Facilitating energy saving behaviours among university student residents

Rosemary Black, Penny Davidson and Karen Retra

November 2009
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Disclaimer

The views expressed in this report are solely the authors’, and do not necessarily reflect the views of Charles Sturt University, NSW Department of Primary Industries or people consulted during the research project.

Cover photos:

Collection of photographs from the project (Penny Davidson, Karen Retra).
EXECUTIVE SUMMARY

The purpose of this project was to test the effectiveness of two specific behaviour change strategies in reducing the household energy consumption by undergraduate university students living in self-catering on-campus housing. We trialed the installation of a digital display that would provide immediate feedback on energy consumption levels, and also trialled a mix of strategies that arose from an exploration of social marketing literature on the barriers and benefits to behaviour change. The energy consumption data reveals a generally consistent pattern of lower energy consumption (both gas and electricity) in the intervention groups than in the control. Across the different phases the reduction in electricity varied from 17% to 28% less than the control group; the reduction in gas varied from no decrease to a decrease of 19-34% in the final phase compared to the control group. We conclude that providing the separate tools of real-time feedback display and social marketing support strategies has a significant influence on energy consumption behaviours, and enhances intrinsic motivations. Our cost-benefit analysis suggests that an institution such as Charles Sturt University – at this current time – would most benefit from rolling out the social marketing strategies, but we expect that advances in technology and increasing demand will very quickly make the installation of ecoMeters (or similar) a desirable strategy.

The specific objectives of the project were:

1. To investigate the impact of social marketing strategies on the energy consumption patterns and behaviour of student residents;
2. To investigate the impact of real time feedback using in-house ecoMeters on the energy consumption patterns and behaviour of student residents; and
3. To compare the impacts of the two approaches on the energy consumption patterns and behaviour of resident students and trial an overall energy conservation program.

Advances in technology have made real-time feedback now possible, and studies have taken place in other countries as to their effectiveness in facilitating changed energy consumption behaviours (Shipworth 2000; Darby 2006; Petersen et al. 2007). We wanted to test the effectiveness of feedback in an Australian context, but also a context devoid of extrinsic motivators, or a reward system, such as pricing.

We set up a quasi experimental approach with students living on the Wagga Wagga campus of Charles Sturt University (known as the CSU cottage residents and the St Martins’ cottage residents), dividing the residential population into three groups (although this report later identifies four groups of cottages): a control group of 14 cottages which had no interaction with researchers or research project; a social marketing group which received the social marketing strategies (initially 15 cottages), and an ecoMeter / combined strategies group which had an in-house display unit (L+G ecoMeter) installed, providing residents with information on their current and recent electricity (initially 18 cottages). Every cottage in the study was fitted with a smart meter which sent usage data back to the Landis+Gyr (NMS) Network Management System website, providing us with a half-hourly profile of gas and electricity usage. We were able to monitor energy consumption over the three study phases. In addition to the energy consumption data which indicates whether or not the strategies were having an impact, we collected self-report data from the participants in the study through focus groups and an on-line survey. Overall we collected energy consumption data from 47 cottages.
The energy consumption data reveals a generally consistent pattern of lower energy consumption (both gas and electricity) in the intervention groups than in the control. Across the different phases the CSU cottages with EcoMeters used 22% to 26% less electricity than the control and the social marketing cottages used 17% to 28% less.

In the case of the St Martin’s cottages (which had additional electrical appliances) in Phase 1 they used 4% less electricity than the control, in Phase 2a they used 14% less and in Phase 2b they used 17% less than the control.

Despite some technical issues (see Results section, p. 14) with the gas data collection the general trend was for lower gas consumption among the intervention groups. In Phase 1 all groups consumed more gas than the control group! However across the next two phases gas consumption declined in the intervention groups to a range of 19% to 34% in the final phase.

The general reduction in energy use (both electricity and gas) was reflected in reduced greenhouse gas emissions among the intervention groups.

