Motivating Sustainable Behaviour Change in Apartment Residents of Moreland, Australia

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By:

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Abstract

The Moreland Energy Foundation in Melbourne, Australia, sought to lower electricity use among apartment residents, who face special barriers to living sustainably. We developed a two-pronged, research-based strategy to promote energy saving habits and devices: information about energy saving habits and devices and competition among residents to reduce consumption as a motivator. A case-control study demonstrated the value of competition: competing residents adopted 250% more energy saving habits and devices than the non-competing control group.

Executive Summary

Australia has the highest per capita carbon pollution rate of all developed nations. To counteract this, the Moreland Energy Foundation (MEFL) brings sustainable programming to Victorian communities in greater Melbourne. As apartment residents comprise one-third of the population in the city of Moreland, we developed a competition-based motivational strategy to overcome their specific barriers to sustainable living. We found that **competition successfully motivated sustainable behaviour change in apartment residents**.

Our motivational strategy consisted of an electricity reduction competition supplemented with an energy savings guide on reduction techniques. To evaluate the effectiveness of our motivational strategy, we recruited participants for a case control study. The case group received our full motivational strategy with a $200 incentive for the competition winner, whereas the control group only received the energy savings guide with a $200 incentive for a randomly selected participant. Offering equivalent incentives and information isolated competition as the sole motivator in our study.

Competition effectively motivated the implementation suggested electricity reduction techniques as 72% of the total habits and devices implemented were from the competitive group. However, we cannot conclusively say the strategy resulted in decreased electricity use, due to inaccuracies and variability in our electricity meter data. Thankfully, the post-study survey proves that the competitive group utilized our energy savings guide at an advantage of more than 2.5 to 1 over the non-competitive group. As the only difference between the groups was the competition, we can conclude that was an effective motivator.

To better gauge the effects of competition on resident electricity use, **we recommended MEFL scale up competitive motivation to landlord vs. landlord or municipality vs. municipality.** These groups can implement more significant changes than individual residents, resulting in substantial reduction in electricity use. MEFL should also investigate using smart meters when conducting these types of study. Smart meters record energy consumption every half hour, allowing for a more in-depth profile of household energy consumption.

The demographic that was the most receptive to and motivated by our study was young, culturally westernized residents. Over half of young residents with whom we spoke

enrolled; whereas, a quarter of middle-aged residents and no elderly residents enrolled. We experienced similarly high success rates in recruiting culturally westernized residents as compared to residents not affluent with Australian culture. Such residents seemed deterred by language or cultural barriers. Young, culturally westernized residents were also the most motivated by the competition, as they implemented an average of two habits and devices more per participant than any other demographic.

To access wider audiences for future energy reduction studies, **we recommended MEFL apply its Culturally and Linguistically Diverse (CALD) outreach framework to apartment residents**. This framework targets communities unreceptive to door-knocking by working through a trusted community member. Furthermore, we suggest MEFL utilize this outreach framework to better target elderly residents. Future studies should examine the applicability of this framework to elderly communities.

Residents preferred hard copy over electronic information and, depending on their past sustainability experience, different aspects of the energy saving guide. Our guide offered two information sources for electricity reduction techniques: a general one-page brief and a more in-depth sustainability booklet. The post-study survey showed that residents who made energy efficient improvements prior to the study preferred the comprehensive packet; that group had made an average of 7.1 energy saving changes per resident before our study began. In contrast, residents who had not previously made energy saving improvements preferred the one-page brief; making an average of 3.1 energy efficient changes prior to the study. The survey also revealed that 10 out of 11 competitive group participants did not utilize the website; however, 9 out of 11 found the hard copy energy savings guide to be beneficial.

To ensure residents receive pertinent information, **we recommended MEFL continue the process of providing both general and in-depth materials.** This will equally accommodate residents who have prior knowledge of energy efficiency techniques those who do not. Further research should investigate which group, those with prior sustainability experience or those without, would be more important to target for outreach programs like this one. With which group does the greatest potential for reducing electricity lie? We also suggest that MEFL place greater emphasis on hard copy materials. This eliminates effort on the resident's part and ensures they receive MEFL's written support tools.

Overall, **competition successfully motivated apartment residents to implement recommendations from our energy savings guide.** Furthermore, young culturally westernized residents were the most receptive demographic throughout the study. Additionally, hard copy form information sources with varying detail proved to be highly effective means of relaying information. Based on these conclusions, we recommended specific actions for MEFL and proposed questions for further research.

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Introduction

Australia has the highest per person carbon pollution rate of any developed nation in the world (Department of Climate Change and Energy Efficiency, 2012b). Thirty-five per cent of this pollution stems from electricity use (Department of Climate Change and Energy Efficiency, 2013). Despite many citizens exhibiting proenvironmental sympathies, community organisations like the Moreland Energy Foundation Ltd. (MEFL) face significant challenges in motivating residents to adopt electricity-conserving behaviours and devices in their homes.

An effective behaviour change strategy depends upon first identifying the barriers to proenvironmental behaviour and then developing a program to overcome them. Two not-for-profit organisations, Roberts Evaluation Pty Ltd and Just Change, as well as a 2010 team of Worcester Polytechnic Institute students, have identified the barriers facing apartment residents. These barriers include lack of knowledge, high cost of retrofit devices, physical inability, and restrictive lease agreements (Roberts Evaluation Pty Ltd, 2010; Just Change,2012; Pearce, E. Marx, B. Kulzer, K. Fields, J., 2010). Since apartment residents comprise one third of Moreland's population, addressing the specific needs of this group could significantly reduce the community's carbon emissions.

In response to MEFL's interest in new methods to engage apartment residents, this project aimed to reduce carbon emissions by motivating decreased electricity consumption among apartment residents. We developed a motivational strategy based on the concept of peer competition, an approach previously unexplored by MEFL. Guided by a series of support tools, apartment residents competed to reduce their personal electricity consumption. Meanwhile, a control group of residents received the same information on energy reduction techniques without the added stimulus of competition.

The results of the competition showed that 100% of residents in the case group implemented suggested habits and devices, in contrast to only 81% in the control group. Overall, the competition group accounted for 72% of all implemented suggestions, as compared with 28% for the control groups, establishing that competition is a viable approach to stimulating proevironmental behaviour change.

Background

Australia "produces more carbon pollution per person than any other developed country in the world" (Department of Climate Change and Energy Efficiency, 2012b). The government recognizes that significant change is needed and has committed itself to reducing the nation's greenhouse gas emissions. Their long term goal is to reduce annual carbon pollution to 80 per cent of the level it was 2000, by the year 2050 (Department of Climate Change and Energy Efficiency, 2012a). To achieve this goal, the government has estimated that each resident must cut their emissions by at least one third (Department of Climate Change and Energy Efficiency, 2012c). As a result, many local non-profit organisations have emerged in recent years. These organisations develop new programs, technologies, and information geared at motivating their regions to conserve energy. One organisation that works within the Moreland community is the Moreland Energy Foundation Ltd (MEFL).

Moreland Energy Foundation Limited

MEFL is a non-profit organisation established by the Moreland City Council in 2000. It was created with the mission of continuing local action to reduce carbon emissions and energy use within the Moreland community. While MEFL is still based and works heavily within the city of Moreland, the foundation has expanded its scope across more than twenty municipalities and councils throughout the state of Victoria. In striving for its vision of sustainability, MEFL has developed five key objectives which guide the organisation:

1. to deliver community based sustainable solutions
2. to build alliances for sustainable communities
3. to grow and share energy knowledge
4. to provide leadership in the transition to a sustainable future
5. to operate in a sustainable way

These strategic directions form the foundation for all of the MEFL's workings, and have allowed the organisation to provide programs that have proven to be both innovative and effective (MEFL, 2012).

From its various projects, the Moreland Energy Foundation has recognized a need for increased outreach to the apartment resident community. According to the Australian Bureau of Statistics (2012), apartment residents comprise over a third of Moreland's population. To garner

any significant reduction in Moreland's residential carbon emissions, apartment residents must play a role. Our project aims to assist MEFL is this task by improving home sustainability within the Moreland apartment resident community. Currently, however, this demographic has specific limitations to reducing their energy consumption that must be identified and overcome.

Barriers to Increasing Energy Efficiency in Apartments

Various reports have identified four key barriers to apartment residents reducing energy consumption:

1. Lack of knowledge
2. Lease agreement restrictions
3. Cost
4. Physical inability

One such report, completed by Roberts Evaluation, determined that residents had a lack of knowledge of ways to reduce their energy consumption. In this evaluation of Zero Carbon Moreland, an overarching MEFL program, they found that "some offers and services were not appropriate for all households (particularly renters)" (Roberts Evaluation, 2012, p. 32). A not-for-profit organisation, Just Change, also found that renters in metropolitan Victoria expressed a desire to make their homes more energy efficient but needed more information about how to do so (Just Change, 2010, p. 10). In addition, Just Change found lease agreements restrictions to be another barrier to apartment residents making sustainable changes. From their renter survey, ninety-four per cent of respondents indicated that they would like to make changes, yet only forty-six per cent had sought landlord approval (Just Change, 2010, pp. 4, 7). Basic installations require landlord consent, but many residents either "did not know they could ask, [did] not feel confident about asking, or believed there was little point as they would be unlikely to receive a positive response" (Just Change, 2010, p. 7).

In their Interactive Qualifying Project report, *Motivating Environmental Behaviour Change*, WPI students Jackson Fields, Kathryne Kulzer, Bradford Marx, and Emily Pearce (2010), identified two barriers which affect Moreland as a whole; the cost of energy-efficient devices and residents' physical inability to install such devices. Just Change noted similar

concern for retrofit costs in their renter survey, as fifty-one percent of respondents cited expense as the reason they declined to make energy efficiency improvements (Just Change, 2010, p. 9). The 2010 WPI study also found that mobility restrictions due to age or physical impairment prevented several residents from installing retrofit devices. One elderly resident said she was afraid she "might not be strong enough" to install a device (Jackson Fields *et al.*, 2010).

Motivating Behaviour Change

The aforementioned barriers are not insurmountable if apartment residents are sufficiently motivated. Similarly, residents can reduce energy consumption by changing their energy use habits if they receive appropriate encouragement. To develop a behaviour change strategy capable of providing such motivation, we turned to three widely accepted behavioural theories, the Value-Belief-Norm Theory, the Theory of Planned Behaviour, and the Social Cognitive Theory. Each is described in context of a pro-environmental campaign.

Personal Car Use (Value-Belief-Norm Theory)

A study aimed at reducing Sweden's personal vehicle use, found that behaviour is prompted by a feeling of obligation to act in a specific way (Norlund and Garvill, 2003). This sense of obligation, known as personal norm, is derived from an individual's values and the beliefs that result from them. The study determined that persons with proenvironmental values were more apt to believe they should reduce their car use. Furthermore, by nurturing these beliefs, one could increase an individual's feelings of obligation to drive their cars less. The results of these values, beliefs, and feelings are measured in the actions taken by individuals to drive their cars less. This study provides strong evidence in support of the Value-Belief-Norm (VBN) theory of proenvironmental behaviour.

The VBN theory builds on multiple behaviour change models in an effort to understand indicators of proenvironmental behaviour. Paul C. Stern (2000) proposed that environmentally significant behaviour is driven by values, beliefs, and personal norms. As shown in Figure 1, values drive beliefs, beliefs result in personal norms, and these factors combined prompt behaviour. Stern emphasizes that the VBN theory can be applied to understand a wide range of proenvironmental behaviours and the factors that drive people to act in that manner.

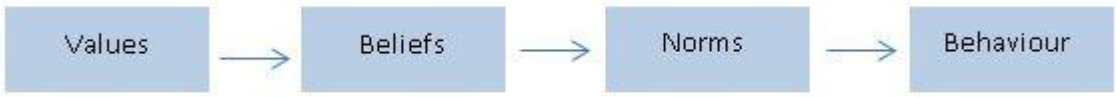

Figure 1: Value-Belief-Norm Theory

The Value-Belief-Norm Theory suggests that personal values cause beliefs. These beliefs directly affect personal norm, or the feeling of obligation to act in a certain way. The theory concludes that people are likely to act on this feeling of obligation.

The VBN Theory can be used to inform behaviour modification strategies by first identifying what behaviour needs alteration and then endorsing beliefs about the behaviour based on the targeted group's known general values. Should the beliefs be promoted successfully, the result will be seen in the population's increased obligation to take on the desired behaviour. In the personal vehicle study, Norlund and Garvill (2003) found that reduced usage was directly related to value for the environment, as well as a consciousness of environmental issues related to cars. They suggest that "strategies aimed to increase willingness to reduce personal car use should emphasize self-transcendent and ecocentric values" (Norlund and Garvill 2003). Based on their findings and the VBN Theory, it can be concluded that **effective strategies for proenvironmental behaviour modification must aim to promote favourable beliefs about a behaviour, based on their existing values.**

To inspire these sympathies, we included in our motivational strategy information on how residents could reduce their electricity consumption easily while saving money. Fields and his colleagues (2010) found that many Moreland residents already value the environment and are aware of the issues surrounding energy consumption and carbon emissions. Thus, we provided them with means to act on this value and believe that there is something they could do to be more ecofriendly. If this belief could be successfully instilled in our target residents, VBN suggests they would behave in a more proenvironmental manner.

Recycling Tendencies (Theory of Planned Behaviour)

Michele Tonglet and her colleagues (2004) conducted a study which showed that pro-recycling attitudes are the driving force in recycling behaviour. Her findings suggest that pro-recycling attitudes are prompted by having the necessary opportunities, facilities and knowledge to recycle. These attitudes can be negatively affected by issues such as time, space, and inconvenience. Lastly, the findings suggest that previous recycling experience as well as concern

for the community also contribute to recycling behaviour. This study's findings illustrate the Theory of Planned Behaviour.

The Theory of Planned Behaviour claims that behaviour is dependent on an individual's intention to act in a specific way. Intention derives from one's attitude toward a behaviour and the subjective norms associated it. Attitude in this instance is defined as a person's beliefs and values about the potential results of the behaviour while subjective norms are a person's beliefs of what other people think should be done. The model additionally proposes that perceived behavioural control, or self-efficacy, also affects intention. In sum, the planned behaviour model suggests that behaviour is driven chiefly by intention, as shown schematically in Figure 2.

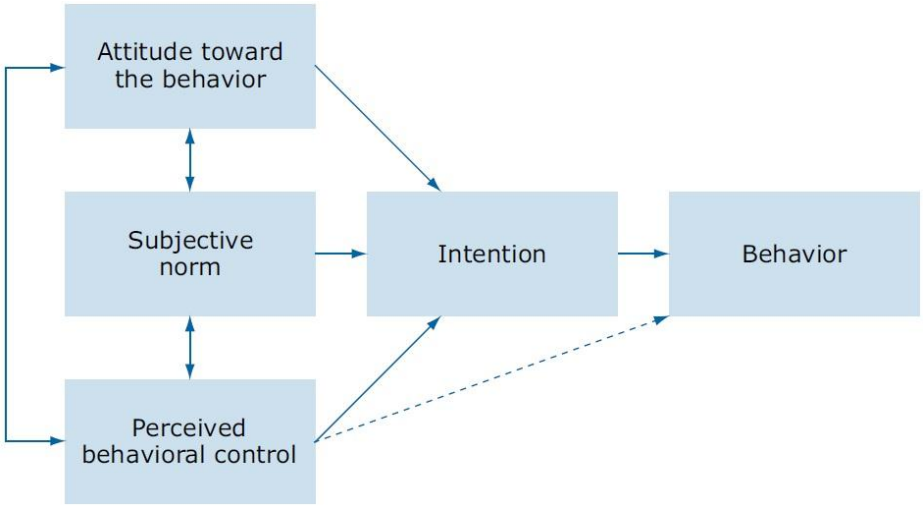

Figure 2: Theory of Planned Behaviour

The Theory of Planned Behaviour regards intention as the main driving force of behaviour. Intention is derived from three main factors: attitude, subjective norms, and perceived behavioural control (Communication for Governance and Accountability Programs, 2012)

This model suggests that behavioural interventions must be focused on changing a person's intention to behave in a sustainable manner. In particular, interventions should focus on generating positive attitudes and perceived behavioural control about the desired behaviour. Tonglet and her colleagues (2004) found that a number of factors, such as knowledge of recycling and opportunities to recycle, affect attitudes and perceived behavioural control towards recycling. As a result, **sustainable behaviour change strategies must aim to improve environmental attitudes and perceived behavioural control to effectively promote proenvironmental intention within the target group.** Tonglet and her colleagues concluded that "this information can then be used to develop and implement [behaviour change] schemes

which are user friendly, and in addition, can be used as the basis for the marketing campaigns which advocate the use of such schemes" (Tonglet et al., 2004).

To alter apartment residents' intentions, we distributed information designed to generate positive attitudes about proenvironmental behaviours. This information was provided in conjunction with simple energy saving solutions to increase perceived behavioural control of being able to carry out such behaviours. If we succeeded in generating positive attitudes and perceptions of control, the Theory of Planned Behaviour suggests that apartment residents would be more likely to reduce their energy consumption.

ECOFLATS Apartment complex (Social Cognitive Theory)

A study conducted in March 2011 shows that external factors motivate individuals to be more environmentally conscience (O'Brien, 2012). The ECOFLATS apartment complex features a monitor in the lobby displaying the real-time energy consumption of each individual unit in the building. This public display inspires a sense of competition that motivates ECOFLATS residents to consume less energy than their neighbours. Over one year of this pilot program, the energy consumption of the entire complex was reduced by 50 megawatt-hours.

The result of the ECOFLATS study provides excellent support for the Social Cognitive Theory, which suggests that **people are driven by both external and internal factors.** These factors include behavioural, environmental, and personal motivation. The environmental factor is defined as situational influences on a person's behaviour. The personal factors represent personal motivational forces such as instinct, drive, and knowledge. Both the environmental and personal factors interact and directly affect behaviour (Communication and Governance Accountability Program, 2012).

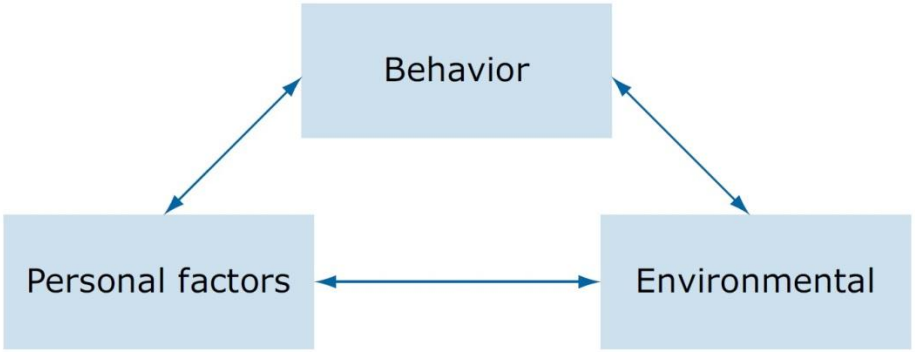

Figure 3: Social Cognitive Theory
The Social Cognitive Theory suggests that environmental or external factors interact with personal or internal factors to affect behaviour (Communication and Governance Accountability Program, 2012).

The Social Cognitive Theory can be applied to increase levels of self-efficacy by providing resources to boost individuals' confidence. Self-efficacy is defined as a personal judgment of one's ability to perform a specific behaviour. In this model, self-efficacy falls under personal factors, which are subject to influence by environmental motivators. The effects of self-efficacy can be seen in the resulting behaviour (Communication and Governance Accountability Program, 2012). In the ECOFLATS case, residents could see their neighbours using less energy which motivated them to do the same. If the residents are able to see other people's success in energy reduction, they would have proof that it is possible to reduce their own energy consumption (O'Brien, 2012). As such, **effective behaviour modification strategies must provide an external factor capable of influencing and ultimately increasing the target group's self-efficacy.**

To further motivate residents to conserve more energy, we used an external factor of competition. Based on the Social Cognitive theory, the external factor of competition was expected to influence personal factors such as drive and self-efficacy. As a result, the successful combination of these two types of motivating factors would have led to a greater reduction in energy consumption.

Motivational Strategy

Combining these behavioural ideas with the barriers facing renters, we identified the following key components of a strategy for reducing energy use among renters: an energy savings guide and peer competition.

Energy Saving Guide

The first component of our motivational strategy was an energy saving guide. This guide was developed to increase residents' attitudes towards the environment and perceived behavioural control which, as suggested by the Theory of Planned Behaviour, would result in proenvironmental behaviour change. Fields and his colleagues (2010) found that many Moreland residents already value the environment and are aware of the issues surrounding energy consumption and carbon emissions. Our energy savings guide looked to capitalize on those values by providing residents a means to act on them. By giving residents a means to act on their beliefs, we encouraged proenvironmental personal norms which lead to proenvironmental behaviour change, as stated by the Value-Belief-Norm Theory.

This guide consisted of a tailored one-page brief and a comprehensive energy packet. The brief was formed based on the results of several opportunity assessments, found in Appendix B: Energy Saving Guide, conducted on participant apartments. It included a list of habits and devices that targeted specific issues present throughout residents' buildings. The energy packet, produced by the Alternative Technology Association, was broader by comparison and provided in depth detail of actions, devices, contacts, and other resources for increased resident sustainability.

The first component of our brief consisted of habits such as setting your refrigerator between 3°C and 5°C. These habits were selected because they are free, simple ways to conserve energy, and easy to incorporate. By including habits, we were able to address residents' lack of knowledge of simple ways to conserve energy, the high costs of retrofit devices, and physical inability to install retrofit devices. The second component of our brief consisted of recommended retrofit devices such as insulated curtains. These components were selected because they were inexpensive, easy to install, and did not require landlord consent. By including devices, we were able to address residents' lack of knowledge of cheap easy to install devices and landlord lease agreement restrictions (see Appendix B: Energy Saving Guide for complete guide).

The second part of our energy saving guide is the Alternative Technology Association's Renters Guide to Sustainable Living. This guide gave more in-depth information on apartment sustainability options beyond the information provided by our brief. The Renters Guide to Sustainable Living also contained information on how to approach landlords about making changes which would be outside of their lease agreement.

Competition

The second component of our motivational strategy was an electricity reduction competition. To encourage apartment residents to reduce their energy consumption, we chose to employ a competition-based motivator. This method was selected for two reasons. First, according to the Social Cognitive Theory external stimulants, such as competition, motivate behaviour change. Secondly, MEFL has yet to explore competition as a viable method to reduce residential electricity consumption.

