Energy's 'Power down project', ba
Murchison, are totally independent of
companies, and are part of a projec
funded by the Federal Governm
being delivered across nine municip
Northern Victoria.

At the meeting, Goulburn
Community Energy's CEO Geoff Lodge and staff member Leeane Button will conduct an information session to inform participants of practical behavioural changes and cost effective solutions to reduce energy use and costs in the home.

Details will also be provided of free Home Energy Assessments available for low income households, for which eligibility criteria exist. As part of this project, a range of retrofit items are available for installation.

Everyone is most welcome

All interested people will be made very welcome at the meeting. So why not roll up, learn how you can save money, and have an enjoyable free supper supplied by GVCE, a the conclusion of the meeting?

Contact details

Anyone with any queries should conta
GV Community Energy at 54A Stevens
Street, Murchison, by visiting them, or
writing to them at PO Box 237 Murchis
3610, or by ringing 58 262 513, or email
info@gvce.com.au or www.gvce.com.au

SHEPPARTON MEN'S SHED INC.
In Partnership with:
vision australia
The Community Fund Goulburn Valley
Patron Jaclynne Powell M.P.

4/25 Impey Street,
MURCHISON 3610
6/12/2014

eeting on 5th November we received a report on the
our Shed. We all felt that the presentation was
are to follow up with House visits. Many in our
er and your program and visits have provided
duce costs in our homes.

ACKNOWLEDGEMENTS

The Powerdown Project would like to thank the contribution of the following people

PAST PROJECT MANAGERS
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STAFF
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