The main conclusion is that all three intervention options (ecoMeter, social marketing, and combined ecoMeter + social marketing) had a significant impact on energy consumption in the student cottages. Across these three testing phases there was not a consistent ‘better’ strategy and so we are not able to conclude that the ecoMeter is better than social marketing, or the combined approach is better than a single approach. However, the relatively high reductions produced by the St Martins’ group indicate an additional effect which we hypothesise is the development of a stronger social norm.

The qualitative data also indicated that the interventions had an impact on the participants’ behaviour with the poster receiving the highest rating of influence, followed closely by the night lights, shower timers and ecoMeters. Apart from the poster most other ‘tools’ were valued by some students but not by others; demonstrating the usefulness of providing a variety of tailored tools; at least one will be found relevant and influential for each person.

The project did not use any extrinsic motivators to encourage behaviour change, that is, students did not receive a lower bill, they did not enter into a competition, there was no penalty or reward for changed behaviour other than their own sense of satisfaction. Whilst undoubtedly extrinsic motivators will work, and might add to the impact observed here, these results demonstrate that extrinsic motivators are not needed to facilitate changed energy behaviours.

The success of the ecoMeter in facilitating reduced energy consumption highlights the usefulness of the provision of feedback in facilitating changed behaviour. The importance of feedback was reinforced by the requests from students participating in the social marketing group (which did not have the ecoMeters); they expressed some frustration at not knowing whether or not their behaviours were having an impact and so wanted to receive specific and comparative feedback.
Recommendations

As a consequence of this study we recommend that:

- Any energy saving program should aim to foster student involvement. The effect is going to be greater the more each student ‘buys’ into the task of reducing energy and for this reason it is desirable to have strategies that will foster energy reduction as a social norm. One way to achieve this is to encourage student involvement in the task at numerous levels.

- Maintenance problems in the cottages are repaired quickly e.g. dripping taps because if this is not done students feel as though CSU doesn’t care. The focus groups with students revealed some strong environmental values and students would point out the leaky taps, and express concern and disappointment about the delay in repairs. They felt that if the university didn’t care about issues such as water or energy then why should they; to them water and energy were all part of the big picture around the environment.

- Social marketing strategies should be installed across all CSU student cottages. At the time of writing this report this is a commitment the university has made.

- An additional study of the CSU halls of residence be undertaken to develop effective strategies in this context. Whilst the student population is highly likely to be similar to the current study, the housing conditions and elements of control are different, and we therefore cannot assume that the same barriers and benefits exist. At the time of writing this report this is a commitment the university has made.

- Feedback technology be installed when it is more accessible. For Charles Sturt University this means also considering whether they want smart meters on all cottages as individual metering is currently a prerequisite for the ecoMeter installation.
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INTRODUCTION

Individuals, communities, governments and industries need to change their practices to ensure that the environment continues to provide us with adequate resources and quality of life. Our increasing energy consumption which has the negative environmental impacts of adding to greenhouse gas emissions, contributing to acid rain atmospheric pollution and land degradation, and depletion of non-renewable resources is of particular concern.

Charles Sturt University has recently identified in its Institutional Development Plan (IDP) the need to operate more sustainably. This includes financial, social and environmental sustainability across all divisions and among both students and staff. To this end it has set specific targets in the IDP in relation to energy consumption, and greenhouse gas emissions (GHG). The first target aims to achieve a 10% reduction in energy consumption by 2011 (compared to 2006) and a 25% reduction by 2015, and the second target is to be greenhouse neutral by 2015 (CSU nd p. 5). This project assists in meeting these targets as well as contributing to the body of knowledge around reducing household energy consumption through the application of real-time feedback and social marketing strategies.

The project delivered behaviour change interventions to on-campus residential undergraduate university students living on the Charles Sturt University Wagga Wagga campus. The specific objectives of the project were:

1. To investigate the impact of social marketing strategies on the energy consumption patterns and behaviour of student residents
2. To investigate the impact of real time feedback using in-house ecoMeters on the energy consumption patterns and behaviour of student residents
3. To compare the impacts of the two approaches on the energy consumption patterns and behaviour of resident students and trial an overall energy conservation program.