The competition took place among residents of several apartment blocks. At the start of the competition, participating residents received our energy saving guide. Participants' electricity meters were then read daily, Monday through Friday. This information was used to calculate average daily electricity consumption per household. These daily averages were then ranked by from greatest to least reduction and posted on our competition web page every Tuesday and Friday. To ensure resident privacy, participants were given a unique code to identify themselves. Whichever competitor reduced their electricity consumption the most from their previous electricity bill received a prepaid debit card for AUD $200.00. In order to maintain participant engagement, we sent out weekly notices including letter box drops and emails (see Appendix C: Competition Updates), informing them of the current rankings, when the rankings would be posted on the web, and additional tips to help improve their standing. The competition standings provided through our engagement methods served to increase participants' perceived behavioural control which, as the Theory of Planned Behaviour suggested, encouraged our desired behaviour.

Testing the Motivational Strategy

We assessed the effectiveness of the motivational strategy via a case-control study. The case group received the complete motivational strategy while the control received only the energy saving guide. Throughout the remainder of this study, the case group will be referred to as competitive, while control will be non-competitive. In the competitive group, the participant who won the electricity reduction competition received an AUD $200 prize; in the non-competitive, a randomly selected participant received the same prize. We offered equivalent prizes to isolate competition as the sole motivator of our study.

To enrol participants for the case-control study, we went through a detailed building selection and recruitment process. Once the formal study began, we read the electricity meters of our participants five times a week to determine a winner of the competition and assess if competition effectively motivated reduced electricity use. To probe participants' responses, we conducted a post-study survey of all of them. The building selection and recruitment process, electricity meter readings, and post-study survey are detailed in the following sections.

Building Selection

To increase the likelihood of enrolling our target of fifteen participants per group, we considered multiple apartment buildings. To qualify for the study, a building must have:

1. **Permitted face-to-face contact with residents**. Face-to-face contact was integral to enrolling a sufficient number of participants within our allotted time frame of one and half weeks. All of the buildings needed to permit access to apartment units.
2. **Had externally accessible electricity meters.** Meter reading formed the backbone of our data collections process. To gather participants' electricity consumption data, we needed daily access to their electricity meters. The information presented allowed us to quantitatively prove or disprove competition as a motivator for reduced consumption.
3. **Been old enough to utilize green devices**. We established this criterion to ensure the relevance of the motivational strategy, particularly the energy saving guide. Newer buildings were more apt to have green technology previously installed, making the guide less applicable to participating residents. Based on the above criteria, eleven apartment buildings were selected; each built between the years of 1960 and 1979. Five buildings were allotted to the non-competitive group and six to competitive. The buildings were

located on DeCarle and Donald Street and DeCarle and Blyth Street respectively. To see exact addresses, please refer to Appendix D: Recruitment Buildings.

4. **Been built in the same municipality.** Selection bias, which can misalign data from true values, occurs when the case and control groups are dissimilar. Moreland City encompasses thirteen distinct municipalities, each with a unique demographic composition. To increase similitude between the competitive and non-competitive groups, and thus remove bias, we restricted the building search to a single municipality. Comparing sets of roughly equivalent economic status and racial composition ensured both groups were equally capable of implementing our desired behaviour.

Recruitment

We employed a two-step process to recruit participants. First, we distributed an introductory letter and consent form to the apartments in our chosen buildings. The letter informed residents of MEFL, the study, and that letter collection would occur within the following days. After twenty-four hours, we went door-to-door to speak with residents about the study and enrol them. The waiting period allowed residents time to familiarize themselves with the information presented in the letter and complete the consent form.

Door-to-door recruitment occurred over a period of four days. We separated into two teams consisting of one male and one female. We used this method to speak to as many residents as possible and to ensure the safety of both the recruiters and potential enrolees. We knocked on doors twice daily, with one morning session between the hours of 10 AM and 12 PM and one evening session between 5 PM and 8 PM. We recorded basic information about the residents, their responses, and their reactions to specific trigger words.

Figure 4 shows the seven distinct responses we received from recruitment. Residents with whom we had no conversation with were categorized under:

- **No response.** This signifies that the resident was not home for the duration of the recruitment period.
- **Inaccessible.** All the chosen apartment complexes permitted face-to-face contact during building selection; however some buildings became locked throughout the recruitment process. Inaccessible classifies apartments where the central entryway to the building became locked and we could not access internal units to recruit.

- **Unoccupied.** This categorizes units that were either vacant or under construction.

Residents with whom we had conversation were categorized under:

- **Accepted/ Rejected.** These signify residents who choose to enrol or not to enrol respectively.
- **Failed return.** This signifies a resident who requested we return at another time, but was not available upon follow up.
- **Get in touch.** This categorizes residents that said they would contact us if they desired to enrol, but from whom we did not receive follow up.

Of the total one-hundred thirty-eight apartment units we knocked on, we had an acceptance rate of 16%. It must be noted however, that several residents were either unavailable or could not be accessed during the recruitment period. In that light, of the seventy-one residents with whom we were able to converse, we had a total success rate of 30.9%.

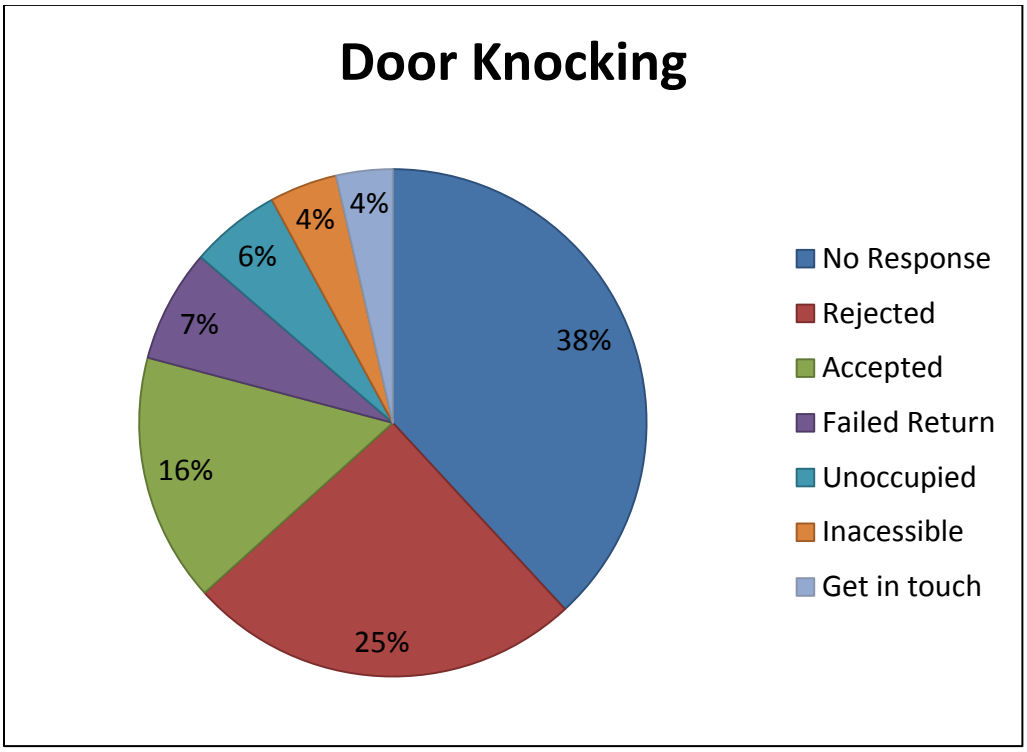

Figure 4: Various responses to door knocking.

Through recruitment, we found that **residents were most successfully enrolled when engaged in a concise, face-to-face conversation led by a woman**. Of the conversations which led to enrolment, 83% were led by women. Initially, men directed recruitment conversation; however, after receiving mostly negative responses, we changed to the more successful female-led approach. We observed that **residents responded negatively to abundant detail**, so conversations were restricted to only the most relevant information. With a total success rate of 3%, letter drops without personal follow-up proved to be ineffective. Of the one hundred thirty-eight households that received consent forms, only four prefilled the letter and had it ready upon our arrival or delivered it via phone or email. As shown in Figure 5, **face-to-face conversation proved to be the most effective method** as 83% of participants were enrolled via this means.

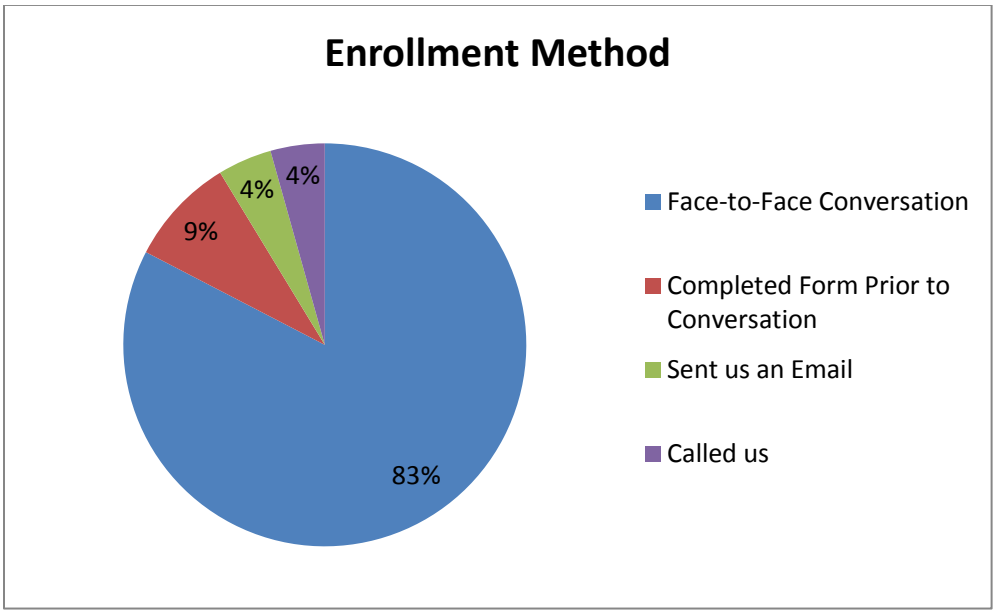

Figure 5: Ways in which residents enrolled in the study.

Based on initial impressions of resident reactions, recruitment tactics were altered and refined. Our observations suggest that **residents were most successfully enrolled by trigger words *student* and *$200 prize,* but were easily deterred by *energy* and *study*.** The word *energy* triggered mostly negative responses, as residents seemed to assume we represented a private energy retailer with the intention of switching their suppliers. Though MEFL is not an energy retailer, residents commonly met their full title with the response "I already have a provider" or "I don't want to buy anything" followed by an immediate termination of contact. The trigger word *study* triggered similarly negative responses. Residents seemed to believe participation

would require a major time commitment and as a result, we were often met with the response of "I'm not interested" or "I don't have time."

Positive trigger words, *student* and *$200 prize*, resulted in several residents enrolling in our study. Residents were generally empathetic when they discovered we were students. *$200 prize* worked well as a secondary trigger. It often caught the attention of people who were sceptical of our study. For a summary of these observations, see Table 1.

Positive Responses	Negative Responses
$200 prize • Caught the attention of most residents • Triggered interest in people who previously seemed hesitant • Was often the main reason for enrolment	Energy • Residents often assumed we were from an energy retailer • They thought we were selling something • They thought we were there to ask them to switch their energy provider
Student • Residents typically showed empathy • Worked well with younger residents • Elicited a sense of helpfulness from the participants who enrolled	Study • Residents were immediately turned off • Assumed a study would involve a major time commitment • They were afraid our methods would be personally invasive

Table 1: Recruitment pitches that triggered positive or negative responses from residents.

As we could not gather age information from residents who did not enrol, we classified young, middle aged, and elderly as any resident(s) who by looks and manner of dress, speech, and body language[1], appeared to be between the ages of 18-35, 36-59, or 60 and above respectively. It must be noted that excepting enrolees, classifications were given based on the combined personal impressions of the recruiters and are subject to variation from true data. Age statistics are shown in Figure 6.

[1] Appearance factors used to categorize age groups.

- Young: Youthful appearance with no wrinkles or signs of aging. Wearing younger clothes. Spoke with a lively or assertive voice, perhaps used slang when speaking.
- Middle aged: Have a few grey hairs. Wearing business clothing or "older" more comfortable clothing. May have had young children.
- Elderly: Signs of aging such as greying or all grey hair. Speaking in a softer voice.

Based on our impressions of resident age ranges and cultural orientation, we found that **young Culturally and Linguistically Australian (CALA)[2] residents were the most likely demographic to enrol in our study**. (We will show later that this group formed the most committed participants as well.) While over half of young people spoken with agreed to participate, only about a quarter of middle-aged people did. Furthermore, of the six elderly people with whom we spoke, none signed up. This observation is further supported by our 48.1% success rate with CALA as compared to 26.6% with Culturally and Linguistically Diverse (CALD)[3] residents. These results are shown in Figure 7.

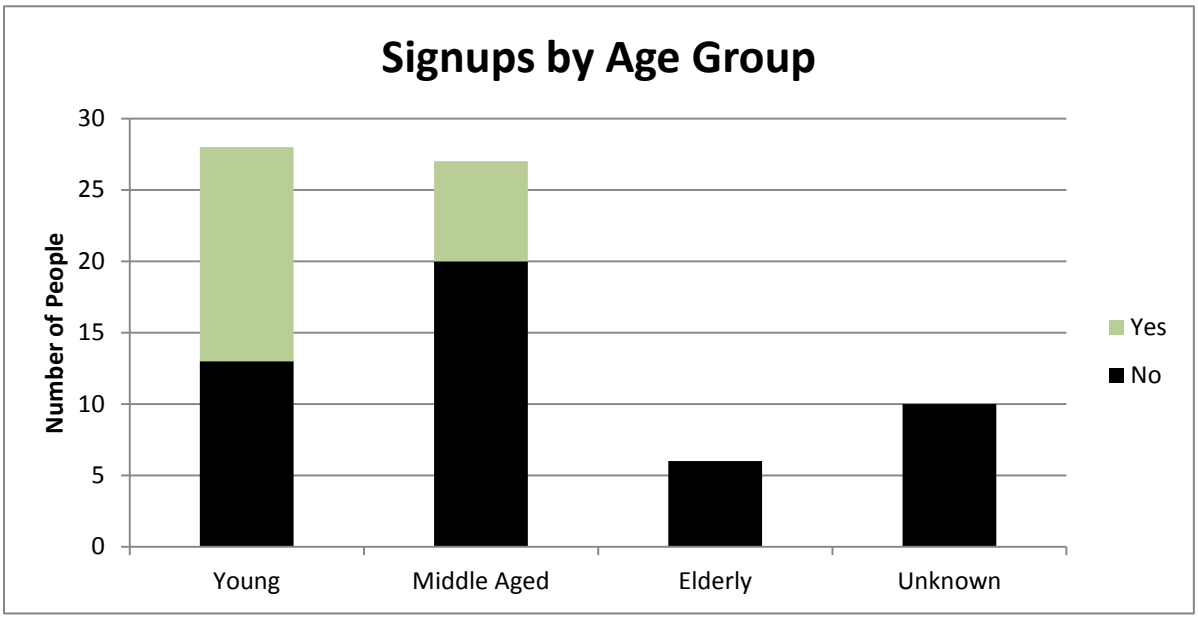

Figure 6: The number of residents in each general age group that chose to enrol or not enrol after we spoke to them.

[2] CALA (Culturally and Linguistically Australian) is a term used to describe westernized residents. It is based on CALD (Culturally and Linguistically Diverse), an official MEFL term used to describe residents who are not affluent with Australian culture.

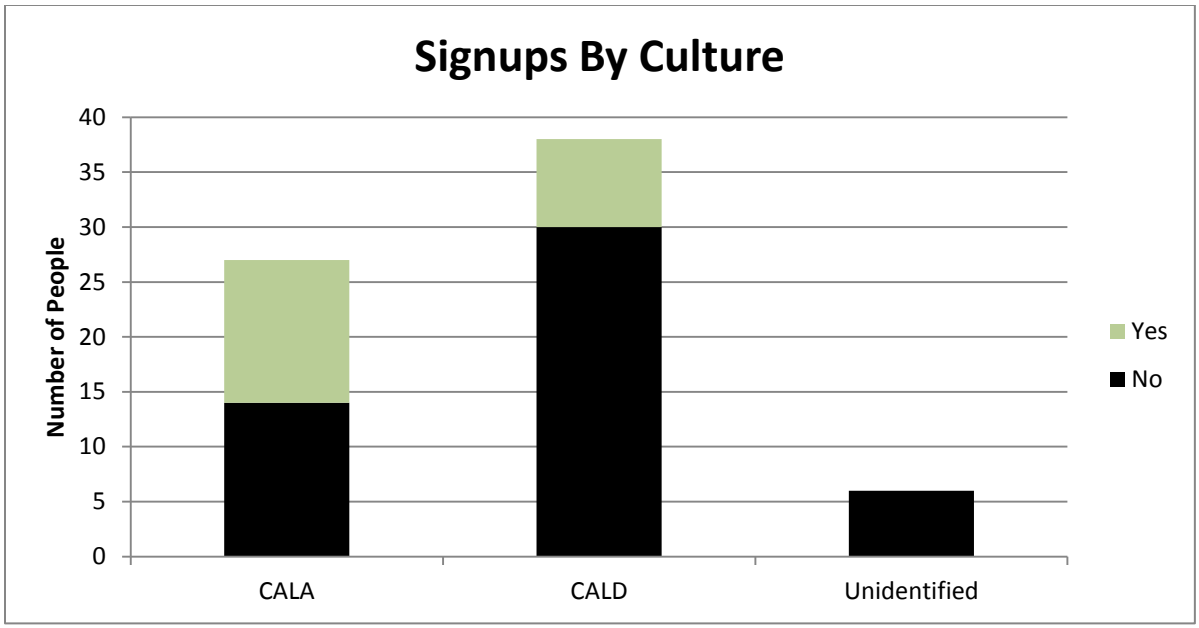

Figure 7: The number of residents who were Culturally and Linguistically Australian (CALA) or Culturally and Linguistically Diverse (CALD) who chose to enrol or not enrol.

In summary, we recruited eight CALA residents and two CALD for the competitive group, in comparison to seven CALA residents and four CALD for the non-competitive. Overall, young CALA resident were the most receptive to our study, representing 68% of total enrolees. We found residents were most successfully enrolled when engaged in a concise, face-to-face conversation led by a woman and stimulated with trigger words student and $200.00 prize.

Electricity Meters

Since one measure of the effectiveness of our strategy is reduction in electricity consumption, we collected two periods of electricity meter readings: a baseline of four days and a study period of seventeen days. At each reading, we recorded each participant's total kWh used to date and the time the reading was taken. The first readings were on Friday, 1 February and the second the following Tuesday. By taking the difference between these first two meter readings and dividing it by the time elapsed between them, we calculated a baseline kWh/day average usage for each participant. The second set of meter readings took place during the study period, from 5 February to 22 February. These readings were recorded every Monday through Friday throughout the study period. Unfortunately, the data from these electricity meter readings showed too much variation to permit reliable comparison of changes in electricity consumption. This variability was due to several factors, including the measurement error from reading analog meters, the

variations in day-to-day electricity use, and the relatively small size of the electricity reductions we were hoping to detect.

The changes in electricity use across the competitive and non-competitive groups fell within the measurement error; therefore, we cannot detect a difference in consumption between the groups. There was an absolute measurement error of 0.5 kWh for every measurement of kWh/day. Analog meters work on a dial system and only have dials down to the ones number place. When taking meter readings, we estimated to the nearest half of a kWh by judging whether the dial in the ones place was closest to a whole number or if it was about halfway between two numbers. This resulted in an absolute measurement error of 0.25 kWh for each meter reading. Whenever we found the difference between two readings, the errors for each reading compounded and resulted in an absolute measurement error of 0.5 kWh. As there was negligible error in time measurements, every use per day calculation had a 0.5 kWh/day absolute error.

Due to this measurement error, we could not accurately determine small changes in electricity use, such as the average change in electricity use we measured for the competitive and non-competitive groups. To find these group averages, we first took the baseline average kWh/day for each participant. We then subtracted the baseline average from the average kWh/day for each participant during the study. From this information the competitive group decreased by 0.108 kWh/day and the non-competitive by 0.063 kWh/day. These changes fall within the measurement error of 0.5 kWh/day; therefore, **we could not conclude whether competition was effective in reducing electricity use.**

The electricity use per day calculations showed a high degree of variability from day to day. Table 2 shows the means and standard deviations of each participant's daily electricity use. The standard deviations range from 0.7 to5.5 kWh/day and, on average, make up 25% of the mean electricity use per day. Such large standard deviations show that participants' electricity use varied greatly from day to day.

	Mean Electricity Use per Day During the Study (kWh/day)	Standard Deviation of Electricity Use per Day (kWh/day)	Standard Deviation's Per Cent of the Mean
1	16.8	3.9	23
2	13.2	3.6	27
3	9.0	1.9	22
4	7.5	2.0	27
5	9.2	3.8	42
6	9.5	1.1	11
7	3.9	0.8	19
8	10.6	5.5	52
9	5.6	0.7	12
10	10.7	3.0	28
11	12.2	1.7	14
12[4]	1.4	0.6	43
13	9.3	2.1	23
14	9.5	2.4	25
15	3.0	0.8	27
16	12.8	3.0	24
17	6.0	1.1	19
18	8.8	1.4	16
19	16.4	2.4	15
20	7.5	3.0	40
21	9.3	1.9	21
22	9.0	2.9	33

Table 2: Mean electricity use per day, the standard deviation of electricity use per day, and the standard deviation's per cent of the mean for each participant. Participant's numerical codes are in the left-hand column; black numbers denote those with air conditioners. Participants 1 through 11 were in the competitive group and participants 12 through 22 were in the non-competitive group.

One cause of this variability was change in weather, particularly intermittent hot days. Participants with air conditioners, labelled in Table 2 with black numbers, had a greater average variability in their daily electricity use than those without; the standard deviations were an average of 35% of the mean for those with air conditioning and 21% of the mean for those without. Another source of variability could be a single use of some common home appliances. For example, an electric clothes drier might use 2.3 kWh per cycle (MEFL, 2010): drying one load of clothes could bump electricity usage by one standard deviation. Washing a load of clothes could produce a similar spike in consumption. Unlike air conditioning, whose use correlates with outside temperature (see the discussion accompanying Figure 8 and Figure **9**); use

[4] This resident informed us at the end of the study that she had been away from home for its duration; therefore, we have omitted this data from all calculations of averages.

of such electricity-hungry appliances produces apparently random variations in meter readings. Other factors that could have contributed to variability in electricity use include changing work schedules of participants and differing times of day of meter readings. Participants may have been in their homes for different lengths of time on different days, leading to differences in day-to-day electricity use.

Potential reductions in electricity consumption achieved through installing recommended devices were too small to be accurately measured; such changes in consumption were masked by measurement error or variability in data. For example, suppose a participant replaced four 75W incandescent light globes with 15W (MEFL, 2010) compact fluorescents (CFLs) and that these globes operated four hours a day. The participant would save 0.96 kWh/day of electricity in total. Similar savings of 0.70 kWh/day would have resulted from replacing the same number of halogen down lights with Light Emitting Diodes (LEDs) (MEFL, 2010). In either case, these changes in electricity use are not large enough to be accurately measured by daily meter readings; the energy savings are masked by the measurement error and variability described previously.