The project was funded by the NSW Department of Energy and Utilities (now called the Department of Environment and Climate Change (DECC)), Public Facilities Program and significant and essential in kind support was provided by Country Energy, Telstra and Ampy ecoMeters.
BACKGROUND

There are a variety of reasons why energy consumption rates are of concern. Dey, Berger, Foran, Foran, Josken, Lenzen & Wood (2007) calculate that the average Australian household is responsible for 49 t CO2-e per annum. Thirty percent of these emissions are the result of direct household and personal activities. The current residential energy use at 402 PJ per annum (electricity, gas, wood and LPG) represents an increase between 1990 and 2008 of 24% (DEWHA, 2008). Although appliances have become more energy efficient our overall energy consumption continues to increase as we buy and use more appliances (Abrahamse, Steg, Vlek & Rothengatter, 2005; ABS, 2008a). No doubt energy efficient appliances can make a useful contribution to the reduction of energy consumption but we also need to foster changed behaviours associated with energy consumption (Costanzo, Archer and Aronson, 1986).

Changing the way household appliances are used provides a potential means of reducing energy consumption, and subsequent greenhouse gas emissions. However, fostering this change, as with other environmental behaviours, is a unique behavioural challenge because of the complexity of inter-relationships between behaviours and motives, delayed benefits against immediate gain, and environmental problems often perceived to be global in nature and out of the realm of the individual’s sphere of influence. One of the paradoxes of environmental psychology is that individuals generally hold pro-preservation attitudes but often engage in environmentally unfriendly behaviours (Shipworth, 2000; Barr, 2007). This discrepancy between environmental values and behaviour is well documented and often referred to as the “value-action gap” (Kempton, Boster, & Hartley, 1995). Research demonstrates that behaviour cannot be predicted on knowledge and/or attitudes alone (Abrahamse et al., 2005; Brandon & Lewis, 1999; McKenzie-Mohr, 2000; McMakin, Malone & Lundgren, 2002; Nordlund & Garvill, 2002; Shipworth, 2000; Stern, 2000); the strongest correlations are found between the attitude to doing a specific behaviour (eg putting fast food wrapping in the bin cf general concern for the environment) and the actual doing of that behaviour (East, Wright & Vanhuele, 2008).

We know there is a range of complex internal (individual, psychological and social) and external (institutional, economic, social and cultural) factors limiting people from making behaviour choices which are consistent with their environmental attitudes and values (Kolluss & Agyeman, 2002). The theory of planned behaviour, which is an extension of Fishbein and Ajzen’s theory of reasoned action (1975, Ajzen & Fishbein, 1980), explains the relationship between beliefs, attitudes, norms, perceived control, behavioural intentions and behaviours. It has been applied in relation to pro-environmental behaviours in a number of studies (e.g. Cheung, Chan & Wong, 1999; Stern, Dietz, Kalof & Guagnano, 1995; Taylor & Todd, 1995, 1997). Oreg, Katz-Gerro (2006) draw on the theory in stating that the best predictors of behaviour are behavioural intentions which have three antecedent factors:

“a) the extent to which individuals hold a favourable attitude toward the behaviour,

b) the individual’s perceptions of the norms and conventions regarding the behaviour and

c) the extent to which the individual perceives the behaviour to be under their personal control” (pp.463-464).

The value of the theory has been demonstrated in a number of studies and meta analyses (e.g. Boldero, 1995; Sparks & Sheperd, 1992; Taylor & Todd, 1995, 1997; Armitage & Conner 2001). For example social norms and others’ pro-environmental behaviour significantly influence the individual’s pro-environmental behaviour (Oskamp et al., 1991; Tucker, 1999; McKenzie-Mohr & Smith, 1999). That is, behaviour is likely to be modified when individuals are aware of an existing social norm and more importantly if they accept this norm (Fishbein & Ajzen 1975). Other psychological variables related to pro-environmental behaviours have also been independently explored, for example altruistic influences (Hopper & Nielsen, 1991), intrinsic motivations (De Young, 1998), self efficacy (Chan, 1998) and social norms (Oskamp et al., 1991Tucker, 1999). We now
recognise that an individual’s choice to participate in pro-environmental behaviours is a consequence, in some part, of a shared interest in ‘the other’ and not just based on self-interest (Kalinowski, Gary & Johnson, 2006).

In a review of intervention studies Gardner and Stern (1996) found that a key principle of successful interventions designed to change environmentally destructive behaviours was the use of multiple intervention types in order to address the many factors limiting behaviour change. They focused on the barriers or limiting conditions to behaviour change and found that until the barrier is removed there will be little or no change in the behaviour. There is supporting evidence that where attitudes do predict environmental behaviour this relationship is improved when obstacles or constraints to that behaviour are removed (Corraliza & Berenguer, 2000; Guagnano, Stern, & Dietz, 1995; Kaiser & Gutsch, 2003).

One approach to the identification and amelioration of behavioural barriers is social marketing. Social marketing draws on conventional marketing and market research strategies to facilitate behavioural change that will benefit society and the individual; this differs from the conventional marketing approaches which focus solely on benefits for the individual and seller. As with conventional marketing, social marketing assumes that the population can be grouped according to their likelihood to behave in particular ways or ‘buy’ into behavioural change. Social marketing focuses on promoting products and practices designed to provide social benefits as opposed to individual benefits and is used in situations where the ‘product’ is an action or changed behaviour i.e. people are ‘buying’ the changed behaviour (Kotler & Lee, 2008). To date this approach has been used in the promotion of products and programs that are designed to yield health or well-being benefits, as well as environmental benefits (Altman & Petkus, 1994; Kotler & Lee, 2008; Maibach, 1993; McKenzie-Mohr, 2000).

A prominent approach to social marketing is the Community Based Social Marketing (cbsm) advocated by McKenzie-Mohr and Smith (1999). They outline the five steps of social marketing:

1. identifying barriers to behaviours;
2. selecting which behaviour to promote;
3. designing a program to overcome the barriers to the selected behaviour;
4. piloting the program; and
5. evaluating it once it has been implemented.

Interventions may include antecedent tools such as information posters and/or consequent tools such as feedback or comparative feedback (McKenzie-Mohr & Smith, 1999). McKenzie-Mohr notes that social marketing has been widely applied in a range of projects in Canada, resulting in changed environmental behaviours (McKenzie-Mohr, 2000).

Social marketing has been taken up as an effective behaviour change ‘tool’ by many sustainability enthusiasts, and we chose to adopt this approach in addition to exploring the effectiveness of immediate feedback on behaviour. Feedback is a significant component of the learning process, whether it is learning to do maths, drive a car, or to reduce one’s energy consumption (Butler & Winne 1995). Feedback is a critical component of Kolb’s experiential learning cycle implicit in the ‘observe and reflect’ stage of the process. There is clear evidence that the provision of feedback, for example letting people know how much rubbish was correctly sorted, provides information that their behaviour is ‘working’ and is a useful support mechanism for behaviour change (DeLeon & Fuqua, 1995; Katzev & Mishima, 1992; Kim, 2005; Ragnarsson & Bjorgvinsson, 1991; Schnelle, McNees Thomas, Gendrich & Beagle, 1980; Van Houten, Nau & Marini, 1980). In a review of feedback studies Darby (2006) established that feedback can play a significant role in developing energy awareness and conservation. In the household energy context feedback techniques are an attempt to inform people about the impact of their energy saving actions. The importance of feedback in this context is that it makes energy more visible and more amenable to control by the consumer. According to Shipworth (2000) and Darby (2006) the provision of feedback can result in 10-20% reduction in energy use and when combined
with other incentives reduce energy consumption by as much as 30%. In the household energy context feedback might be provided by a meter or an associated display offering real-time data, or indirect feedback that has been processed in some way before it reaches the consumer, normally via billing (Darby, 2006). If we interpret sustainability as a process of ongoing improvement and assessment of changing conditions then feedback systems are crucial to the process of achieving sustainability (Newman 2005).