Residents with air conditioners consumed more electricity on warm days. Air conditioners typically demand 3kW of *power* (i.e., they consume 3kWh of *energy* each hour they operate) (MEFL, 2010). In spite of our data inaccuracies, the energy demand of air conditioners is still large enough to be noticed against our participants' average daily electricity use of 9.5 kWh. Figure 8 shows the electricity use for each participant with an air conditioner compared to the daily outdoor temperature. Note that each participant's usage trend line has a positive slope, indicating that residents with air conditioners consumed more electricity with increasing outdoor temperature. Figure 9 displays the electricity use for participants without air conditioners compared to daily outdoor temperature. Their trend lines have slopes that vary in direction, many are near zero, suggesting the lack of correlation between usage and temperature.

As a result, it is clear that **warm temperatures caused participants with air conditioners to consume more electricity, while having no effect on participants without air conditioners.** This observation is hardly surprising, though it illustrates the challenge of

identifying trends in electricity use in the face of such significant measurement error and data variation: small changes are lost in the noise.

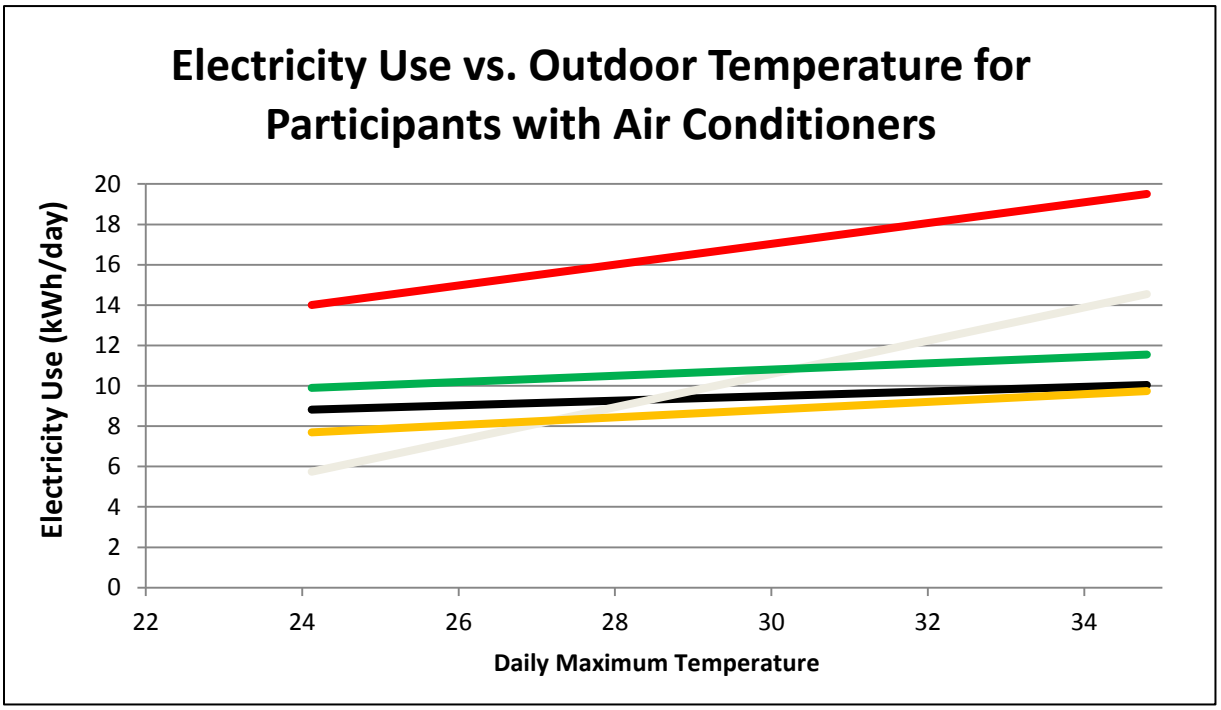

Figure 8: Electricity use compared to outdoor air temperature for participants with air conditioners.

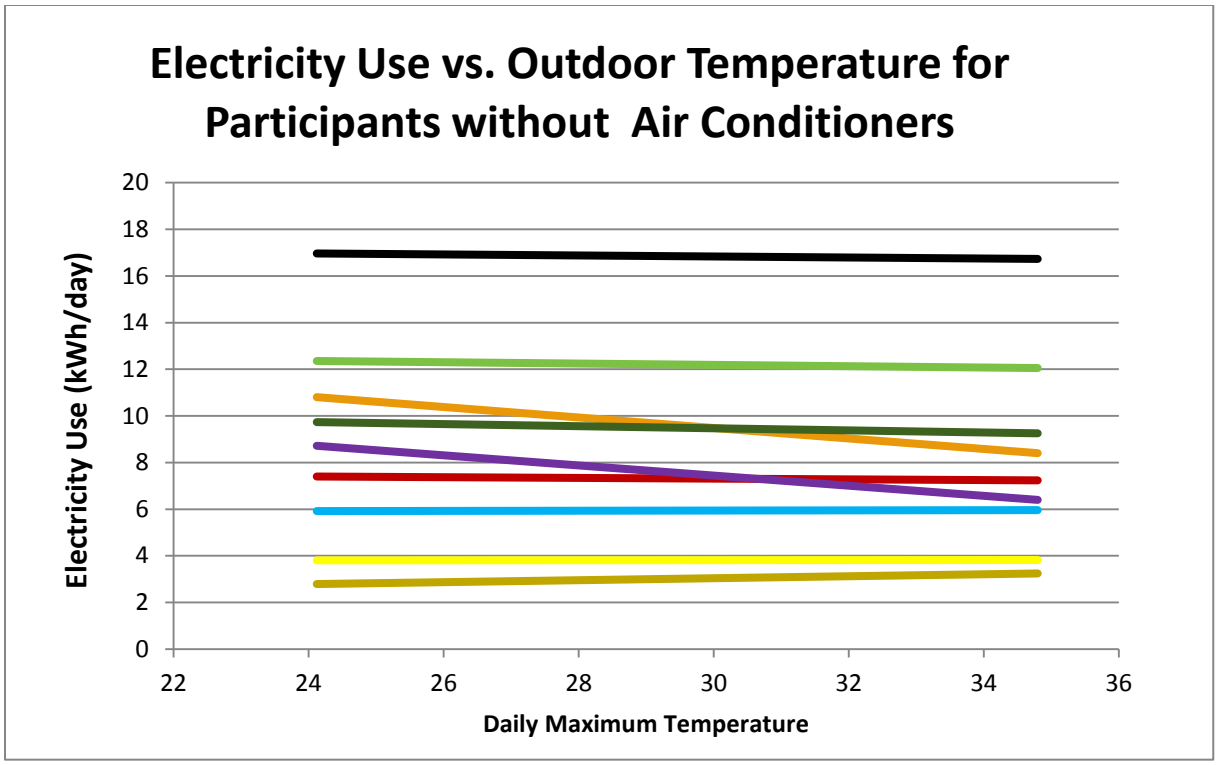

Figure 9: Electricity use compared to outdoor air temperature for participants without air conditioners.

Post-Study Survey

A post-study survey of both groups of residents revealed encouraging changes in habits and adoption of energy-saving devices. The two-part survey identified variations in habit and device implementation during the study as well as other contingencies that electrical usage data could not provide for. The first component of the survey combined written and multiple-choice questions which sought such demographic information as age, size of household, living situation, annual income, and country of origin. We delivered the second portion of the survey orally. It consisted of six questions on habit and device implementation. We aimed to identify which aspects of the guide were implemented and when as well as why residents chose to do so. We also sought information on resident reactions to the various information sources offered through the study and to MEFL as a whole. The survey identified those across the competitive and non-competitive groups whose behaviour changed and more importantly, why. Exact wording of survey questions can be seen in Appendix F: Survey Questions & Responses. The following section reports the significant findings from those surveys.

Overall, 72% of the participants were CALA residents and 45% were between 18 and 30 years old. CALA residents under the age of 30 participated in our study more frequently than any other age range. However, residents older than 41 years of age, especially CALD residents, typically declined to participate in our study. The full age-culture breakdowns for the competitive and non-competitive groups are shown in Table 3.

Age Range	CALA		CALD	
18-30	**3**	**7**	**2**	**1**
31-40	**3**	**0**	**0**	**1**
41-50	**0**	**1**	**2**	**0**
51-60	**1**	**1**	**0**	**0**

Table 3: The number of residents in the competitive and non-competitive group who fall into each age-culture group. The cells highlighted in yellow refer to non-competitive group participants and those highlighted in blue refer to competitive group participants.

Two separate findings from the surveys, installing energy saving devices and changing daily habits, support one of our study's key findings: **competition in conjunction with electricity reduction information more effectively motivated sustainable behaviour change than information on its own.** As a result of coupling information *and* competition, while only 18% of non-competitive group participants did. Figure 10 shows the full details on the amount of new energy saving devices installed by the two groups of participants.

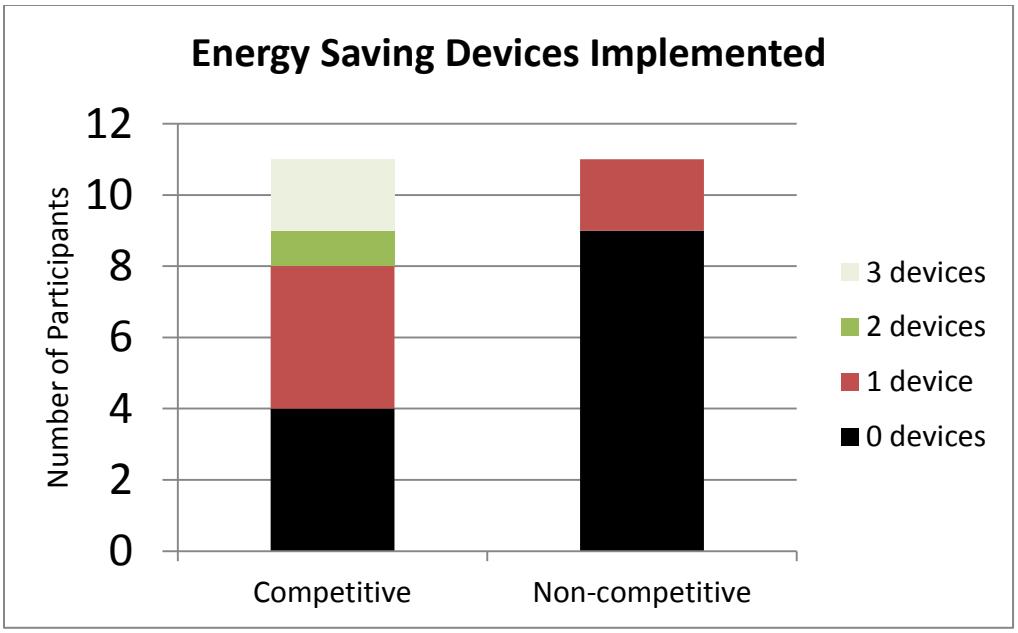

Figure 10: Number of participants in the competitive and non-competitive groups who installed energy saving devices.

In addition to installing more energy saving devices, **competitive group participants adopted energy saving habits in greater quantity than the non-competitive group.** *One hundred per cent* of the competitive group adopted at least one energy saving habit, 63% adopting three habits or more. By comparison, just 81% of non-competitive group participants adopted new habits and only 27% adopted three or more. Figure 11 shows the full details on number of energy saving habits adopted during the study for both groups.

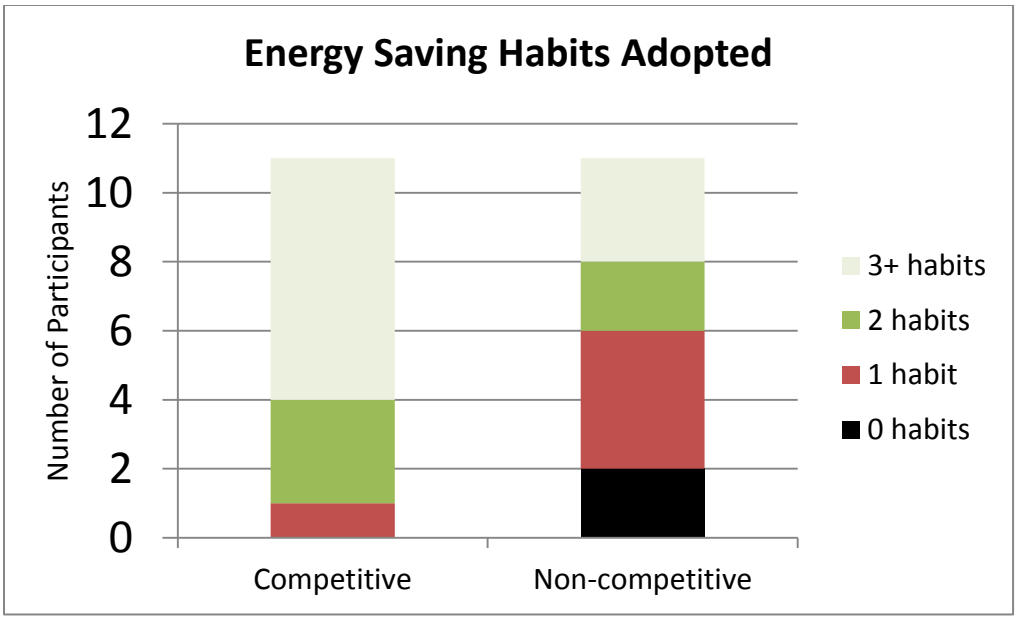

Figure 11: Number of participants across the competitive and non-competitive groups who adopted new energy saving habits.

The competition more effectively motivated CALA residents than CALD residents. 18-30-year-old CALA residents showed a greater difference in habit and device implementation between the competitive and non-competitive groups than 18-30-year-old CALD residents.

Figure 12 details the average number of devices and habits implemented by competitive group participants according to culture and age.

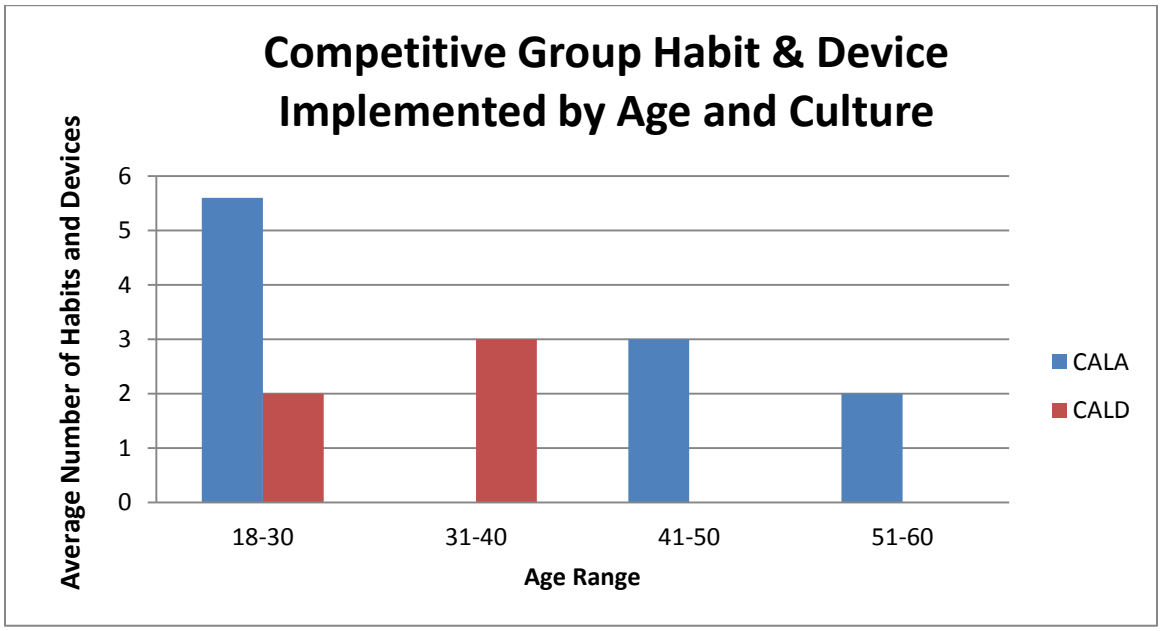

Figure 12: Average number of habits and devices implemented by age-culture in the competitive group. CALA: Culturally and Linguistically Australian, CALD: Culturally and Linguistically Diverse.

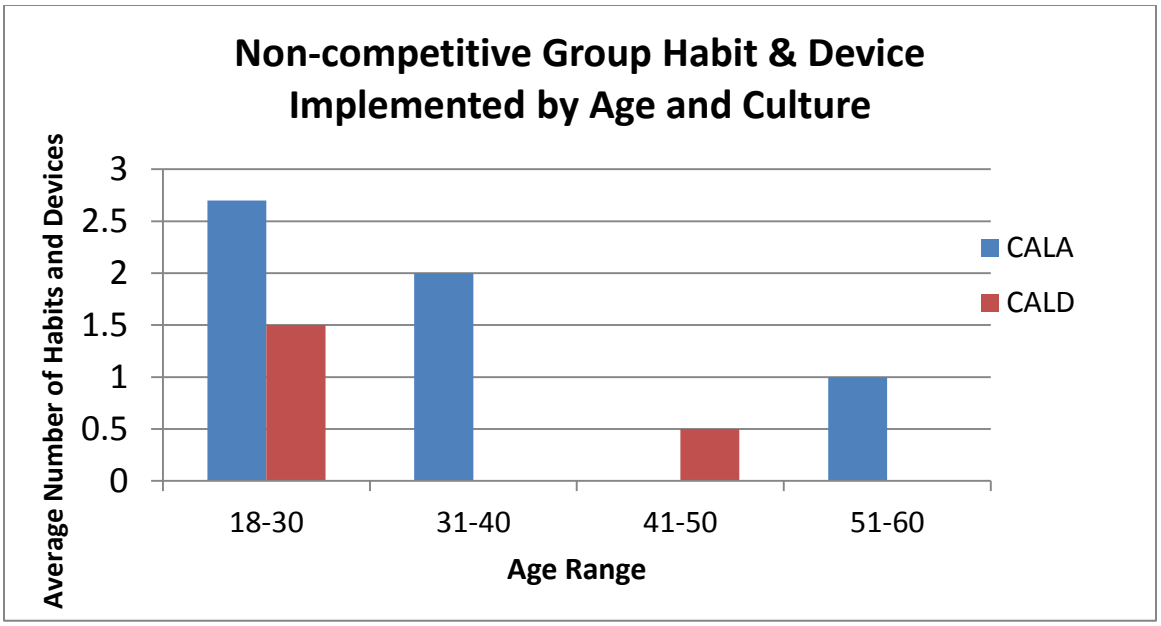

Figure 13: Average number of habits and devices implemented by age-culture in the non-competitive group. CALA: Culturally and Linguistically Australian, CALD: Culturally and Linguistically Diverse.

Figure 13 details the same information as

Figure 12 but for the non-competitive group. The comparison of these two figures shows a significant difference in habit and device implementation by 18-30-year-old CALA residents. Participants in that age-culture category implemented an average of 5.6 habits and devices when involved in the competition, but only 2.7 habits and devices when not involved. On average, this comparison reflects an increase of almost *three* habit and device implementations per competitive resident. No other age-culture set in either the competitive or non-competitive groups had an increase of more than one habit and device implementation. These comparisons show that **competition effectively motivated 18-30-year-old CALA residents to implement energy saving devices and habits.**

18-30-year-old CALA residents across the competitive and non-competitive groups showed the greatest positive change in energy saving behaviour compared to other age-culture groups. As shown in Figure 14, participants in the 18- to 30-years-old age range implemented the most devices and habits of any age group. Additionally, Figure 15 shows that CALA participants implemented 2.2 more devices on average than CALD participants.

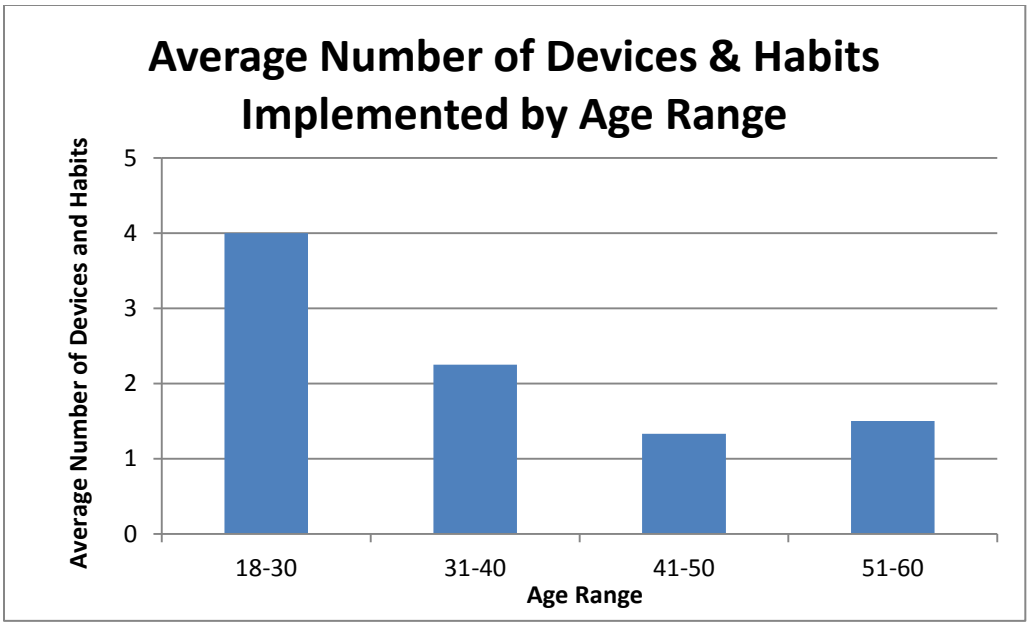

Figure 14: Average number of devices and habits implemented by age range.