It is a common and socially acceptable approach to introduce financial rewards or penalties to encourage particular behaviours. Financial incentives are extrinsic rewards, a reward that is external to the individual, as opposed to intrinsic rewards which are internally derived such as a sense of satisfaction and pleasure. Authors such as Alfie Kohn (1993) suggest that the use of extrinsic motivators have the disadvantage of eroding any existing intrinsic motive. Research has found that extrinsic rewards are:

- ineffective if people would most likely have taken the action anyway,
- ineffective if people reduce energy only when there is economic reward; but
- effective if the financial incentive helps transform the market for energy efficiency products (Shipworth, 2000).

Acknowledging the ambiguity of external rewards, this study has sought to avoid them entirely. We have used emerging technology (ecoMeters) to provide real-time energy use feedback, combined with social marketing, in a context devoid of extrinsic motivators. That is, the study population did not receive any tangible consequence as a result of their behaviour as they are a population that do not pay energy bills and did not receive any rewards or penalties for increased or decreased energy bills. The residential managers, as opposed to the Residential Advisors, were requested by the researchers not to seek to influence the students’ energy behaviour though they did help to let intervention cottages know about the existence of the project.

FIGURE 1: WAGGA WAGGA CAMPUS STUDENT RESIDENCES USED IN THE STUDY.
METHOD

The study population was on-campus resident undergraduate students living in self-contained residences on the Wagga Wagga campus of Charles Sturt University (CSU) (Figure 1). Each residence (or “cottage”) accommodated eight students. The students were considered a homogenous group with a random range of ages and fields of study. The same group of students resided in the cottages during Phase 2a and 2b. Some of the students in Phase 1 may have resided in intervention cottages during Phase 2a and Phase 2b. The city of Wagga Wagga is located 245 kms west of Canberra the capital of Australia, in a temperate climatic zone experiencing a July (mid-winter) average minimum temperature of 0-3 degrees Celsius and a January (mid-summer) average maximum temperature of 30-33 degrees Celsius. Our sample population lived in 48 self-catered residences. These residences were all of similar brick construction and design.

This study used a quasi experimental design with three groups: a control group; intervention group A and intervention group B. Our data consisted of half hourly automatic electricity and gas measures; six monthly manual reads of gas and electricity used for confirmation, and qualitative data from the participants. Each residence had a smart or interval meter\(^1\) installed on the outside of the residence, which allowed us to receive web-based, detailed data about the gas and electricity consumption for that residence. These devices were also necessary precursors for the use of the in-house ecoMeters. We also collected qualitative responses from the participants, regarding the effectiveness of the interventions in influencing their behaviour, using focus groups and an on-line questionnaire.

The research was divided into three phases: Phase 1, Phase 2a and Phase 2b (see Table 1).

Phase 1 – involved the trialling of two behavioural intervention methods: social marketing and real-time feedback on behavioural change (seven week period from 3 Oct- 20 Nov 2007).

Phase 2a – involved the trialling of two behavioural intervention methods: social marketing and a combined intervention (social marketing and real-time feedback) (eight week period from 17 Apr -11 Jun 2008).

Phase 2b – a repetition of Phase 2a with additional energy use feedback provided in the social marketing weekly report to the students (11 week period from July-November 2008).

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<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Phase 2a</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Phase 2b</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

\(^1\) This device is different to the EcoMeter which is an energy display unit inside the cottage. The smart meter is a computerised meter that is located outside the cottage and can relay information back to the provider’s website and to the EcoMeter.
Ethics approval

Approval was gained for this project through the CSU Human Ethics Committee. Prior to all the focus groups, which signalled the beginning of the project, students were informed about the project, provided with an Information Statement (Appendix 1) and requested to complete an Informed Consent Form (Appendix 2).