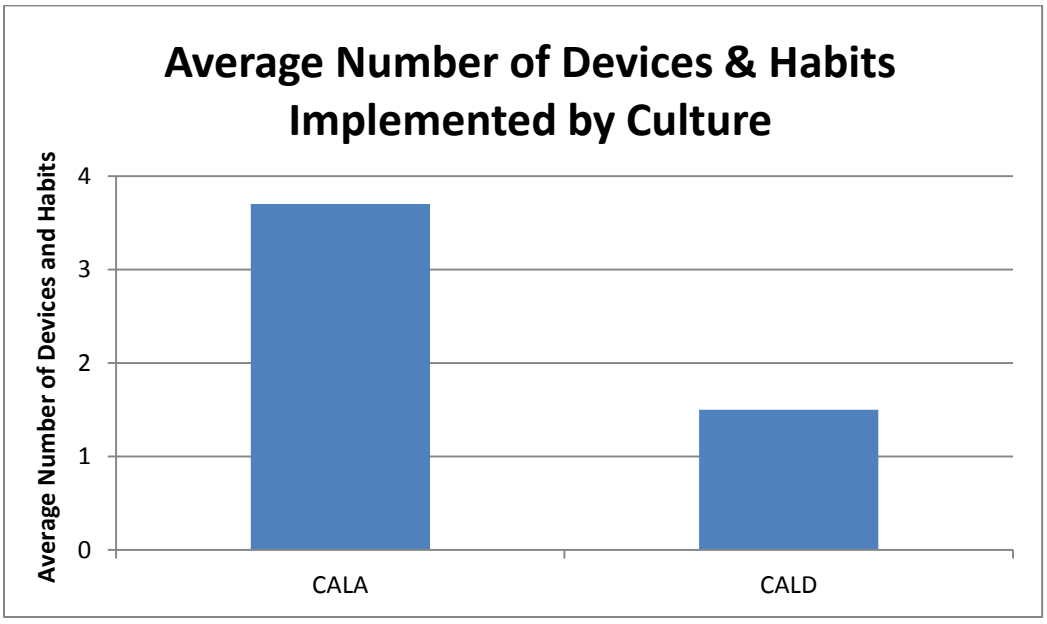

Figure 15: Average number of devices and habits implemented by culture. CALA: Culturally and Linguistically Australian, CALD: Culturally and Linguistically Diverse.

Participants in both the competitive and non-competitive groups were more willing to take up the suggested habits than the suggested devices. Twenty participants adopted at least one energy saving habit during the study, while only nine participants installed at least one device. All of the participants combined, competitive and non-competitive, adopted a total of 51 new energy saving habits as shown in Figure 17; compare with Figure 16, which shows that they only installed 14 devices. Of all of the devices suggested in our one-page brief and in the ATA guide, participants only installed four: CFL light globes, LED down lights, curtains, and door draught sealers. Figure 16 shows the total number of participants who installed each of these devices.

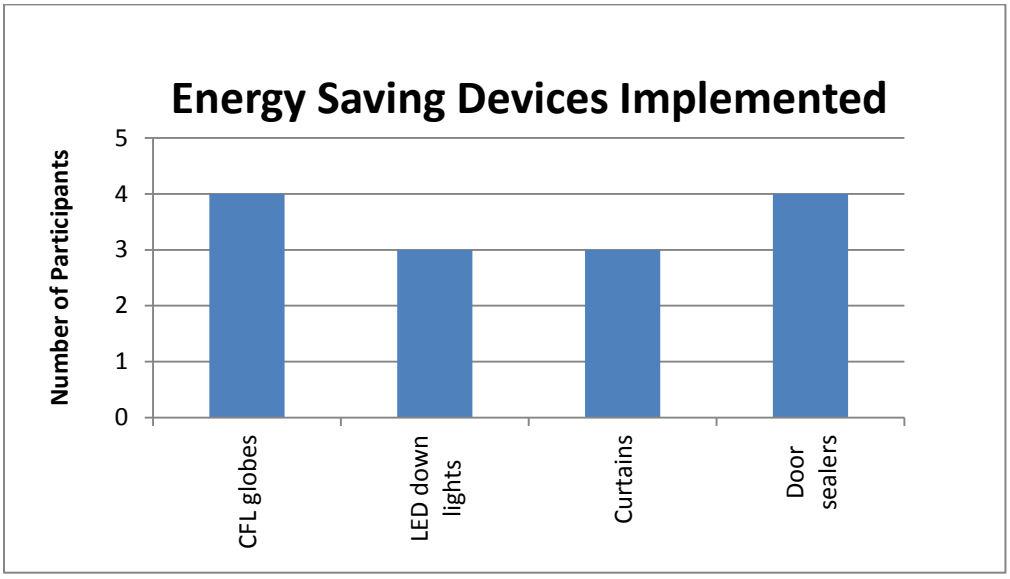

Figure 16: Number of participants who installed energy saving devices.

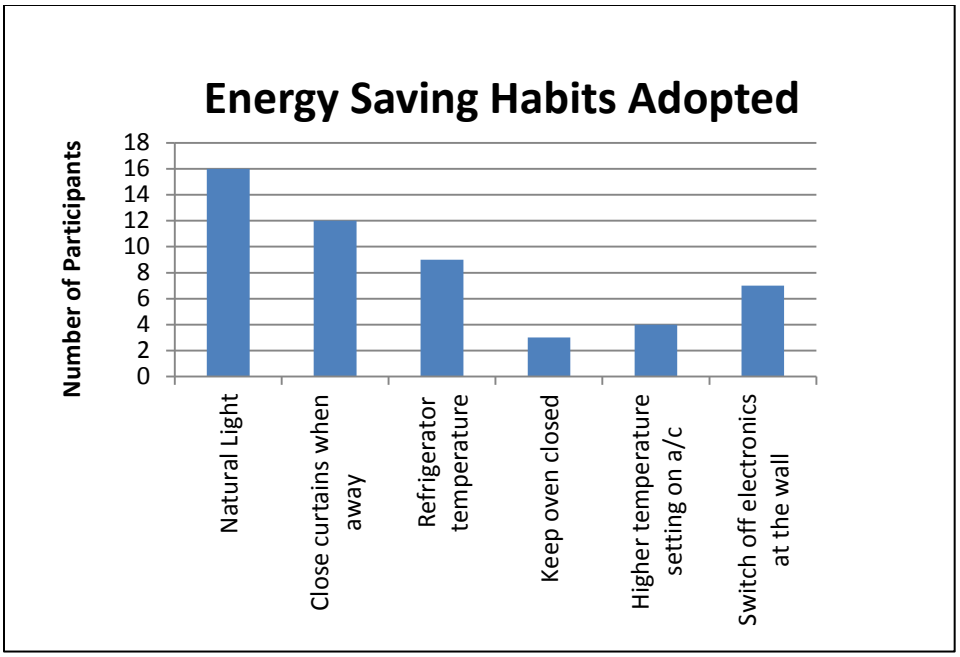

Figure 17: Number of participants who adopted particular energy saving habits.

Among the various sources of information on reducing energy consumption, participants utilized the energy savings guide most frequently. As shown in Figure 18, participants utilized the ATA guide and the one-page brief more than the reminder emails, letterbox drops, or website; they consulted the brief slightly more frequently than the ATA guide.

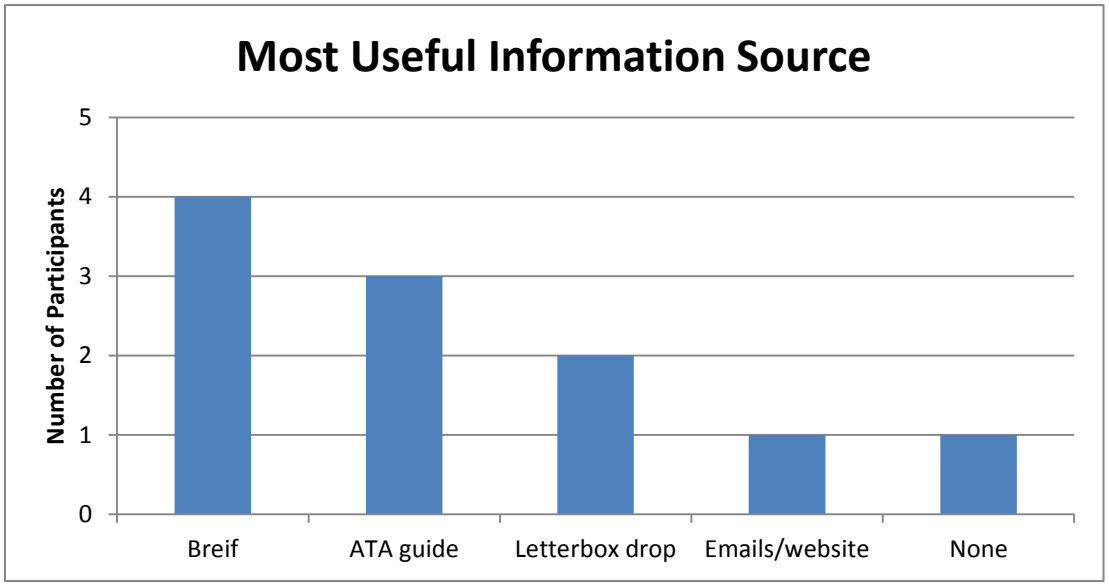

Figure 18: Number of participants who selected a particular information source as the most useful for energy reduction information

Conclusions and Recommendations

Participant 2 won the competition by reducing electricity consumption by 19%. The standings at the end competition are shown in Table 4 in order of greatest to least percent reduction in electricity use.

Participant Code	Baseline Period Avg. Electricity Use Per Day (kWh/day)	Study Period Avg. Electricity Use Per Day (kWh/day)	Reduction in Electricity Use from Baseline to Study Period (kWh/day)	Percent Reduction in Avg. Electricity Use Per Day
2	16.5	13.4	3.2	19
4	8.8	7.3	1.6	18
5	10.8	9.4	1.4	13
10	12.2	11.1	1.2	9
11	12.5	11.9	0.6	5
6	9.3	9.2	0.1	1
3	8.4	8.8	-0.5	-5
7	3.3	3.8	-0.4	-12
1	14.6	16.9	-2.3	-16
9	4.8	5.6	-0.8	-17
8	8.1	10.4	-2.3	-28

Table 4: Results of the competition: average electricity use per day during the baseline and study periods, the reduction from baseline to study, and the percent reduction in average electricity use per day for each participant. Participants are listed in order of greatest to least percent reduction.

Competition effectively motivated residents to implement energy saving habits and devices. However, variability in electricity meter data prevents us concluding conclusively that providing competition with energy saving information resulted in a greater decrease in electricity use than providing information alone. The average reduction in electricity use across the competitive group was 0.108 kWh/day, slightly larger than the 0.007 kWh/day reduction among the non-competitive group. However, the measurement error of ±0.5 kWh/day corresponds to more than ±5% of participants' average daily consumption of 9.5 kWh/day, considerably larger than either group's average reduction. In addition, the standard deviation of participants' daily electricity use ranged from 0.7 to 5.5 kWh/day. Such large standard deviations highlight the extreme

variability of participants' day-to-day electricity usage. Even if participants did implement new devices or habits, the savings would have been masked by the variability of the data.

The post-study survey showed far more encouraging results in favour of competition in contrast with the inconclusive meter data. As seen in Figure 19, the post-study survey revealed that **competitive group participants accounted for 72% of the total habits and devices implemented across the study.** This outcome represents an advantage of more than 2.5 to 1 over the non-competitive group. Since the only difference between the two groups was the competition to reduce electricity use, we conclude that competition was effective in motivating residents to implement energy saving habits and devices.

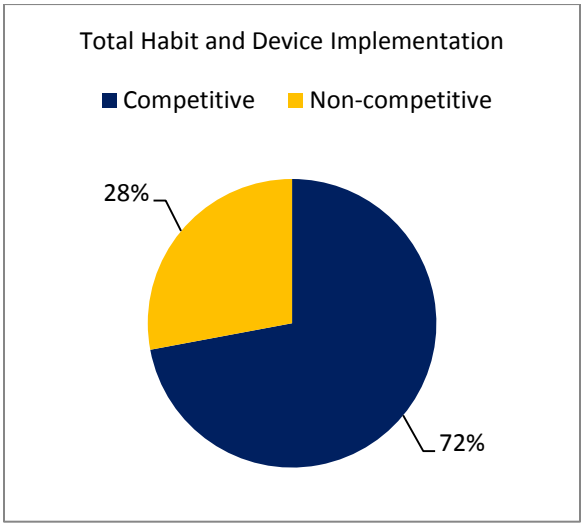

Figure 19: Total habit and device implementation by the competitive and non-competitive groups combined.

Based on this conclusion, we recommend the following:

1. **Competition is worthy of further exploration because it successfully motivated residents to change habits and install devices.** Scaling up the competition would allow for more significant energy saving changes. For example, if the competition were conducted between landlords, they might consider large renovations such as solar panels, improved windows, or new insulation. Further research should inquire if large scale competition, such as landlord vs. landlord, university vs. university, or municipality vs. municipality, generates measureable reductions in energy use.

2. **We recommend a longer term study of competition.** A longer study period would produce smoother data, and lead to more conclusive results. Potential long term studies should consider what combination of extended time, number of participants, and other variables would lead to a robust conclusion on the effectiveness of competition in reducing energy consumption.
3. **Studies which require an abundance of data to be conclusive should be conducted in buildings with smart meters**. Smart meters substantially reduce measurement error by recording precise data every thirty minutes (CitiPower and Powercor Australia, 2012). Such detailed information facilitates more detailed studies of habit and device implementation. As shown in Figure 20, smart meters provide a detailed profile of residents' electricity use throughout the day. This could be used to determine their baseline electricity use, or the amount of electricity consumed when they are not actively using any appliances. Changes in habits such as turning off devices at the outlet and increasing refrigerator temperatures could be identified by comparing a resident's baseline usage from before the study to during it.

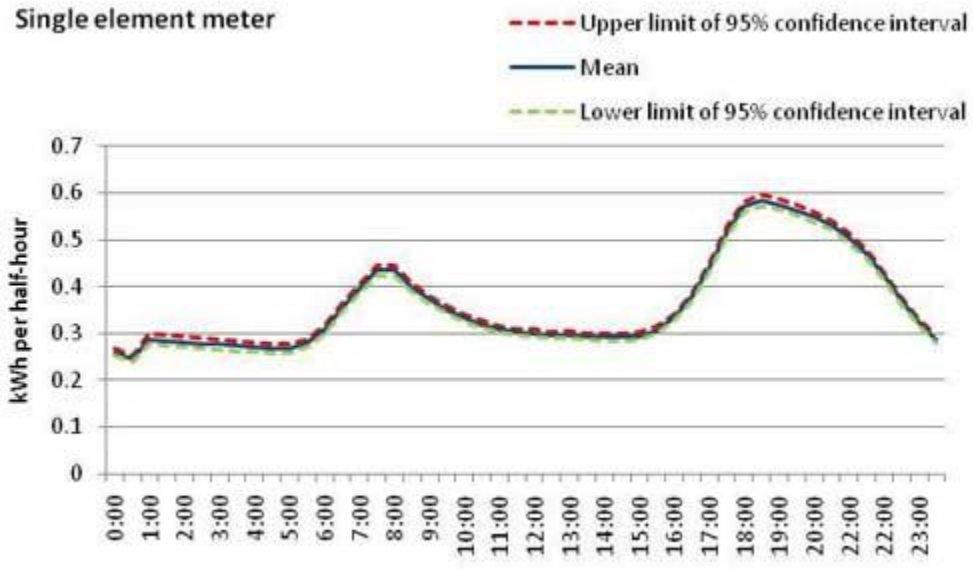

Figure 20**:** A profile of one household's electricity consumption as recorded by a smart meter (Department of Primary Industries, 2012); note its tiny error bands.

We concluded that young CALA residents were the most receptive during recruitment, and the most active group in the study itself. With an acceptance rate of 53.5%, young residents were the most willing to enrol in the study. By comparison, only a quarter of middle

aged residents and no elderly residents signed up. Further statistics on enrolment by age group can be seen in Figure 21.

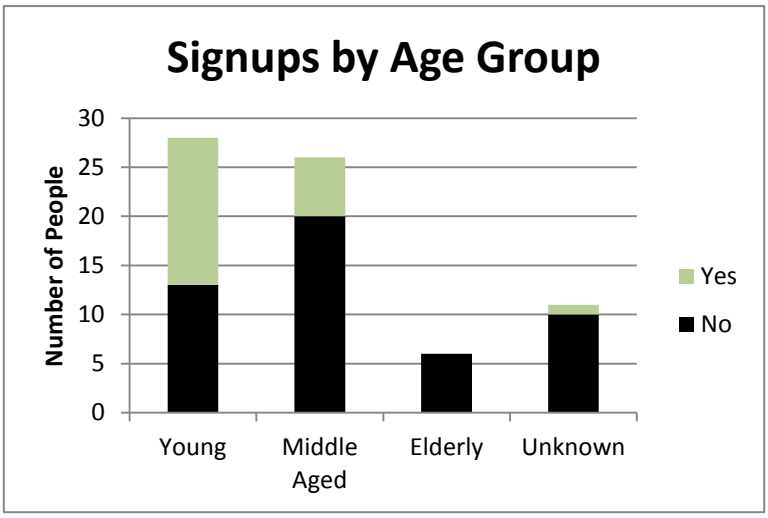

Figure 21: Number of residents who signed up for our study by age group.

We also had a **higher success rate in recruiting CALA residents than CALD residents.** As shown in Figure 22, about half of the residents we spoke with were CALD and seemed deterred by language or cultural barriers. For example, several CALD women declined to speak to us without their husbands present.

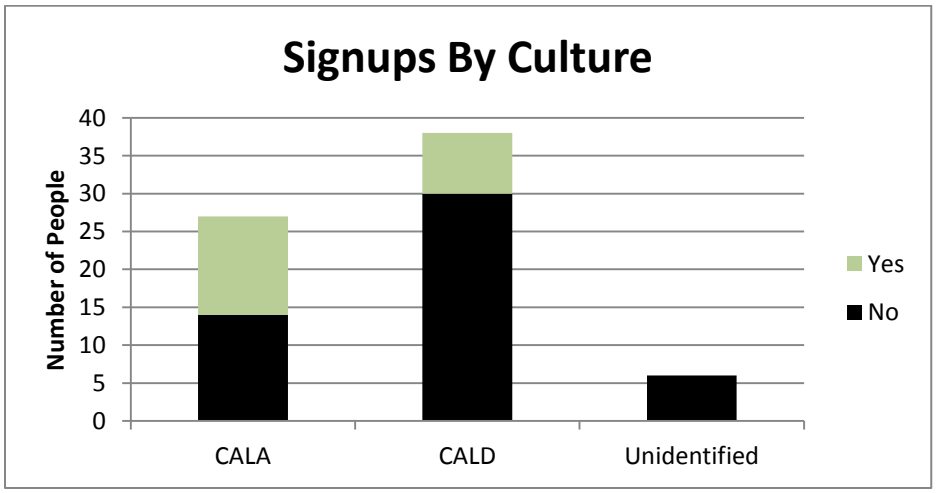

Figure 22: Number of residents who signed up for our study by culture. CALA: Culturally and Linguistically Australian, CALD: Culturally and Linguistically Diverse.

The survey results show that the most substantial behaviour change came from the 18-30-year-old CALA demographic. As shown in Figure 23, this age-culture group implemented an

average of 4.7 habits and devices over the course of the study, nearly two habits and devices per participant more than any other group.

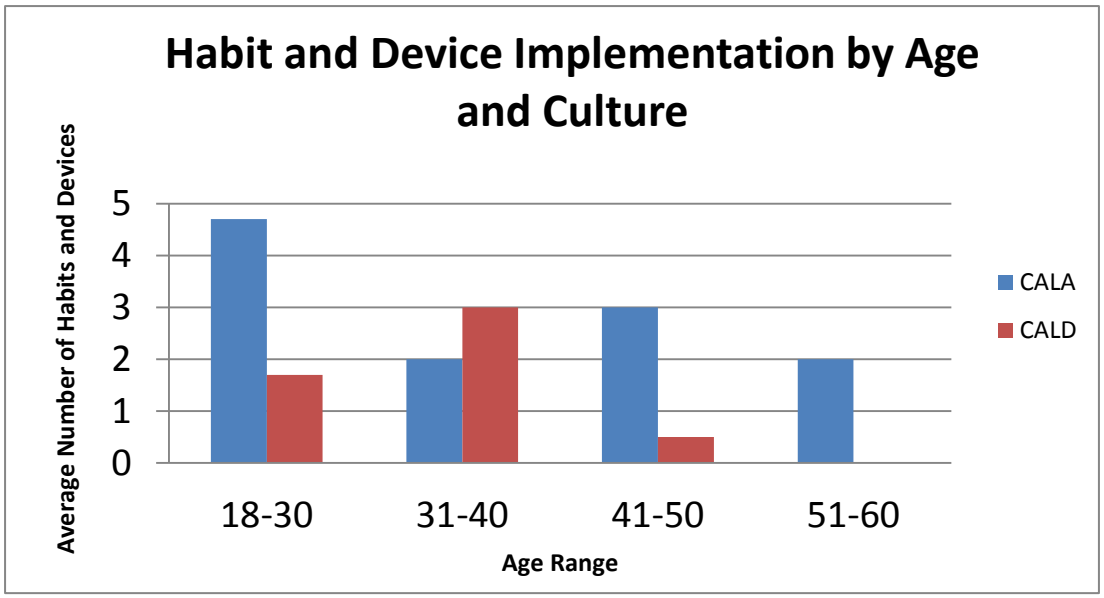

Figure 23: The average number of habits and devices implemented by age-culture group. CALA: Culturally and Linguistically Australian, CALD: Culturally and Linguistically Diverse

Given our success with this one demographic, we offer the following recommendations for engaging other demographics, those who are not young CALA residents.

1. **Projects of this nature must follow MEFL's framework for engaging CALD residents established by the Green Town project.** The framework utilizes a trusted member of any specific CALD community to introduce MEFL staff to the community. In doing so, CALD residents gain a sense of trust for MEFL staff, aiding in the acceptance of the programs and services the foundation wishes to promote. If this framework is used, the programs and services must offer tailored information sources specific to CALD community needs. Further research may wish to answer the following questions; if this framework is applied to a study in the area of sustainable competition**,** will CALD residents be motivated by competition? Are some cultures motivated by competition while others are not? Answers would help MEFL better serve Moreland's diverse population.
2. To better engage the elderly, programs must focus on overcoming barriers specific to them. **We suggest that research be conducted on the applicability of MEFL's CALD**

outreach framework to elderly residents. In applying this framework, programs might utilize local groups, such as elderly activity clubs, to approach a large number of elderly residents. Utilizing such a framework, future studies might ask if sustainable competition would motivate the elderly. Would different forms of competition be more applicable to this demographic, e.g., community group vs. community group?

Residents who owned air conditioners continued to use them during study, despite guidance in the one page brief, the ATA guide, and on the MEFL website. Without further information, we cannot say if they were ignoring that guidance or if their units operated despite the resident choosing a higher setting. Figure 24 details daily electricity consumption with increasing temperature for participants who owned air conditioners. Figure 25 details the same information for participants who did not own air conditioners. The trend lines show that every resident with an air conditioner increased their electricity use on high temperature days, whereas electricity consumption of participants with no air conditioner stayed the same or decreased.

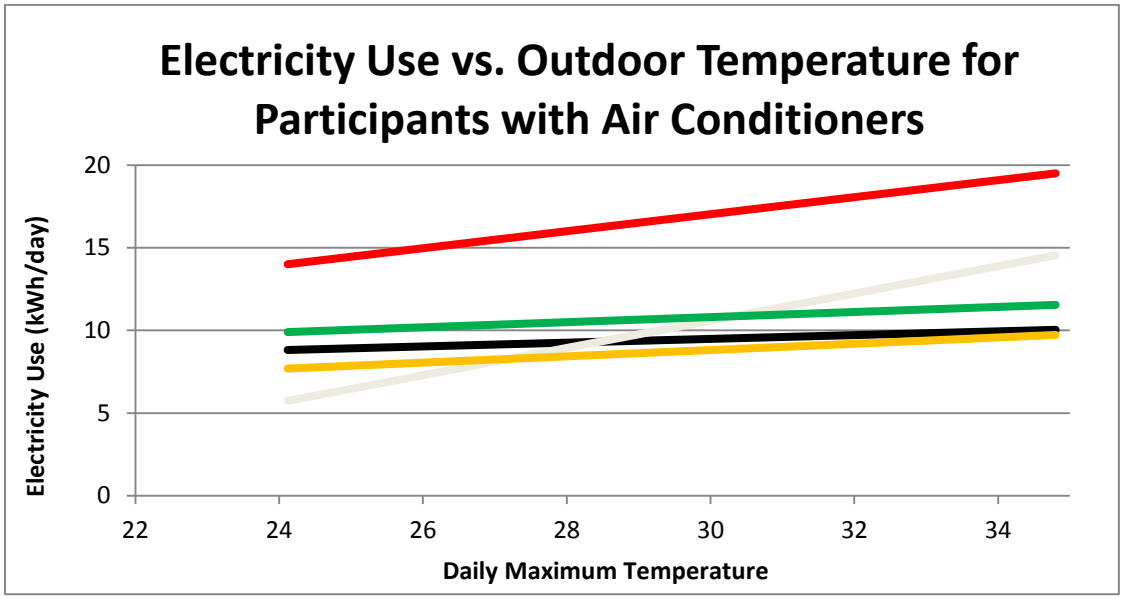

Figure 24: Daily electricity use by temperature for the 5 residents with air-conditioning.

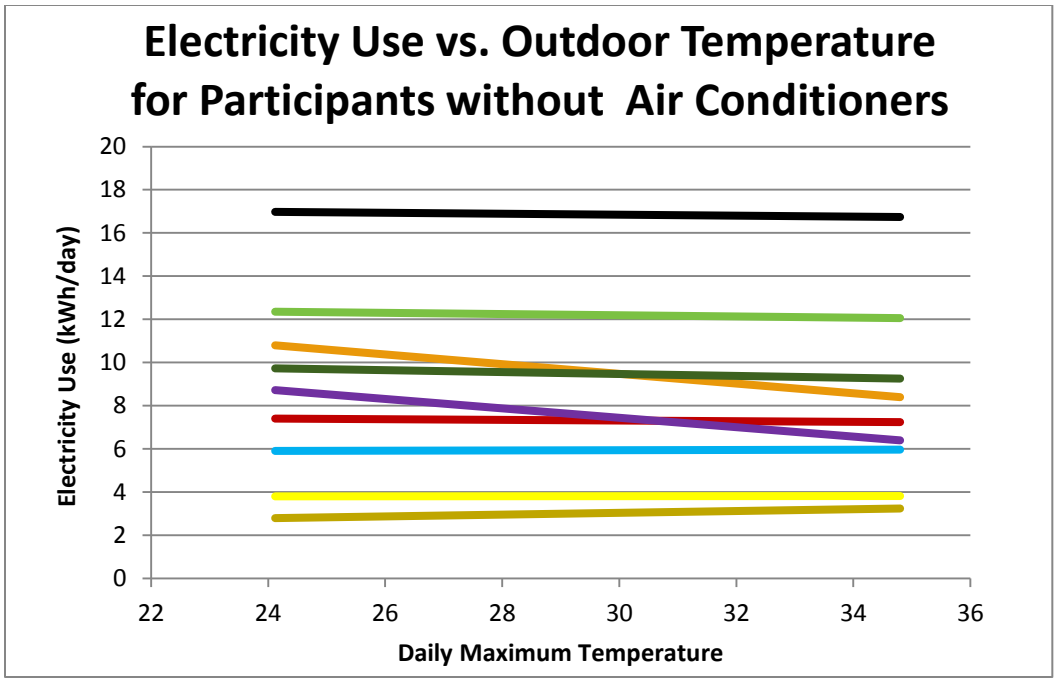

Figure 25: Outdoor air temperature compared to daily electricity use of participants without air conditioners.

To better target residents with air conditioners, we offer the following recommendations:

1. W**e suggest including a detailed section on air conditioner use in summer energy efficiency programs.** The section could explain the amount of electricity and money saved by turning off air conditioners or by using more energy efficient cooling devices such as fans. Future studies should consider how to motivate residents to stop or reduce their use of air conditioners. Is providing detailed information on potential savings enough or is further motivation needed?

Residents who had already made energy efficient improvements prior to the study preferred the ATA's comprehensive booklet; *Renters Guide to Sustainable Living*. In contrast, residents who did not make many energy efficient improvements prior to the study preferred the one-page brief. As shown in Figure 26, the participants who found the ATA guide more helpful made an average 7.1 energy efficient changes prior to the study as compared to the average of 3.1 energy efficient changes made by participants who found the one-page brief more helpful.

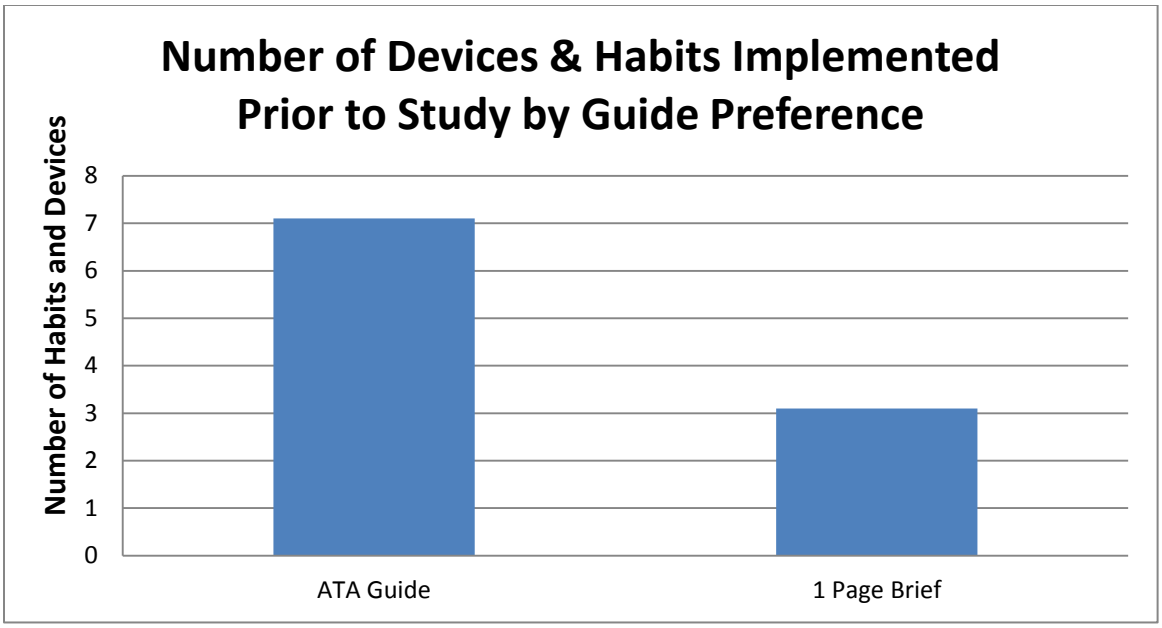

Figure 26: Number of devices and habits implemented prior to the study by guide preference across the competitive and non-competitive groups.

To ensure residents utilize the information in these guides, we suggest that **future studies continue to provide both brief and comprehensive materials.** Supply both version will accommodate equally residents who have prior knowledge of energy efficiency techniques those who do not. The study may wish to consider which group to target for future sustainability programs, those with prior sustainability knowledge or those without. Does it make sense to target both at the same time or would a focus on one or the other provide more substantial results?

According to post-survey results, **81% of residents in the competitive group preferred to receive hard copies of energy reduction methods as opposed to electronic ones.**[5] As shown in Figure 27, nine residents found the paper sources the more useful, whereas only one resident found the electronic sources of information more useful.

[5] This conclusion only refers to the competitive group because there were no electronic forms of communication with the non-competitive group.

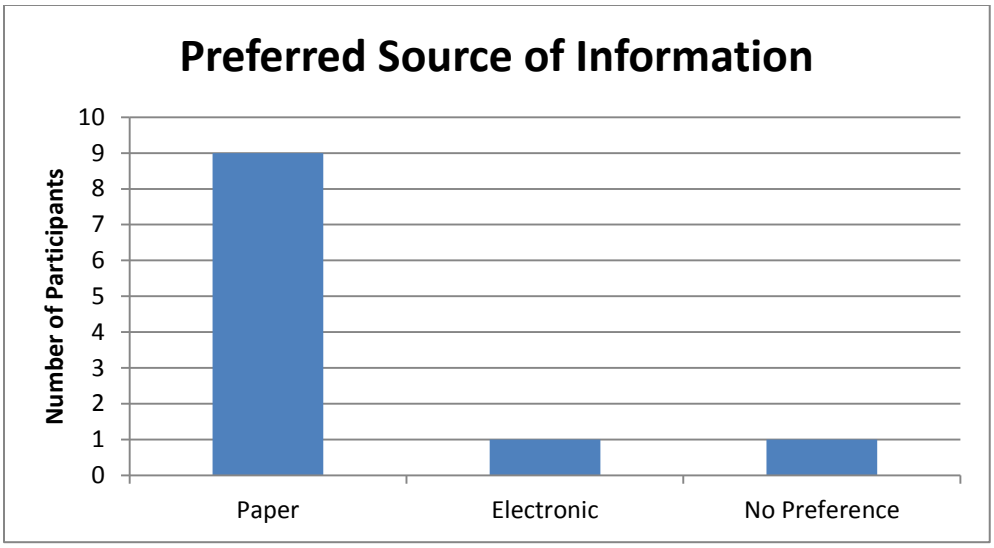

Figure 27: Number of participants who preferred paper to electronic sources in the competitive group.

To improve resident-MEFL communication, **future studies should rely on hard copy materials more than electronic materials.** We found that 10 of 11 participants in the competitive group did not find the website useful despite the fact that it was easy to access and navigate. Hard copy materials minimize effort on the resident's behalf. Nonetheless, electronic information should still be provided for the minority of residents who prefer that form.

In conclusion, competition promoted the implementation of new energy saving habits and devices. Furthermore, young Culturally and Linguistically Australian (CALA) residents were the most motivated by the competition.

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Appendix A: Opportunity Assessments

Kitchen

Light Bulbs: Lamps _____ Ceiling_____	# of Reg. Light Bulbs Incandescent _____ CFL _____ LED _____ Halogen _____	# of Down Lights Incandescent _____ CFL _____ LED _____ Halogen _____	Appliances: (Y/N) Dish Washer _____ Microwave _____ Toaster_____ # of Misc. _____	
Electrical Outlets: # of Out. _____	# of Switches / Timers Turn off Switches _____ Timers _____	# of standby power appliances _____	# of standby power controllers _____	
Windows: # of Windows_____ Can open _____ Can't open_____	# of curtain/blind type Venetian _____ Holland _____ Vertical_____ Light C. _____ Heavy C. _____ Reflective_____ Outside Blind_____	# of each direction West _____ East _____ North _____ South_____	Pelmets (Y/N) Pelmet _____ # of Pelmet _____	# of draught proofed Windows (Y)_____ Windows (N)_____ Doors (Y) _____ Doors (N) _____ *Look for weather sealant/caulk or draught blockers*

Bathroom:

Light Bulbs: Lamps _____ Ceiling_____	# of Reg. Light Bulbs Incandescent _____ CFL _____ LED _____ Halogen _____	# of Down Lights Incandescent _____ CFL _____ LED _____ Halogen _____	SB Appliances: (Y/N) Hair Dryer _____ Curling Iron _____ Electric Shaver_____ # of Misc. _____	Misc. Description: _____ _____ _____ _____

Living Room / Dining Room / Family Room Area

Light Bulbs: Lamps _____ Ceiling_____	# of Reg. Light Bulbs Incandescent _____ CFL _____ LED _____ Halogen _____	# of Down Lights Incandescent _____ CFL _____ LED _____ Halogen _____	# of A/V standby power appliances_____ # of Misc. standby power appliances_____ Ex. of misc. items _____ _____ _____	
Electrical Outlets: # of Out. _____	# of Switches / Timers Turn off Switches _____ Timers _____	# of standby power appliances _____	# of standby power controllers _____	
(Whole House) Air Conditioning: # of A/C _____ # of fans _____ # of ceiling fans _____	# of units Wall Unit _____ Window Unit _____ Central Air _____	Timer Capabilities (Y/N) Wall Unit _____ Window Unit _____ Central Air _____		
Windows: # of Windows_____ Can open _____ Can't open_____	# of curtain/blind type Venetian _____ Holland _____ Vertical_____ Light C. _____ Heavy C. _____ Reflective_____ Outside Blind_____	# of each direction West _____ East _____ North _____ South_____	Pelmets (Y/N) Pelmet _____ # of Pelmet _____	# of draught Proofing Windows (Y)_____ Windows (N)_____ Doors (Y) _____ Doors (N) _____ *Look for weather sealant/caulk or draught blockers*

What temperature do you turn your aircon on? _____ Do you close your shades during the day?_____
Do you unplug appliances after use? _____Do you use lights during the day? _____
If you have timers, do you use them frequently throughout the week? _____
Any additional comments: _____
_____
Address: _____

Appendix B: Energy Saving Guide

One-Page Brief

Some quick tips to help you save energy

Appliances

Did you know appliances account for about 17% of energy consumption around your home? Here are some tips to help you save:

- Check your refrigerator temperature: Set your refrigerator from 3° to 5°, and freezer from –15° to –18°.
- Hot tip for your oven: Keep your oven closed while cooking. Every time the door opens between 5° and 15° of heat are lost.
- Free energy saving habit: When you're finished with an appliance, switch it off at the wall power point. This will save on standby power.

Draught Proofing

- Install lined curtains: Lined curtains, coupled with pelmets, can help reduce heat gain in the summer and heat loss in the winter. Using these curtains can help you save up to $36 a year!
- Seal it up: Door and window sealers can be found at your local hardware store. They seal the gaps and cracks around your doors and windows to reduce heat loss or gain.
- Close up: Close the blinds, window shades, doors and windows around your home before heading out. This will keep the heat out so your home will stay nice and cool for when you return.

Keeping cool

- Fan power: Use a ceiling or pedestal fan rather than an air conditioner. This will save huge amounts of power and you might be surprised at how cool a fan can keep you.
- Keep it maintained: If you have an air conditioner, keep up on your maintenance to make sure it performs at its best without wasting energy.
- Free energy saving habits: Take it off, Don't turn it on! Make sure to wear light and loose clothing around your home as opposed to turning on the air con. Set your air con to 25° in the summer.

Lights

Lighting accounts for an average 12% of energy consumption in households! Here are some ways to help reduce lighting costs:

- CFL bulbs: Compact fluorescent lights can last up to 10 times longer and are 4 times more efficient than incandescent lights. Switch your lights now.
- Switch from halogen downlights: Halogen downlights are hot, power guzzlers. Swap to LED downlights. They're up to five times more efficient, and can save you up to $600 per globe (estimated calculation based on average daily use).
- Free energy saving habit: Make sure to turn off all your lights during the day time and use as much natural light as possible.

Need More Help?

Positive Charge is here!

Positive Charge are the energy-saving experts on your side. When you plug into Positive Charge you get:

- Straight-talking, tailored advice
- Links to great deals on top-quality products
- Ongoing support when you need it

It's a free service and you can sign up now online or over the phone:

www.positivecharge.com.au

9385 8555

Positive Charge is a social enterprise run by independent energy-experts, the Moreland Energy Foundation.

positive charge

Moreland Energy Foundation

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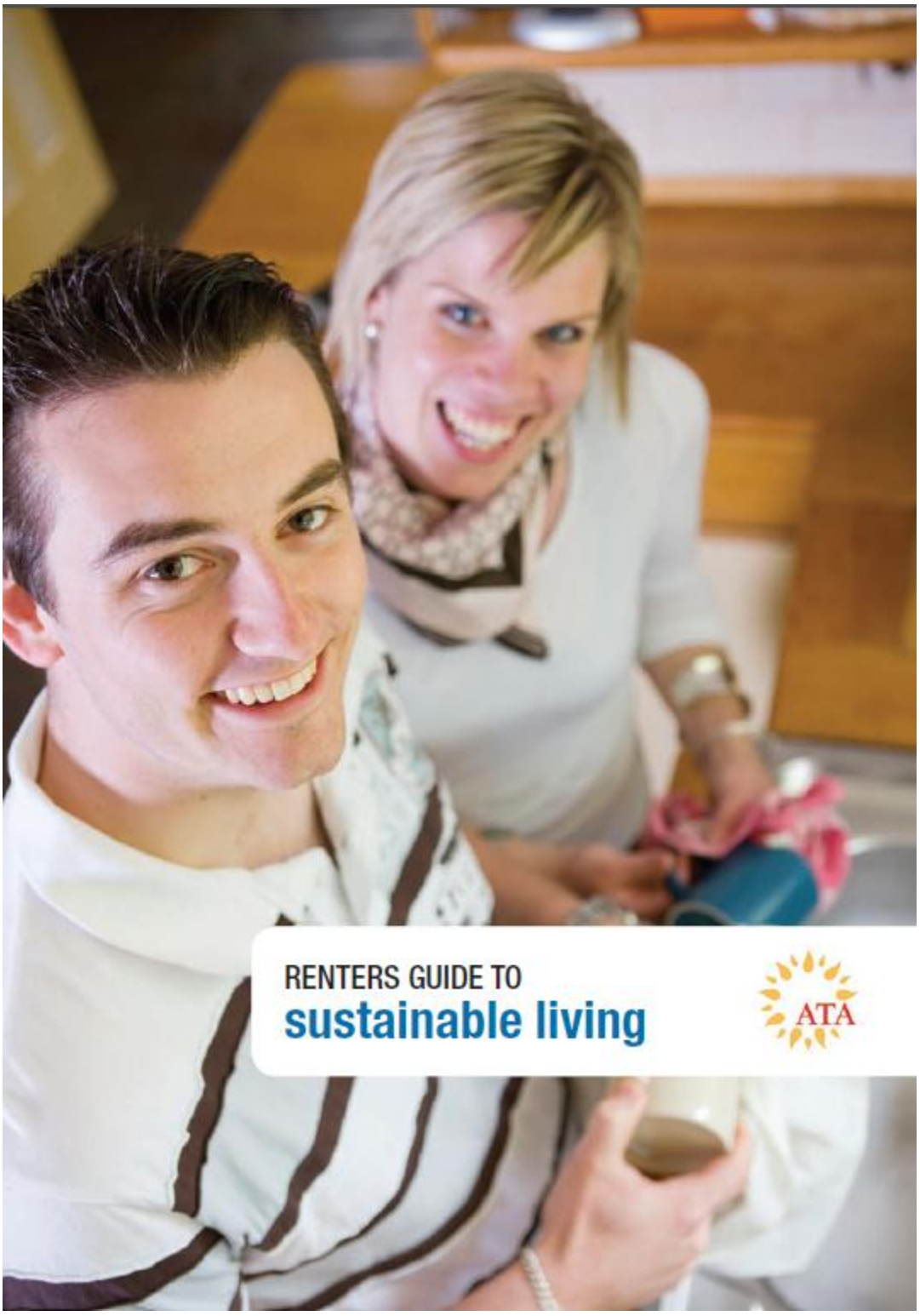
ATA Renters Guide to Sustainable Living




Start out with small and easy-to-implement changes like shorter showers and collecting waste water for use in the garden. Let your sustainability grow from there.

No matter if you're a home owner or a home renter, you can make changes to your home to make it more comfortable, save money and reduce your environmental impact. With the smallest effort, there are many simple, inexpensive things you can do to make a difference.

This booklet is designed to help you reduce your rental home's energy and water use without the need for major home renovations. Many actions can be done at zero or low cost, or through small changes in your behaviour.

To make it easier we have tips for each room of the house. These range from the simplest tweaks, to improvements that may require permission from your landlord.

Some changes to rental properties require you to consult your landlord, real estate agent or property manager. But don't let this discourage you. You might find that they are more than willing to undertake improvements in the area of sustainability, or grant you permission to make some changes yourself. After all, there are a number of government rebates and tax concessions available to assist with sustainable improvements and these will also improve the property's resale value.

P **This icon means you will need permission from your landlord.**

Get support from the entire household. With everyone's help, the changes you make will be easier to put in place and maintain. You might want to write up an action plan with tasks and dates when you aim to achieve things. If you have kids, get them involved. You will be surprised how enthusiastic kids can be in coming up with ideas for smarter living!

Disclaimer: Each State and Territory has legislation that regulates residential tenancies. Generally, for any changes you wish to make to the rental property you must receive permission, often in writing, from your landlord. You will need to check your own lease document for the requirements relating to your tenancy. If you have no lease then check with your landlord. Please see the sample letter at the back of this booklet.

TIPS FOR THE WHOLE HOUSE

The following tips will help you improve your rental home's efficiency, making it more economical to run and helping to reduce your impact on the environment.

Lighting

Switch off lights when not in use and change to energy-efficient light bulbs, it'll make a huge difference to your power bills.

Turn off lights when not in use

If you're not using a room or an outdoor entertaining area turn the lights off. Leaving outdoor lights on for long periods can double your lighting bill. Smart use of sensors, particularly outdoors, can ensure that lights are only on when needed.

Let in natural light

Open blinds and curtains to let in natural light rather than turning on lights.

Replace incandescent light bulbs

Replace incandescent light bulbs with compact fluorescents lights (CFLs) or light emitting diode (LED) bulbs. CFLs are cheap to run – they can reduce running costs by 75% – and they last much longer than incandescent bulbs. LED bulbs are becoming more readily available, and they can be as efficient or more so than CFLs.

Don't use halogen downlights

If your house is full of energy-hungry halogen downlights, replace them with good quality LED bulbs. Alternatively, you could buy floor and table lamps and fit them with CFLs or LED bulbs and leave the halogens off.

Heating and cooling

Heating and cooling are the most energy hungry activities in a home, but it doesn't take much effort to reduce their impact.