Phase 1

The first group of 14 residences constituted the control group which simply had their energy consumption measured but had no formal interaction with the researchers or overt participation in the project. The second group of 18 residences had in-house ecoMeters (Figure 2) mounted on a wall in their kitchen or living room. These devices displayed the residence's current or past accumulated electricity consumption. The ecoMeter has the potential to display both electricity and gas consumption; our units displayed only electricity consumption. Each ecoMeter unit provided energy consumed, equivalent dollar cost, and GHG produced. The display has four coloured lights along its base that allowed residents to see at a glance whether their current energy consumption is low (green lights), average (yellow lights) or high (red lights). The lights were set so that one light (green) indicated current use was below 1kW; two lights (green) indicated use of between 1 and 2kW; three lights (yellow) indicated use of between 2kW and 4kw and all four lights (red) would illuminate when 4 kW or more was being used. The third group of 15 residences received a social marketing approach which used targeted strategies to ameliorate barriers or maximise benefits associated with reduced electricity or gas consumption.

Both intervention groups were invited to an initial information session on the project which outlined the key issues around energy consumption, greenhouse gas emissions and climate change i.e. why the project was being undertaken, and what the project entailed. It was made clear that a research officer would be available to provide ongoing advice and support. The ecoMeter group was also provided with training in the use of the display units. Students were also asked to complete a one page survey to collect socio-demographic data (see Appendix 3) and a New Ecological Paradigm (NEP) survey that provides an indication of participant’s environmental attitudes (Dunlap et al. 2000) (see Appendix 4). In the end we didn’t use this data in the analysis, partly as a consequence of not collecting from the control group members, and partly because it isn’t necessary to answer the key questions.

FIGURE 2: AMPY ECOMETER USED TO PROVIDE REAL TIME FEEDBACK
SOCIAL MARKETING INTERVENTION

The first task with the social marketing group was to ascertain what stopped or discouraged students from using less electricity and gas (the barriers), and what might motivate them or help them use less energy (perceived benefits). In line with other researchers (Abrahamse et al., 2005; Gardner & Stern, 2002; McKenzie –Mohr & Smith, 1999); three focus groups were held on the Wagga Wagga campus that explored barriers and benefits of reducing energy consumption associated with three specific behaviours. The behaviours were:

- turning off standby on appliances,
- turning off lights, and
- taking shorter showers.

These behaviours were targeted because they were likely to have a significant impact (e.g., hot water accounts for approximately 30% of household energy use) on overall energy consumption, and the students had control over these behaviours. The questions posed during the focus group are provided in Appendix 5. The focus groups were advertised using posters in the residences and personally promoted by the Residential Advisors. Sustenance was provided to the students during the focus group. The focus group discussions were audi-taped and transcribed and analysed for common themes and issues, essentially outlining the barriers and benefits to selected energy saving behaviours. Four tools were selected to promote the desired behaviours:

- shower timers which allowed the student to monitor how long they had been in the shower addressing the absence of someone reminding them to take a short shower, and tendency not to pay attention to how long they shower for;
- night lights (small, portable, low wattage lights) which could be installed in the living room or bathroom (we had intended they be installed in the hallways but there were no electricity outlets there) addressing safety concerns that students arriving home late at night or needing to use the bathroom in the middle of the night would trip in the darkness;
- three laminated posters targeting the three behaviours which provided information on strategies for reducing energy consumption and reasons for doing. The posters addressed lack of awareness of amount of energy used, and forgetting the usefulness of behaviours such as turning off lights and standby (see Figure 3). Each poster was located in a site considered most likely to have an impact. For example, the ‘lights off’ posters were put on the wall near the front light switch, the ‘shorter shower’ posters were put in the bathroom, and the ‘appliances off’ posters were put near the television and DVD player. The posters were designed and produced specifically for this project and its student audience. Other studies (Luyben, 1980; Staats, 2000; Zolik et al., 1982-3) suggest that posters can be an effective prompt and are effective if they are tailored to the target audience (see Abrahamse et al., 2005; Shipworth, 2000) and the information is relevant and personalised; and
- the residences also received a hard copy ‘weekly update’ feedback report which provided them with a brief overview on how much energy their residence had consumed in the last week, addressing lack of awareness of amount of energy used, and forgetting the usefulness of behaviours such as turning off lights and standby. These were posted in the living room on the notice board. Note this feedback differed from the ecoMeter group in that it consisted of a weekly summary not an instantaneous indication of their energy use.
EcoMeter Intervention