Pull on a jumper

Before turning on the heater, put on a jumper. By dressing appropriately for the weather you reduce the need for turning on the heater or airconditioner

Use heating and airconditioning wisely

Reducing the temperature on the thermostat of your heater or increasing it on your airconditioner by just 1°C can reduce the energy used by 10%. In winter, set the heater thermostat to a maximum of 18-20°C; in summer set your airconditioner to a minimum of 26°C.

Heat and cool only what you need

Only heat or cool rooms you are using, and keep the heat or cool in by keeping doors closed.

Cool and heat the house naturally

On hot, still summer days close all windows, doors and curtains to help keep the house cool. And when that cool change arrives, take advantage of it by opening windows and doors to let the cooling breeze through the house.

Hang heavy, lined curtains

Heavy, lined curtains or blankets keep heat in during winter and heat out on hot summer days. For best results make sure they are close fitting, hang down to the floor, and have an overlap of 100mm each side of the window.

Install pelmets P

Pelmets are covers over the top of curtains, and they stop hot air circulating behind the curtains. If your house does not have pelmets ask your landlord to see if permanent pelmets can be installed. Alternatively, use a rolled towel, blanket or strips of thick cardboard over the top of curtains for temporary, removable pelmets.

Use timer switches

Set timers on your heater or cooler to switch off when not needed.

Direct the heat

If your house has central heating consider buying vent directors. These can be placed over vents to help direct the air into the centre of the room instead of straight up to the ceiling – and they're not expensive.

Seal up gaps and draughts P

Stop draughts by closing gaps around doors and windows. Self adhesive door and window seals are cheap, easy to install and removable when you leave. Or you could use a 'door snake'. Alternatively, ask your landlord if you can install permanent draught stoppers and seals around doors and windows.

Shade your windows P

External shading of windows is twice as effective as internal blinds in keeping out the heat, so in summer place a removable external blind, shade cloth, sun sail or outdoor umbrella over a window to shield it from the sun. If you want to install a permanent shade solution attached to the house, ask your landlord.

Close up ventilation outlets

Check whether chimney ventilation outlets, flues and extraction fans can be sealed when not in use. Removable dampers are available which can be placed over extraction fans which vent into roof spaces. Note that you shouldn't close up ventilation outlets in a house with un-flued gas heaters.

Install insulation P

Insulation is critical to a home's ability to be heated and cooled efficiently, so if your rental property is uninsulated ask the landlord to install some in the ceiling, assuming it is accessible. There are State and Federal rebates available (see the box), and the landlord might be even more willing to pay for it if you offer to do the installation.

Insulation Rebate

Landlords and tenants (with landlord permission) are eligible for a rebate of up to $1,000 to install ceiling insulation in their rental properties under the Low Emissions Assistance Plan for Renters.

The Low Emission Plan for Renters is under development. Landlords can subscribe to the online register so that they can be notified of start dates and program details as soon as they become available.

www.environment.gov.au/energyefficiency/insulation-renter.html

Switch to GreenPower

One of the easiest ways to make your home more sustainable is to simply choose the GreenPower option from your electricity retailer. Accredited GreenPower is electricity generated from clean, renewable energy sources, such as wind, solar, wave and small-scale hydro plants, as well as landfill gas and biomass (waste).

Accredited GreenPower products are individually assessed to verify they comply with high environmental standards. By buying GreenPower you are helping to support the development of the renewable energy industry and reducing the demand for electricity from the burning of fossil fuels. For the biggest impact ask for 100% accredited GreenPower.

www.greenpower.gov.au
www.greenelectricitywatch.org.au

GreenPower
Accredited Renewable Energy

Living Room

You probably spend a lot of time in your living room, so it's the best place to start making your home more comfortable and sustainable.

Turn appliances off at the power point when not in use

Many appliances such as DVD players, TVs, stereos and computers use electricity called 'standby power' when they are not being used, if they are left switched on at the power point. Standby power accounts for as much as 10% of household energy bills. Turn off appliances at the power point. To make things easier, place multiple appliances on a single or multiple switch powerboard to avoid hard-to-reach spots and reduce the number of switches to flick.

Turn off computer monitors

Set your computer to enter 'sleep' mode after a certain period of inactivity and turn the computer monitor off when you're not using it, even for a short time.

Choose an LCD monitor

LCD computer monitors generate around half the greenhouse gas emissions of conventional monitors. Turning the brightness down can cut emissions to a quarter.

Don't super-size your telly

A simple rule of thumb is the bigger the TV, the more energy it will use. Indeed, some larger TV models use more energy to run than a standard-sized fridge.

Look at the stars

Check the Energy Star label on DVD players, TVs, stereos, computers and printers. Appliances that have the energy star label use much less power when in 'standby' mode.

www.energystar.gov.au

Reach for the stars

When buying new appliances look for the energy label. The Energy Rating scheme rates the energy efficiency of electrical products and appliances to help you with your purchasing choices. The star ratings of all labelled products and appliances are also available on the energy rating website. When comparing different appliances or equipment it is important to look at comparative energy consumption, which is shown in kilowatt-hours, rather than just the number of stars.

www.energyrating.gov.au

Kitchen

While the kitchen is home to one of the house's biggest energy guzzlers, the fridge, simple tips can keep energy use down.

Don't open the fridge door too often

In most households, the fridge uses more power than any other appliance. To cut energy use, try to limit the number of times you open the fridge door, and never leave it open.

Don't place hot items in the fridge

Wait until a dish has cooled down before placing it in the fridge. Put cold items back into the fridge after use rather than letting them warm to room temperature.

Get the temperature right

The recommended operating temperature for a fridge is 3°C to 5°C. For freezers, the recommended range is -15 to -18°C.

Switch off the second fridge

If you have a second fridge, consider how often your 'drinks fridge' is really used. Turn it on only when you need it.

Keep the fridge well ventilated

Provide at least 50mm of space at the top, back and sides to improve ventilation and let your fridge work at its best.

Place the fridge in a cool spot

Locate fridges and freezers in cool spots, away from direct sun and other heat sources such as stoves.

Check fridge seals

Check and clean seals on your fridge to make sure the door closes securely. Regularly remove any frost buildup in the freezer.

Save rinsing water

Rinse vegetables over a bowl and tip the water on the garden or a pot plant. You can also buy tubs with a handle and plug, which fit snugly in the kitchen sink to make it easy to transport water to the garden.

Boil the water you need

Use an electric kettle instead of the electric stovetop to boil water. Fill the kettle with only as much water as you need.

Run a full load in the dishwasher

Wait until the dishwasher is full before running it. It wastes a lot of water to clean a small number of dishes. Also, the less the dishwasher is used the more energy is saved.

Scrape rather than rinse

If you have a dishwasher, scrape dishes rather than rinse where possible, or use less water by not rinsing dishes under running water.

Cooking toast

Cooking toast in a toaster instead of the grill reduces energy use by up to 75%.

Cooking with gas

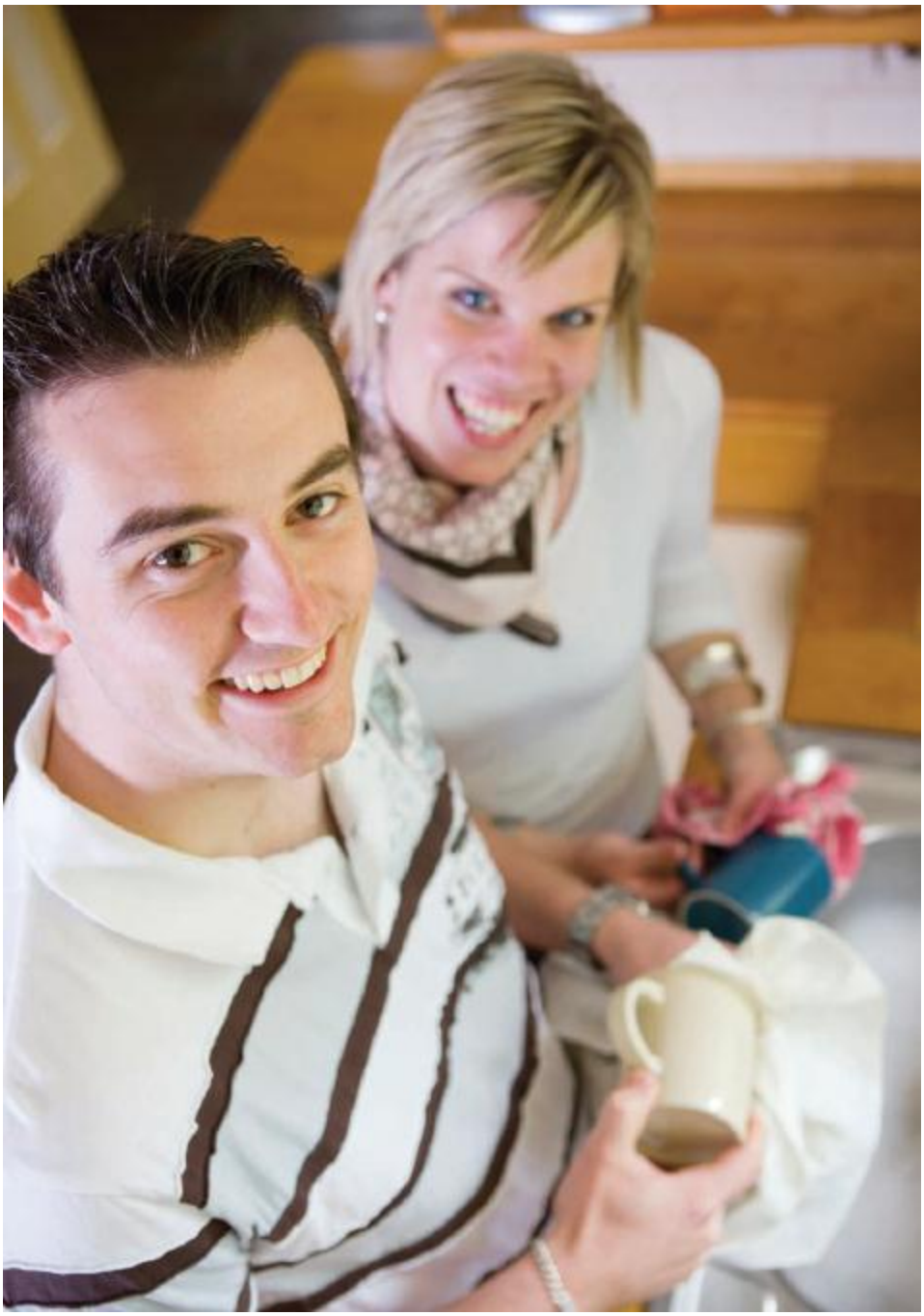
If possible, use gas for cooking. Gas is generally cheaper and it's less damaging to the environment than coal-fired electricity production. Turn the gas down to keep flames under the pot rather than up the sides. Gently simmer pots with the lid on rather than boiling vigorously. If you have to use electricity to cook, use a microwave where practical.

Install tap aerators P

Aerators can be fitted to taps to reduce water flow. They can be fitted inside or on the tap. Check with your landlord before installing.

Choose energy and water efficient appliances

When it comes time to replace fridges, microwaves and other appliances, buy the most energy and water efficient one. Buy the right size for your needs.



Bathroom

Fixing dripping taps and using the half flush are just two of the many things you can do to save water in your bathroom.

Use cold water

When washing your hands, shaving or cleaning your teeth use cold water.

Don't leave the bathroom tap running

When brushing your teeth, use a cup of water for rinsing – don't leave the tap running. Put the plug in the basin when washing or shaving.

Have short showers

Take shorter showers to save both water and energy. Hot showers cause up to half a kilogram of greenhouse gas every minute, so try to keep your showers to four minutes or less. Use a shower timer as a reminder.

Use the half flush

If your toilet is a dual flush system, use the half flush as much as possible.

Use a bucket

Put a bucket in the shower while waiting for the water to run hot, then use this cold water on the garden. You can purchase tubs big enough to stand in while you shower, which will capture a full shower's worth of 'grey water' for the garden. Make sure you use gentle, garden-friendly soaps and shampoos if you do this.

Check flow rates of your showerheads

Check your shower's flow rate on the showerhead. If there's no rate written on the showerhead you can measure the flow rate by turning on the shower at its normal rate for 30 seconds and capturing the water in a bucket. Measure how many litres of water are in the bucket and double the figure to get the flow rate.

Inefficient showerheads can use more than 15 litres per minute; a WELS four-star rated showerhead uses 7 litres per minute.

Install water efficient showerheads P

One of the best ways to save both water and energy is to install an efficient showerhead. Water saving showerheads can be easily fitted to existing shower arms. Rebates are available and prices start from $20. Regulations differ between states, so ask your landlord before installing a showerhead.

Fix leaking toilets P

To check the toilet for leaks take the lid off the cistern and add a few drops of biodegradable food colouring to the water. If food colouring comes into the toilet bowl without flushing this is a sign that the toilet cistern is leaking. Contact your landlord to have the toilet serviced.

Reduce water in the toilet cistern

If you have a single flush toilet, place one or two plastic drink bottles full of water in the cistern to reduce the volume of water in each flush. There are also flush modifying devices available which stop the flush as soon as the button is released. Check with your landlord before installing.

Fix leaking taps

A dripping tap can waste a lot of water, so install new washers to fix leaks. Regulations differ between states so ask your landlord before installing new washers.

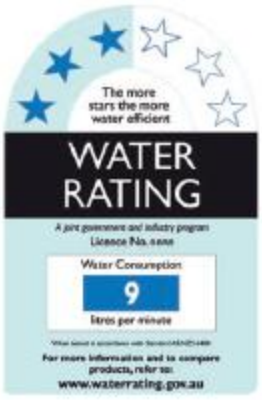
Install aerators on taps

Aerators can be fitted to taps to reduce water flow and can be fitted either inside or on the tap. Once again, check with your landlord before installing.

Reach for the stars

The Water Efficiency Labelling Scheme (WELS) shows the consumption of water by appliances. The label gives products and appliances a star rating from one to six and also provides a number that shows the comparative water consumption in litres. The labels will be on the product or packaging to allow you to compare when you are purchasing. The WELS website contains a searchable database on a range of products including washing machines, dishwashers, flow controllers, showers, taps and toilets.

www.waterrating.gov.au



Laundry

Making changes in the laundry can be as simple as hanging up your clothes or as complex as researching and purchasing the latest in energy and water efficient appliances. It's up to you.

Wash in cold water

While some clothes need to be washed in hot water, eg, nappies or clothes with oily stains, most clothes can effectively be washed in cold. Washing clothes in cold water saves energy.

Hang it up

Avoid using electric clothes dryers. Use the natural power of the sun to dry your washing by placing your clothes outside on a clothes line. During wet weather use a clothes rack inside your house.

Wash a full load

Always make sure you wash a full load of clothes. Not only will you save water but the less you use the washing machine the more energy you save.

Buy detergents made from biodegradable substances

Biodegradable detergents are a safer option for the environment.

Use your washing water on the garden

Providing you use biodegradable detergents, you can run a diverter hose, available from hardware stores, straight from your washing machine onto the garden.

Buy energy and water efficient appliances

If you need a new washing machine or dryer check the energy and water star ratings. Look for the highest star rating and buy the right size for your needs. Make sure the washer can do a true cold cycle because some machines heat the water even during cold washes.

Fix leaking taps

A dripping tap can waste a lot of water, so install new washers to fix leaks. Regulations differ between states so ask your landlord before installing new washers.

Install aerators on taps

Aerators can be fitted to taps to reduce water flow and can be fitted inside or on the tap. Once again check with your landlord before installing.

Outdoor areas

Improving your rental home's efficiency can be as much about what you do outside your home as what you do inside it. Follow these tips to have a real impact.

Use a broom

Clean down paths and driveways with a broom or rake rather than a leaf blower or hose.

Group pot plants together

Pot plants placed together create their own microclimate, which can reduce the number of times you'll need to water.

Water at the appropriate time

Water the garden early in the morning or late in the evening to reduce water evaporation. Watering longer, but less often, will encourage the plants to grow deeper roots which will help them grow more resilient to drought conditions. Make sure any watering complies with local water restrictions.

Compost your food scraps

Install a compost bin or worm farm for your food scraps to reduce the amount of organic matter going to landfill. Organic matter buried in landfill produces methane, a potent greenhouse gas. The compost you'll produce is also great for your garden.

If you live in an apartment consider buying one of the small composting systems that use a mixture of bacteria, fungi and yeasts to produce high-grade fertiliser for pot plants.

Mulch garden beds

Mulch on garden beds and pots can help reduce water evaporation by up to 70%. The mulch shields the soil from the sun and reduces run off during watering.

Add compost or a wetting agent

Adding compost and wetting agents, available from plant nurseries, to soil to help it hold water, reducing the number of times you'll need to water.

Use greywater

Greywater from baths, showers and washing machines can be reused on the garden in most locations. While bucketing shower water can be a chore, small pumps are available that let you pump it straight to the garden via the bathroom window. Some greywater systems are also suitable for renters as they don't require permanent installation if the pipes are accessible from outside the house.

www.sta.org.au

Reduce the temperature of hot water [P]

Check the thermostat setting on your hot water system is set at 60°C. If it's set higher than 60°C you will be wasting energy, but any lower could pose a health risk as harmful bacteria may thrive. Instantaneous hot water systems should be set to no more than 50°C.

Setting the temperature on some types of hot water systems requires a plumber; contact your landlord to have the system assessed.

Check the hot water system overflow [P]

Check the amount of water dripping from the overflow pipe of the hot water system. If the overflow is excessive contact the landlord to have the system assessed.

Invest in a portable rainwater tank [P]

Rainwater tanks which come with a lid, stand and plastic tap are available in small sizes of around a few hundred litres. Just position your tank under a convenient hole in a downpipe to collect water. If there isn't a convenient hole, ask permission from your landlord to make a hole and seal it up when you move.

Reducing waste

Reducing your impact on the environment is as much about your behaviour as it is about your home and its appliances. Reduce waste and you reduce your carbon footprint.

Avoiding waste

Being conscious of the amount of waste that is associated with the products that we buy and avoiding products that have unnecessary or excessive packaging is a good first step in reducing household waste.

Recycle household waste products

Most local councils supply a service for residents to recycle common waste products such as glass, cans, some plastics, paper and cardboard. If you do not have a recycling bin contact your council to arrange for one to be delivered.

A new life

Save useful items from landfill by finding them a new home. As the saying goes, one person's trash is another's treasure. There are many ways to give life to unwanted clothes, furniture and books such as charity stores, markets and resource recovery centres.

Reduce e-waste

Electronic waste, or e-waste, is a growing contributor to landfill and a growing concern for the environment. Each year millions of computers, modems, printers and mobile phones are thrown out. This e-waste not only adds to landfill, it contains toxic components which can leach into the water table.

Check with your local council to see if there is a safe way to dispose of old equipment before throwing it in the rubbish. You may also wish to ask your council for contact details of any local charities which collect old equipment and recondition them to give away to the disadvantaged and community groups.

www.recyclingnearyou.com.au
www.mobilemuster.com.au

Getting around

Transport is a major contributor to greenhouse emissions, but there are many choices you can make to reduce your impact while still getting you from A to B.

Choose where you live carefully

When you're looking for a rental property, think about its location. Is it within walking or cycling distance of public transport, schools, work, shops and your recreation choices? On average, Australian households generate close to six tonnes of greenhouse gas and spend around $9000 each year on transport, $3500 being for fuel. Reducing the amount of time travelling will be better for the environment, your health and hip pocket.

Ride a bike or use public transport

Riding a bike is not only an eco-friendly way to travel it's also good exercise. If you are unable to ride catch a bus, train or tram–leave the car at home whenever possible.

www.travelsmart.gov.au

Be car wise

If you are looking at buying a new car, choose a fuel efficient one. If you drive a car, minimise fuel consumption by avoiding traffic jams, combining travel tasks within one trip and sharing rides with other people.

www.greenvehicleguide.gov.au

Working with your landlord

Before you undertake any alterations to a rental property you must have the owner's written permission, but don't let this discourage you. Most landlords will agree to improving the resale value of their rental property if it keeps their tenants happy – even better if they're doing their bit for the environment at the same time.

Before contacting your landlord, it may pay to do a bit of research into state, territory and federal government tax deductions and rebates. If you have any concerns about contacting your landlord contact your state or territory tenants union or tenants advocacy service.

The Australian Taxation Office offers tax deductions for energy efficiency improvements made to rental properties. Maintenance, repairs and servicing costs such as sealing cracks and gaps and repairing damaged insulation can be claimed at the end of each financial year. The depreciation on capital improvements such as erecting a pergola or replacing an inefficient hot water system can be claimed over a specified period of time.

When writing to your landlord, point out the benefits of the repairs and any available rebates they can receive to make sustainable changes to the property. If you are offering to make some minor changes yourself, such as installing a water efficient showerhead, outline what you would like to do and how much it would cost so that you can be reimbursed.

If you receive no reply after a few weeks, send a follow up note, asking if they have received your letter and if they have had time to consider your request.

Even with the landlord's approval, once your lease expires certain measures may require you to restore the property back to the condition it was in when you moved in. You need to check your lease document or clarify this with the landlord.

For more information on the available tax deductions go to:

www.environment.gov.au/settlements/local/publications/pubs/brochure5.pdf

For more information on Australian Government rebates go to:

www.environment.gov.au/rebates

Sample letter

[Your name and address]

[Date]

[Landlord's or agent's name and address]

Dear …

Re: Repairs to [your address]

We would like to undertake the following alterations to the premises to improve the water and energy efficiency of the home.

We are willing to conduct the following repairs and request your permission to do so. We would appreciate reimbursal for the cost of the products outlined below:

- Item Cost $
- Item Cost $
- Item Cost $

The following repairs we are unable to undertake:

- Item Cost $
- Item Cost $
- Item Cost $

The Australian Taxation Office offers tax deductions for improvements made to rental properties. I have included a copy of the brochure outlining the tax deductions available. [Attach brochure: www.environment.gov.au/settlements/local/publications/pubs/brochure5.pdf]

I look forward to hearing from you. I can be contacted on [phone] during daytime hours.

Yours sincerely,

[Your name]

Alternative Technology Association

The Alternative Technology Association (ATA), is a not-for-profit organisation that has been promoting the use of renewable energy, water conservation and sustainable building since 1980. ATA has thousands of members across Australia who are actively walking the talk in their own homes.

ATA also publishes two magazines *ReNew: technology for a sustainable future* and *Sanctuary: sustainable living with style*, available from newsstands across Australia.

Become a member of the ATA and you gain access to a large support network of knowledgeable people and receive a range of privileges to help you achieve your sustainability dreams.

Your ATA membership also provides you with a number of benefits:

- Free advice service, with answers to tricky questions provided by the ATA's experienced advisors.
- Discounts from the ATA Shop and a range of sustainable products and services.
- Invitations to local branch activities. An opportunity to network and exchange information with like-minded individuals.
- Quarterly issues of *ReNew* magazine, packed with practical information on the latest and greatest in sustainable technologies.
- Updates on the ATA's local, national and international projects

For more information go to:
www.ata.org.au or call (03) 9639 1500

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Appendix C: Competition Updates

Letterbox Update: February 12, 2013

Moreland Energy Foundation

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Brunswick Victoria 3056

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F 03 9385 8586
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ww.mefl.com.au

Positive Charge Competition Update

Dear Resident,

In case you haven't had a chance to check up on your standings, here are the current standings from last Friday.

Weekly Energy Rankings

*The following chart displays average energy consumption per day by ID code and is ranked from largest reduction (1st place) to smallest reduction (11th).

Energy reduction is marked by a code highlighted in green, increased consumption is in red.

Rank	Code	Starting Energy Use	This Week's Energy Use
1	8	11.5 kWh/day	5.4 kWh/day
2	5	9.3 kWh/day	7.9 kWh/day
3	10	11.8 kWh/day	11.1 kWh/day
4	2	15.1 kWh/day	14.2 kWh/day
5	3	9.7 kWh/day	9.2 kWh/day
6	4	8.4 kWh/day	8.0 kWh/day
7	6	9.5 kWh/day	9.4 kWh/day
8	9	5.2 kWh/day	5.1 kWh/day
9	7	3.3 kWh/day	3.4 kWh/day
10	1	15.6 kWh/day	16.2 kWh/day
11	11	12.0 kWh/day	12.5 kWh/day

Not where you want to be in the rankings? Visit: http://tinyurl.com/9wpvwzx for links to energy saving tips and be sure to check back this evening, 12 Tuesday, for the new standings!

Best Wishes,
WPI MEFL Team

Contact us: If you have any questions please don't hesitate to call us on **9385 8503** or email wpi@mefl.com.au

About us: Moreland Energy Foundation Limited (MEFL) is a local not-for-profit community organisation dedicated to sustainable energy. We are a group of University students who study at Worcester Polytechnic Institute (WPI) in the United States. Currently, we are performing this research project as interns for Moreland Energy Foundation.

Email Update: February 15, 2013

Dear Resident,

In case you haven't had a chance to check up on your standings, here are the current standings from last Friday.

Weekly Energy Rankings

*The following chart displays average energy consumption per day by ID code and is ranked from largest reduction (1st place) to smallest reduction (11th).

Energy reduction is marked by a code highlighted in green, increased consumption is in red.

Rank	Code	Starting Energy Use	This Week's Energy Use
1	8	11.5 kWh/day	5.4 kWh/day
2	5	9.3 kWh/day	7.9 kWh/day
3	10	11.8 kWh/day	11.1 kWh/day
4	2	15.1 kWh/day	14.2 kWh/day
5	3	9.7 kWh/day	9.2 kWh/day
6	4	8.4 kWh/day	8.0 kWh/day
7	6	9.5 kWh/day	9.4 kWh/day
8	9	5.2 kWh/day	5.1 kWh/day
9	7	3.3 kWh/day	3.4 kWh/day
10	1	15.6 kWh/day	16.2 kWh/day
11	11	12.0 kWh/day	12.5 kWh/day

Not where you want to be in the rankings? Visit: http://tinyurl.com/9wpvwzx for links to energy saving tips and be sure to check back this evening, 12 Tuesday, for the new standings!

Best Wishes,
Bill, Shelby, Tim, & Tyler

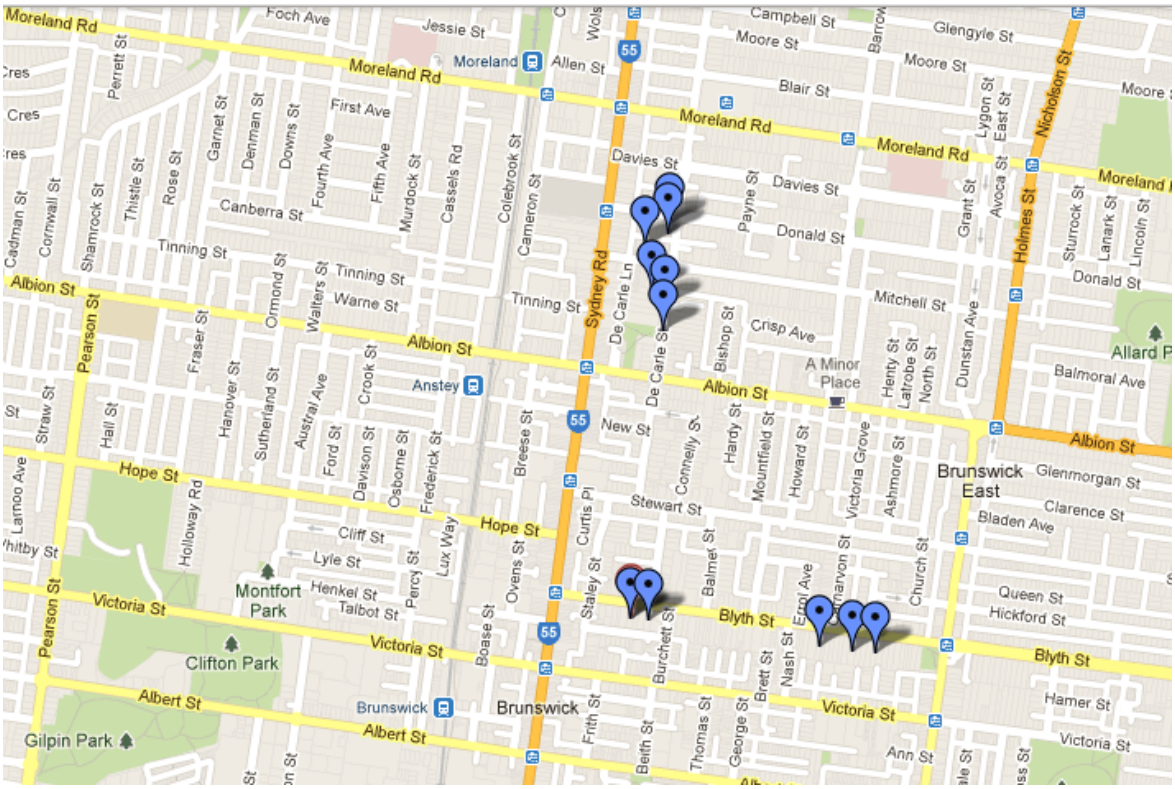
Contact us: If you have any questions please don't hesitate to call us on **9385 8503** or email **wpi@mefl.com.au**

About us: Moreland Energy Foundation Limited (MEFL) is a local not-for-profit community organisation dedicated to sustainable energy. We are a group of University students who study at Worcester Polytechnic Institute (WPI) in the United States. Currently, we are performing this research project as interns for Moreland Energy Foundation.

WPI Project Team

Moreland Energy Foundation Limited ABN 72 095 439 160
Level 1, 233 Sydney Road, Postal Address: PO Box 276 Brunswick Victoria 3056
Phone MEFL: 03-9385 8585 Fax: 03-9385 8586
www.mefl.com.au

Appendix D: Recruitment Buildings



Apartment	Competitive, Non-Competitive, No Participants
14 Blyth St.	No Participants Enroled
22 Blyth St.	No Participants Enroled
86 Blyth St.	Competitive
100 Blyth St.	Competitive
108 Blyth St.	Competitive
45 De Carle St.	Competitive
51 De Carle St.	Non-Competitive
53 De Carle St.	Non-Competitive
55 De Carle St.	Non-Competitive
55C De Carle St.	Non-Competitive
16 Donald St.	Non-Competitive
5 Mitchel St.	No Participants Enroled

Appendix E: Website

Home ▸ What we do ▸ Energy efficiency ▸ WPI ▸ WPI project information

- Community action
- Energy efficiency
  - Professional development
  - Blog & Media
- Energy supply
- Urban development
- Climate policy
- Consulting & research
- Professional development

Positive Charge Competition

Welcome

Hello, and welcome to the Positive Charge competition page. Tune in here each week to check out our Tip of the Week, Red Alert Advice, and check how your home ranks against other competitors.

Plug Into Smart Energy Answers

Positive Charge is a free service for households of all shapes and sizes, helping you take action to reduce your energy bills. We do the hard work for you.

- Give you straight talking advice
- Link you to products with integrity
- Keep you up-to-date with new ways to save

Sign up for free at Positive Charge today!

Tip of the Week

- Want to do more to save money? contact your landlord today using the tips in the ATA Renter's Guide to Sustainable living.

For more energy, and more importantly, money saving tips, consult your Energy Saving Guide or check out our sustainability advice!

Weekly Energy Rankings

The following chart displays average energy consumption per day by ID code and is ranked from largest reduction (1st place) to smallest reduction (11th).

Energy reduction is marked by a code highlighted in green, incressed consumption is in red.

Rank	Code	Last Week's Energy Use	This Week's Energy Use
1	4	5.4 kWh/day	5.7 kWh/day
2	2	9.7 kWh/day	5.1 kWh/day
3	3	15.1 kWh/day	14.2 kWh/day
4	6	9.5 kWh/day	8.9 kWh/day
5	5	11.5 kWh/day	11.4 kWh/day
6	11	12.0 kWh/day	12.1 kWh/day
7	10	11.5 kWh/day	11.9 kWh/day
8	8	9.3 kWh/day	10 kWh/day
9	9	5.2 kWh/day	6.1 kWh/day
10	7	3.3 kWh/day	4.0 kWh/day
11	1	15.6 kWh/day	19.5 kWh/day

Red Alert Advice

Not doing to well this week? Here are some simple things you can do to get back in the green.

Halogen isn't always the best. Avoid halogen downlights, their concentrated field means you need to install many to achieve adequate lighting. CFLs (the twisty lights) are a more energy efficient choice.

If you're not home, turn it off. Remember, your devices only need to be plugged in when you're there to use them. Remember to unplugg your small appliances and turn off the lights before you go.

Turn on the fan, not the aircon. Fans use less energy than A/C, while still getting your home nice and cool. To increase the cooling effects, close your blinds or shades in areas with bright, warming sunlight.

Set a timer. If you live by a schedule, an electric timer is a cheap and easy option for you. Set it and forget it.

About Us

Moreland Energy Foundation Limited (MEFL) is a local not-for-profit community organisation dedicated to sustainable energy. We are a group of University students who study at Worcester Polytechnic Institute (WPI) in the United States. Currently, we are performing this research project as interns for Moreland Energy Foundation. If you have any questions please don't hesitate to call us on 9686 8600 or email wpi@mefl.com.au

Appendix F: Survey Questions & Responses

Written portion of the survey

Moreland Energy Foundation

Level 1, Suite 6, 200 Sydney Road
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Postal: PO Box 276
Brunswick Victoria 3056

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Resident Survey

1. **How many people live in your home?**

2. **Do you live with your family or with roommates? (Circle One)**

   Family Roommates Alone

3. **Which age range do you fall into?**
   - ☐ 18-30
   - ☐ 31-40
   - ☐ 41-50
   - ☐ 51-60
   - ☐ 60+

4. **Do you rent or own your apartment? (Circle One)**

   Rent Own

5. **What is the highest level of education you have completed?**
   - ☐ Primary
   - ☐ Secondary
   - ☐ University
   - ☐ Prefer not to answer

6. **What is your yearly household income?**
   - ☐ Up to $25K
   - ☐ $25K to $50K
   - ☐ $50K to $75K
   - ☐ $75K +
   - ☐ Prefer Not to Answer

7. **What is your country of birth?**

   _____

   - ☐ Have you lived in Australia for morethan 5 years? YES NO
   - ☐ Are you a part of any local community organizations? If so, which ones?

   _____

Oral portion of the survey

1. **Do you have an air conditioner?** Yes No
    a. If so, at what temperature do you set it on when you are home? _____℃
    b. Do you ever leave it on when you aren't home? Yes No

2. **(We provided suggested retrofit devices) Which devices did you install? When? (Identify which week, or if it had been done prior to our study)**

	x	How many?	When?
Timers			1 2 3 Previously
Standby Power Controller			1 2 3 Previously
CFL bulbs			1 2 3 Previously
LED bulbs			1 2 3 Previously
Curtains			1 2 3 Previously
Pelmets			1 2 3 Previously
Door draught sealer			1 2 3 Previously
Window draught sealer			1 2 3 Previously
Fans (ceiling or standing)			1 2 3 Previously
Other device			1 2 3 Previously

3. **What energy saving habits did you adopt? (/did you do any of these prior to our study?)**
    a. Standby Power/ Miscellaneous devices
        i. Turn off when not in use
        ii. Unplug
    b. Lights/Windows
        i. Using natural light
        ii. Turn off lights
        iii. Closing curtains/blinds
    c. Temperature
        i. Shutting off/timing aircon

   ii. Using fans
   iii. Open windows
d. Other:

4. What motivated you to make these changes?

a. Did our study influence you?
   i. Competition
   ii. Reminders (email/letterbox drop)
   iii. Information
b. Care for the environment
c. Prize money
d. Reduce Energy Bills
e. Other _____

5. Did you use any of the following? Which was the most helpful and why?

a. Energy savings packet
   i. 1 page brief
   ii. ATA guide
b. Emails
c. Website
d. Other _____

Why: _____

6. Would you be interested in participating in future MEFL programs?

Would you like to sign up for Positive Charge? (Offers free products and advice etc.)

Key for Survey Responses

Category	Code	Meaning
Age Range	1	Adults are 18 to 30 years old
	2	Adults are 31 to 40 years old
	3	Adults are 41 to 50 years old
	4	Adults are 51 to 60 years old
Culture	1	CALA
	2	CALD
Do you have an aircon	1	No
	2	Yes
What temperature is aircon set at	0	No aircon
	X	Enter the temperature in degrees Celsius
Is aircon on when no one is home	0	No aircon
	1	No
	2	Yes
Device 1... (one row for each device in the survey)	0	Did not implement
	1	Implemented during our study
	2	Implemented prior to our study
Habit 1... (one row for each habit in the survey)	0	Did not implement
	1	Implemented during our study
	2	Implemented prior to our study
Preferred form of information	0	None
	1	One-page brief
	2	ATA guide
	3	Emails
	4	Website
	5	Letterbox Drop

Competitive Group Survey Responses

	1	2	3	4	5	6	7	8	9	10	11
Age Range	2	1	1	1	1	3	1	1	4	1	1
Culture	2	1	1	1	1	1	1	1	1	1	2
Do you have an aircon	2	1	1	1	2	1	1	2	1	2	1
What temperature is aircon set at?	22	0	0	0	23	0	0	21	0	23	0
Is the aircon on when no one is home?	1	0	0	0	1	0	0	1	0	1	0
Timers	0	2	0	0	0	0	0	0	0	0	2
Standby Power Controller	0	2	0	0	0	2	0	2	2	2	2
CFL bulbs	1	1	2	1	1	0	0	0	0	2	0
LED bulbs	0	1	0	1	0	0	0	0	0	0	0
Curtains/Blinds	1	2	1	1	2	2	2	2	2	2	2
Pelmets	0	0	0	0	0	2	0	0	0	2	2
Door draught sealer	0	1	1	0	0	0	1	0	0	2	1
Window draught sealer	0	0	0	0	0	0	0	0	0	0	0
Fans (ceiling or standing)	2	0	0	0	0	2	2	0	2	2	2
Turning off devices when not in use	1	1	0	1	2	2	1	0	2	2	2
Unplugging / turning off devices at the outlet when not in use	0	0	2	2	0	0	0	0	0	2	0
Using natural light	1	1	1	1	1	1	1	1	1	0	1
Closing curtains / blinds to control temperature	0	1	1	1	1	1	1	0	1	2	1
Shutting off aircon	0	0	0	0	1	0	0	1	0	1	0
Using fans to control temperature	2	0	0	0	0	2	2	0	2	2	2
Opening windows to control temperature	2	0	2	0	0	2	0	0	0	2	2
Preferred form of information	1	5	5	1	1	2	3	0	1	2	2

Non-Competitive Group Survey Responses

	12	13	14	15	16	17	18	19	20	21	22
Age Range	4	1	1	2	3	1	1	2	3	1	2
Culture	1	1	1	1	2	2	1	1	2	2	1
Do you have an aircon?	1	1	1	1	1	1	1	1	1	1	2
What temperature is aircon set at?	0	0	0	0	0	0	0	0	0	0	22
Is the aircon on when no one is home?	0	0	0	0	0	0	0	0	0	0	1
Timers	0	0	0	0	0	0	0	0	0	0	0
Standby Power Controller	2	0	0	0	2	0	0	0	2	2	0
CFL bulbs	2	0	1	2	0	0	2	2	2	0	0
LED bulbs	0	2	0	0	0	0	1	0	0	0	0
Curtains/Blinds	2	2	2	2	0	2	2	2	0	2	0
Pelmets	0	0	0	0	0	2	0	0	0	0	0
Door draught sealer	2	0	0	0	0	0	0	0	0	0	0
Window draught sealer	0	2	0	0	0	0	0	2	0	0	0
Fans (ceiling or standing)	2	2	2	0	2	2	2	0	2	2	0
Turning off devices when not in use	0	2	1	1	2	1	2	2	0	2	2
Unplugging / turning off devices at the outlet when not in use	2	2	2	0	2	2	0	2	0	0	0
Using natural light	1	1	1	0	1	2	2	1	1	2	2
Closing curtains to control temperature	2	1	0	1	0	1	0	1	0	2	0
Shutting off aircon	0	0	0	0	0	0	0	0	0	0	1
Using fans to control temperature	2	2	2	0	0	2	2	0	0	2	0
Opening windows to control temperature	2	0	2	0	0	2	0	0	0	0	0
Preferred form of information	0	2	2	1	0	2	1	2	1	0	1

Appendix G: Raw Electricity Meter Data

Competitive Group

Participants 1 Through 4

	Identification Code →	1	2	3	4
1st meter reading (2/1)	Level	16917	09052	92680	57217
	Time	11:00 AM	11:10 AM	11:10 AM	11:10 AM
from 1 to 2	change in level	61	69	35	37
	change in time	4.185	4.181	4.181	4.181
	electricity use per day	14.6	16.5	8.4	8.8
2nd meter reading (2/5)	Level	16978	09121	92715	57254
	Time	3:27 PM	3:30 PM	3:30 PM	3:30 PM
from 2 to 3	change in level	16	19.5	11.5	9
	change in time	1.016	1.021	1.021	1.021
	electricity use per day	15.7	19.1	11.3	8.8
3rd meter reading (2/6)	Level	16994	9140.5	92726.5	57263
	Time	3:50 PM	4:00 PM	4:00 PM	4:00 PM
from 3 to 4	change in level	18.5	11.5	12	6.5
	change in time	1.05	1.017	1.017	1.017
	electricity use per day	17.6	11.3	11.8	6.4
4th meter reading (2/7)	Level	17012.5	9152	92738.5	57269.5
	Time	5:02 PM	4:25 PM	4:25 PM	4:25 PM
from 4 to 5	change in level	13.5	5	9	6
	change in time	0.715	0.743	0.743	0.743
	electricity use per day	18.9	6.7	12.1	8.1
5th meter reading (2/8)	Level	17026	9157	92747.5	57275.5
	Time	10:11 AM	10:15 AM	10:15 AM	10:15 AM
from 5 to 6	change in level	44.8	40.5	30	25.5
	change in time	3.116	3.069	3.069	3.069
	electricity use per day	14.4	13.2	9.8	8.3
6th meter reading (2/11)	Level	17070.8	9197.5	92777.5	57301
	Time	12:58 PM	11:55 AM	11:55 AM	11:55 AM
from 6 to 7	change in level	20.6	17.5	8.5	10
	change in time	1.019	1.045	1.045	1.045
	electricity use per day	20.2	16.7	8.1	9.6
7th meter reading (2/12)	Level	17091.4	9215	92786	57311
	Time	1:25 PM	1:00 PM	1:00 PM	1:00 PM
from 7 to 8	change in level	13.3	14.5	10	9
	change in time	1.107	1.126	1.126	1.126
	electricity use per day	12.0	12.9	8.9	8.0
8th meter reading (2/13)	Level	17104.7	9229.5	92796	57320

	Time	3:59 PM	4:02 PM	4:02 PM	4:02 PM
from 8 to 9	change in level	20.3	16.5	10	8
	change in time	1.039	1.058	1.058	1.058
	electricity use per day	19.5	15.6	9.5	7.6
9th meter reading (2/14)	Level	17125	9246	92806	57328
	Time	4:55 PM	5:26 PM	5:26 PM	5:26 PM
from 9 to 10	change in level	15.1	11	6	4
	change in time	0.745	0.722	0.722	0.722
	electricity use per day	20.3	15.2	8.3	5.5
10th meter reading (2/15)	Level	17140.1	9257	92812	57332
	Time	10:48 AM	10:46 AM	10:46 AM	10:46 AM
from 10 to 11	change in level	66.7	45	23.5	19
	change in time	2.969	2.972	2.972	2.972
	electricity use per day	22.5	15.1	7.9	6.4
11th meter reading (2/18)	Level	17206.8	9302	92835.5	57351
	Time	10:03 AM	10:06 AM	10:06 AM	10:06 AM
from 11 to 12	change in level	21.9	11	6.5	7
	change in time	1.059	1.026	1.026	1.026
	electricity use per day	20.7	10.7	6.3	6.8
12th meter reading (2/19)	Level	17228.7	9313	92842	57358
	Time	11:28 AM	10:43 AM	10:43 AM	10:43 AM
from 12 to 13	change in level	10.9	8	6	8
	change in time	1.024	1.044	1.044	1.044
	electricity use per day	10.6	7.7	5.7	7.7
13th meter reading (2/20)	Level	17239.6	9321	92848	57366
	Time	12:03 PM	11:47 AM	11:47 AM	11:47 AM
from 13 to 14	change in level	12.8	11	9	6
	change in time	0.934	0.967	0.967	0.967
	electricity use per day	13.7	11.4	9.3	6.2
14th meter reading (2/21)	Level	17252.4	9332	92857	57372
	Time	10:38 AM	11:00 AM	11:00 AM	11:00 AM
from 14 to 15	change in level	12.5	16	8	6
	change in time	1.013	1.011	1.011	1.011
	electricity use per day	12.3	15.8	7.9	5.9
15th meter reading (2/22)	Level	17264.9	9348	92865	57378
	Time	10:57 AM	11:16 AM	11:16 PM	11:16 AM

Participants 5 Through 8

	Identification Code →	5	6	7	8
1st meter reading (2/1)	Level	06784	6303	72436	80624
	Time	11:00 AM	11:00 AM	11:00 AM	11:10 AM
from 1 to 2	change in level	45	39	14	34
	change in time	4.185	4.188	4.181	4.181
	electricity use per day	10.8	9.3	3.3	8.1
2nd meter reading (2/5)	Level	06829	6342	72450	80658
	Time	3:27 PM	3:30 PM	3:21 PM	3:30 PM
from 2 to 3	change in level	8	10	3	14
	change in time	1.016	1.015	1.018	1.021
	electricity use per day	7.9	9.9	2.9	13.7
3rd meter reading (2/6)	Level	06837	6352	72453	80672
	Time	3:50 PM	3:52 PM	3:47 PM	4:00 PM
from 3 to 4	change in level	12.8	8.5	3.5	24
	change in time	1.05	1.047	1.058	1.017
	electricity use per day	12.2	8.1	3.3	23.6
4th meter reading (2/7)	Level	6849.8	6360.5	72456.5	80696
	Time	5:02 PM	5:00 PM	5:10 PM	4:25 PM
from 4 to 5	change in level	5.2	8.5	2.5	8
	change in time	0.715	0.717	0.707	0.743
	electricity use per day	7.3	11.9	3.5	10.8
5th meter reading (2/8)	Level	6855	6369	72459	80704
	Time	10:11 AM	10:13 AM	10:08 AM	10:15 AM
from 5 to 6	change in level	27.3	29.3	10	16
	change in time	3.116	3.116	3.116	3.069
	electricity use per day	8.8	9.4	3.2	5.2
6th meter reading (2/11)	Level	6882.3	6398.3	72469	80720
	Time	12:58 PM	1:00 PM	12:55 PM	11:55 AM
from 6 to 7	change in level	5.5	9.6	3	5
	change in time	1.019	1.018	1.017	1.045
	electricity use per day	5.4	9.4	2.9	4.8
7th meter reading (2/12)	Level	6887.8	6407.9	72472	80725
	Time	1:25 PM	1:26 PM	1:20 PM	1:00 PM
from 7 to 8	change in level	6	9.9	4	6
	change in time	1.107	1.11	1.105	1.126
	electricity use per day	5.4	8.9	3.6	5.3
8th meter reading (2/13)	Level	6893.8	6417.8	72476	80731
	Time	3:59 PM	4:05 PM	3:51 PM	4:02 PM
from 8 to 9	change in level	4.7	8.9	4	7
	change in time	1.039	1.036	1.043	1.058

	electricity use per day	4.5	8.6	3.8	6.6
9th meter reading (2/14)	Level	6898.5	6426.7	72480	80738
	Time	4:55 PM	4:57 PM	4:53 PM	5:26 PM
from 9 to 10	change in level	6.8	8	3	4
	change in time	0.745	0.745	0.745	0.722
	electricity use per day	9.1	10.7	4.0	5.5
10th meter reading (2/15)	Level	6905.3	6434.7	72483	80742
	Time	10:48 AM	10:50 AM	10:46 AM	10:46 AM
from 10 to 11	change in level	33.7	26.2	12	46
	change in time	2.969	2.969	2.967	2.972
	electricity use per day	11.4	8.8	4.0	15.5
11th meter reading (2/18)	Level	6939	6460.9	72495	80788
	Time	10:03 AM	10:05 AM	9:59 AM	10:06 AM
from 11 to 12	change in level	18	8.7	5	16
	change in time	1.059	1.06	1.053	1.026
	electricity use per day	17.0	8.2	4.7	15.6
12th meter reading (2/19)	Level	6957	6469.6	72500	80804
	Time	11:28 AM	11:33 AM	11:16 AM	10:43 AM
from 12 to 13	change in level	8	10.5	5	10
	change in time	1.024	1.022	1.030	1.044
	electricity use per day	7.8	10.3	4.9	9.6
13th meter reading (2/20)	Level	6965	6480.1	72505	80814
	Time	12:03 PM	12:05 PM	11:59 AM	11:47 AM
from 13 to 14	change in level	14.8	9	5	12
	change in time	0.941	0.934	0.934	0.967
	electricity use per day	15.7	9.6	5.4	12.4
14th meter reading (2/21)	Level	6979.8	6489.1	72510	80826
	Time	10:38 AM	10:40 PM	10:34 AM	11:00 AM
from 14 to 15	change in level	8.4	9.3	4	9
	change in time	1.013	0.986	1.005	1.011
	electricity use per day	8.3	9.4	4.0	8.9
15th meter reading (2/22)	Level	6988.2	6498.4	72514	80835
	Time	10:57 AM	11:00 AM	10:41 AM	11:16 AM

Participants 9 Through 11

	Identification Code →	9	10	11
1st meter reading (2/1)	Level	73691	93836	15523
	Time	11:00 AM	11:30 AM	11:30 AM
from 1 to 2	change in level	20	51	52
	change in time	4.181	4.167	4.16
	electricity use per day	4.8	12.2	12.5
2nd meter reading (2/5)	Level	73711	93887	15575
	Time	3:21 PM	3:30 PM	3:21 PM
from 2 to 3	change in level	6	11	10
	change in time	1.018	1.021	1.018
	electricity use per day	5.9	10.8	9.8
3rd meter reading (2/6)	Level	73717	93898	15585
	Time	3:47 PM	4:00 PM	3:47 PM
from 3 to 4	change in level	6	11	11.5
	change in time	1.058	1.017	1.058
	electricity use per day	5.7	10.8	10.9
4th meter reading (2/7)	Level	73723	93909	15596.5
	Time	5:10 PM	4:25 PM	5:10 PM
from 4 to 5	change in level	4	9	9.5
	change in time	0.707	0.743	0.707
	electricity use per day	5.7	12.1	13.4
5th meter reading (2/8)	Level	73727	93918	15606
	Time	10:08 AM	10:15 AM	10:08 AM
from 5 to 6	change in level	15	40	38.8
	change in time	3.116	3.069	3.116
	electricity use per day	4.8	13.0	12.5
6th meter reading (2/11)	Level	73742	93958	15644.8
	Time	12:55 PM	11:55 AM	12:55 PM
from 6 to 7	change in level	5	10	12.6
	change in time	1.017	1.045	1.017
	electricity use per day	4.9	9.6	12.4
7th meter reading (2/12)	Level	73747	93968	15657.4
	Time	1:20 PM	1:00 PM	1:20 PM
from 7 to 8	change in level	6	7.5	11.1
	change in time	1.105	1.126	1.105
	electricity use per day	5.4	6.7	10.0
8th meter reading (2/13)	Level	73753	93975.5	15668.5
	Time	3:51 PM	4:02 PM	3:51 PM
from 8 to 9	change in level	5.5	8.5	17
	change in time	1.043	1.058	1.043

	electricity use per day	5.3	8.0	16.3
9th meter reading (2/14)	Level	73758.5	93984	15685.5
	Time	4:53 PM	5:26 PM	4:53 PM
from 9 to 10	change in level	4.5	12	8.6
	change in time	0.745	0.722	0.745
	electricity use per day	6.0	16.6	11.5
10th meter reading (2/15)	Level	73763	93996	15694.1
	Time	10:46 AM	10:46 AM	10:46 AM
from 10 to 11	change in level	20	41.5	33.4
	change in time	2.967	2.972	2.967
	electricity use per day	6.7	14.0	11.3
11th meter reading (2/18)	Level	73783	94037.5	15727.5
	Time	9:59 AM	10:06 AM	9:59 AM
from 11 to 12	change in level	6	13	13.3
	change in time	1.053	1.026	1.053
	electricity use per day	5.7	12.7	12.6
12th meter reading (2/19)	Level	73789	94050.5	15740.8
	Time	11:16 AM	10:43 AM	11:16 AM
from 12 to 13	change in level	6	7.5	12
	change in time	1.030	1.044	1.030
	electricity use per day	5.8	7.2	11.7
13th meter reading (2/20)	Level	73795	94058	15752.8
	Time	11:59 AM	11:47 AM	11:59 AM
from 13 to 14	change in level	6.5	10	11.9
	change in time	0.934	0.967	0.934
	electricity use per day	7.0	10.3	12.7
14th meter reading (2/21)	Level	73801.5	94068	15764.7
	Time	10:34 AM	11:00 AM	10:34 AM
from 14 to 15	change in level	4.5	7.5	13.1
	change in time	1.005	1.011	1.005
	electricity use per day	4.5	7.4	13.0
15th meter reading (2/22)	Level	73806	94075.5	15777.8
	Time	10:41	11:16 AM	10:41 AM

Non-Competitive Group

Participants 12 Through 15

	Identification Code →	12	13	14	15
1st meter reading (2/1)	Level	75538	78881	63241	30271
	Time	4:55 PM	10:57 AM	10:46 AM	11:03 AM
from 1 to 2	change in level	8	51	30	14
	change in time	3.934	4.186	4.190	4.183
	electricity use per day	2.0	12.2	7.2	3.3
2nd meter reading (2/5)	Level	75546	78932	63271	30285
	Time	3:20 PM	3:25 PM	3:20 PM	3:27 PM
from 2 to 3	change in level	2	10	6	3
	change in time	1.021	1.019	1.022	1.018
	electricity use per day	2.0	9.8	5.9	2.9
3rd meter reading (2/6)	Level	75548	78942	63277	30288
	Time	3:52 PM	3:53 PM	3:50 PM	3:55 PM
from 3 to 4	change in level	1.5	6	6	2
	change in time	1.013	1.015	1.01	1.014
	electricity use per day	1.5	5.9	5.9	2.0
4th meter reading (2/7)	Level	75549.5	78948	63283	30290
	Time	4:10 PM	4:15 PM	4:05 PM	4:15 PM
from 4 to 5	change in level	1.5	7	6	3
	change in time	0.751	0.749	0.753	0.75
	electricity use per day	2.0	9.3	8.0	4.0
5th meter reading (2/8)	Level	75551	78955	63289	30293
	Time	10:12 AM	10:13 AM	10:10 AM	10:15 AM
from 5 to 6	change in level	3.5	25	19	6
	change in time	3.076	3.075	3.08	3.073
	electricity use per day	1.1	8.1	6.2	2.0
6th meter reading (2/11)	Level	75554.5	78980	63308	30299
	Time	12:02 PM	12:01 PM	12:05 PM	12:00 PM
from 6 to 7	change in level	1	11	11	4
	change in time	1.035	1.037	1.031	1.038
	electricity use per day	1.0	10.6	10.7	3.9
7th meter reading (2/12)	Level	75555.5	78991	63319	30303
	Time	12:52 PM	12:54 PM	12:50 PM	12:55 PM
from 7 to 8	change in level	1.5	9	10	3
	change in time	1.128	1.128	1.127	1.128
	electricity use per day	1.3	8.0	8.9	2.7
8th meter reading (2/13)	Level	75557	79000	63329	30306
	Time	3:56 PM	3:58 PM	3:53 PM	4:00 PM
from 8 to 9	change in level	1	8	13	3

	change in time	1.06	1.059	1.06	1.058
	electricity use per day	0.9	7.6	12.3	2.8
9th meter reading (2/14)	Level	75558	79008	63342	30309
	Time	5:22 PM	5:23 PM	5:20 PM	5:24 PM
from 9 to 10	change in level	1	10	7	2
	change in time	0.722	0.722	0.719	0.722
	electricity use per day	1.4	13.9	9.7	2.8
10th meter reading (2/15)	Level	75559	79018	63349	30311
	Time	10:41 AM	10:42 AM	10:37 AM	10:44 AM
	change in level	2	26	32	13
	change in time	2.972	2.972	2.972	2.972
	electricity use per day	0.7	8.7	10.8	4.4
11th meter reading (2/18)	Level	75561	79044	63381	30324
	Time	10:00	10:02	9:57	10:04
	change in level	3	7	10	3
	change in time	1.019	1.021	1.021	1.025
	electricity use per day	2.9	6.9	9.8	2.9
12th meter reading (2/19)	Level	75564	79051	63391	30327
	Time	10:27	10:32	10:27	10:40
	change in level	1	12	11.5	2
	change in time	1.046	1.047	1.046	1.044
	electricity use per day	0.96	11.46	10.99	1.92
13th meter reading (2/20)	Level	75565	79063	63402.5	30329
	Time	11:33 AM	11:39 AM	11:33 AM	11:43 AM
	change in level	1.00	9.50	11.50	3.00
	change in time	0.990	0.986	0.995	0.983
	electricity use per day	1.01	9.63	11.56	3.05
14th meter reading (2/21)	Level	75566.00	79072.50	63414.00	30332.00
	Time	11:19 AM	11:16	11:26 AM	11:18
	change in level	1.50	10.50	12.50	4.00
	change in time	1.002	1.004	0.99	1.001
	electricity use per day	1.50	10.46	12.58	4.00
15th meter reading (2/22)	Level	75567.5	79083	63426.5	30336
	Time	11:22	11:22	11:18 AM	11:20 AM

Participants 16 Through 19

	Identification Code -->	16	17	18	19
1st meter reading (2/1)	Level	43156	20595	13627	88321
	Time	10:58 AM	10:57 AM	10:49 AM	10:46 AM
from 1 to 2	change in level	56	24	33	94
	change in time	4.185	4.186	4.188	4.190
	electricity use per day	13.4	5.7	7.9	22.4
2nd meter reading (2/5)	Level	43212	20619	13660	88415
	Time	3:25 PM	3:25 PM	3:20 PM	3:20 PM
from 2 to 3	change in level	18	7	7	20
	change in time	1.019	1.019	1.021	1.023
	electricity use per day	17.7	6.9	6.9	19.6
3rd meter reading (2/6)	Level	43230	20626	13667	88435
	Time	3:53 PM	3:53 PM	3:50 PM	3:50 PM
from 3 to 4	change in level	14.5	4	8	18.5
	change in time	1.015	1.015	1.014	1.01
	electricity use per day	14.3	3.9	7.9	18.3
4th meter reading (2/7)	Level	43244.5	20630	13675	88453.5
	Time	4:15 PM	4:15 PM	4:10 PM	4:05 PM
from 4 to 5	change in level	12.5	4.5	6.5	9.5
	change in time	0.749	0.749	0.75	0.753
	electricity use per day	16.7	6.0	8.7	12.6
5th meter reading (2/8)	Level	43257	20634.5	13681.5	88463
	Time	10:13 AM	10:13 AM	10:10 AM	10:10 AM
from 5 to 6	change in level	37	19.5	32.5	54.5
	change in time	3.075	3.075	3.079	3.08
	electricity use per day	12.0	6.3	10.6	17.7
6th meter reading (2/11)	Level	43294	20654	13714	88517.5
	Time	12:01 PM	12:01 PM	12:04 PM	12:05 PM
from 6 to 7	change in level	12	6	8	16.5
	change in time	1.037	1.037	1.033	1.031
	electricity use per day	11.6	5.8	7.7	16.0
7th meter reading (2/12)	Level	43306	20660	13722	88534
	Time	12:54 PM	12:54 PM	12:51 PM	12:50 PM
from 7 to 8	change in level	15	7	13	21
	change in time	1.128	1.128	1.126	1.127
	electricity use per day	13.3	6.2	11.5	18.6
8th meter reading (2/13)	Level	43321	20667	13735	88555
	Time	3:58 PM	3:58 PM	3:53 PM	3:53 PM
from 8 to 9	change in level	10	8	11	19
	change in time	1.059	1.059	1.06	1.06

	electricity use per day	9.4	7.6	10.4	17.9
9th meter reading (2/14)	Level	43331	20675	13746	88574
	Time	5:23 PM	5:23 PM	5:20 PM	5:20 PM
from 9 to 10	change in level	13	3.5	6.5	9
	change in time	0.722	0.722	0.72	0.719
	electricity use per day	18.0	4.8	9.0	12.5
10th meter reading (2/15)	Level	43344	20678.5	13752.5	88583
	Time	10:42 AM	10:42 AM	10:37 AM	10:37 AM
	change in level	29.5	18.5	25	53
	change in time	2.972	2.972	2.972	2.972
	electricity use per day	9.9	6.2	8.4	17.8
11th meter reading (2/18)	Level	43373.5	20697	13777.5	88636
	Time	10:02	10:02	9:57	9:57
	change in level	9.5	8	7.5	16
	change in time	1.021	1.021	1.021	1.021
	electricity use per day	9.3	7.8	7.3	15.7
12th meter reading (2/19)	Level	43383	20705	13785	88652
	Time	10:32	10:32	10:27	10:27
	change in level	12	5	9	14
	change in time	1.047	1.047	1.046	1.046
	electricity use per day	11.46	4.78	8.60	13.38
13th meter reading (2/20)	Level	43395	20710	13794	88666
	Time	11:39 AM	11:39 AM	11:33AM	11:33AM
	change in level	10.00	6.00	9.50	15.00
	change in time	0.986	0.986	0.993	0.995
	electricity use per day	10.14	6.09	9.57	15.08
14th meter reading (2/21)	Level	43405.00	20716.00	13803.50	88681.00
	Time	11:16 AM	11:16 AM	11:23 AM	11:26 AM
	change in level	13.00	5.00	7.50	18.00
	change in time	1.004	1.004	0.997	0.99
	electricity use per day	12.95	4.98	7.52	18.11
15th meter reading (2/22)	Level	43418	20721	13811	88699
	Time	11:22 AM	11:22 AM	11:18 AM	11:18 AM

Participants 20 Through 22

	Identification Code →	20	21	22
1st meter reading (2/1)	Level	83248	60365	66618
	Time	4:55 PM	10:57 AM	10:57 AM
from 1 to 2	change in level	21	31	28
	change in time	3.934	4.186	4.186
	electricity use per day	5.3	7.4	6.7
2nd meter reading (2/5)	Level	83269	60396	66646
	Time	3:20 PM	3:25 PM	3:25 PM
from 2 to 3	change in level	6	11	11
	change in time	1.022	1.019	1.019
	electricity use per day	5.9	10.8	10.8
3rd meter reading (2/6)	Level	83275	60407	66657
	Time	3:52PM	3:53 PM	3:53 PM
from 3 to 4	change in level	7	8	11.5
	change in time	1.013	1.015	1.015
	electricity use per day	6.9	7.9	11.3
4th meter reading (2/7)	Level	83282	60415	66668.5
	Time	4:10 PM	4:15 PM	4:15 PM
from 4 to 5	change in level	6	9	5.5
	change in time	0.751	0.749	0.749
	electricity use per day	8.0	12.0	7.3
5th meter reading (2/8)	Level	83288	60424	66674
	Time	10:12 AM	10:13 AM	10:13 AM
from 5 to 6	change in level	19.5	22	20
	change in time	3.076	3.075	3.075
	electricity use per day	6.3	7.2	6.5
6th meter reading (2/11)	Level	83307.5	60446	66694
	Time	12:02 PM	12:01 PM	12:01 PM
from 6 to 7	change in level	6.5	11	7
	change in time	1.035	1.037	1.037
	electricity use per day	6.3	10.6	6.8
7th meter reading (2/12)	Level	83314	60457	66701
	Time	12:52 PM	12:54 PM	12:54 PM
from 7 to 8	change in level	7.5	14	7
	change in time	1.128	1.128	1.128
	electricity use per day	6.6	12.4	6.2
8th meter reading (2/13)	Level	83321.5	60471	66708
	Time	3:56 PM	3:58 PM	3:58 PM
from 8 to 9	change in level	8	8	10
	change in time	1.06	1.059	1.059

	electricity use per day	7.5	7.6	9.4
9th meter reading (2/14)	Level	83329.5	60479	66718
	Time	5:22 PM	5:23 PM	5:23 PM
from 9 to 10	change in level	5.5	7	3
	change in time	0.722	0.722	0.722
	electricity use per day	7.6	9.7	4.2
10th meter reading (2/15)	Level	83335	60486	66721
	Time	10:41 AM	10:42 AM	10:42 AM
	change in level	16	22	31
	change in time	2.972	2.972	2.972
	electricity use per day	5.4	7.4	10.4
11th meter reading (2/18)	Level	83351	60508	66752
	Time	10:00	10:02	10:02
	change in level	17.5	10	16
	change in time	1.021	1.021	1.021
	electricity use per day	17.1	9.8	15.7
12th meter reading (2/19)	Level	83368.5	60518	66768
	Time	10:30	10:32	10:32
	change in level	6.5	8	11
	change in time	1.044	1.047	1.047
	electricity use per day	6.23	7.64	10.51
13th meter reading (2/20)	Level	83375	60526	66779
	Time	11:33 AM	11:39 AM	11:39 AM
	change in level	6.00	10.50	8.50
	change in time	0.990	0.986	0.986
	electricity use per day	6.06	10.65	8.62
14th meter reading (2/21)	Level	83381.00	60536.50	66787.50
	Time	11:19	11:16 AM	11:16 AM
	change in level	7.00	7.00	9.50
	change in time	1.002	1.004	1.004
	electricity use per day	6.99	6.97	9.46
15th meter reading (2/22)	Level	83388	60543.5	66797
	Time	11:22 AM	11:22 AM	11:22 AM

Appendix H: Team Assessment

In our formative team assessments, we identified the following specific actions we would take to improve our performance:

- Spend more time writing as a group
- Utilize outlines before writing to improve organization
- Hold debriefing sessions after advisor MEFL meetings to assess what we intend to take away from the discussions
- Hold group update meetings to keep everyone aware of individual progress
- Hold more group discussions dedicated to critical thinking on creative ways to approach problems
- Take ourselves less seriously
- Stop ruminating over small decisions
- Have a more effective disagreement discussion process

Responding to each of these goals facilitated the production of the best possible IQP for our team. The formative assessments were extremely helpful in giving us a chance to identify our strongpoints and shortcomings. In addressing the shortcomings and capitalizing on our strong points, we took the following actions:

- Debrief after every MEFL staff or advisor meeting to discuss our key takeaways and develop specific tasks to act on them.
- We created a process to effectively discuss issues and disagreements. Each member would begin by stating his or her opinion and then as a group, we would weigh the benefits of each. If the discussion became redundant any member could step in and bring attention to the lull in progress. If we came to a lull, we would inquire if any members had a new or alternative idea to discuss and if no additional ideas were presented, we would make a decision.
- In trying to take ourselves less seriously, we would take time after work to discuss our project and hang out as a team in a relaxed environment. This boosted team morale and allowed for a freer flow of idea, both of which reflected themselves in our work and improved team dynamics.
- To improve the organization of our paper, we utilized a drafting system. Either individually or in groups of two, team members would create an outline or full draft for a section. The document would then be given to another group member for primary editing. After the primary edit, we would look at the document as a team and create a final copy. We found that this rigorous writing/editing process allowed us to produce well-vetted material.

The methods above are just a few of the many we used to work effectively together. We declined to use a structured work process, opting instead to maintain a relaxed environment that allowed us to respect one another and work together successfully. Future teamwork; however, could benefit from slightly more structured work process. One example of this is the lack of communication about individual progress. It would have been better for each of us to be on the same page with what everyone was working on at all times. Luckily this was a minor issue, and our team worked rather well in spite of it. Though we ran into this and other problems throughout the IQP process (formative team assessment depicts these problems), we took the specific steps listed above to them. We feel confident in the project we have produced.