Eighteen residences received an ecoMeter. Once the display units were installed, and after the initial information session, the residents were not contacted again until the end of the semester (9 weeks later). The intention in Phase 1 was to test the impact of the feedback on the students’ energy consumption without any other support or motivating materials.

Phase 2(a)

As a result of the positive outcome in Phase 1 two modifications were made in Phase 2(a): targeting heating and cooling behaviours and the combination of the ecoMeter with social marketing strategies. Two focus groups were held with students that resided on the CSU Thurgoona campus. The aim of the focus groups was to ascertain what stopped or discouraged students (the barriers) from using less electricity and gas, and what might motivate them or help them use less energy in relation to heating and cooling. In line with McKenzie-Mohr and Smith’s (1999) community based social marketing method focus groups were held with a like population of students, but a population who would not be part of the intervention. The participants were initially divided into the two focus groups using a ‘sifting’ question that identified pro and anti energy saving behaviour. The focus group discussions were tape recorded and analysed for common themes and issues.

Phase 2a of the project was implemented between February and June 2008 (with a data collection period of 8 weeks). The two intervention groups in this phase were the ‘combined strategies’ intervention group which had both the social marketing strategies and an ecoMeter installed in their residences (18 residences), and the ‘social marketing’ intervention group (15 residences) which had only the social marketing strategy tools in
their residences. The focus group data identified the potential benefit of providing a thermometer in the combined strategy residences with additional poster information indicating the optimum maximum and minimum temperatures for heating and cooling the residences. As a result of feedback in Phase 1 we combined all the poster material onto one poster (plus we added heating and cooling information) and located the poster on the back of the toilet doors. The original information was generally modified to create a ‘new poster’ look. The ‘control’ group of residences did not have any interventions. In this phase we aimed to test whether combining real-time feedback together with social marketing strategies produced a better result than the two separate interventions.

PHASE 2 (B)

Phase 2b of the project was implemented between July and November 2008 (with a data collection period of 11 weeks). Phase 2b used the same interventions as Phase 2a with some modification to the social-marketing weekly report. This report was individualised for each cottage and showed the cottage’s electricity and gas use for that week, and in this phase the average of the control cottages’ electricity and gas use was also provided (Appendix 6). This modification was in response to comments made in the online survey data at the end of Phase 1, where students sought to have some way to benchmark their energy use against others.

EVALUATION OF THE STRATEGIES

The effectiveness of each intervention strategy was evaluated quantitatively and qualitatively. The quantitative measures, actual energy (electricity in kilowatt hours) consumed, allowed us to compare the intervention groups’ energy consumption with the control residences’ consumption.

We also evaluated the strategies using focus groups (qualitative data) which were held at the end of Phase 1 and Phase 2b. At the end of Phase 1, four focus groups were held with students who lived in the social marketing (2 focus groups) and the ecoMeter residences (2 focus groups). The questions posed during the focus groups are provided in Appendix 7. The aim of the focus groups was to gain an understanding of the students’ experiences of the social marketing strategies or ecoMeters, whether or not they felt they had influenced their behaviour or attitudes, and other feedback on the interventions and process used such as whether they felt the strategies were intrusive, and what other factors influenced their behaviour. The focus groups were advertised by the Residential Advisors and by displaying posters in the residences. The focus groups were audio taped and were analysed for common themes and issues. The feedback from the focus groups was used to refine the interventions for Phase 2a, which were implemented in 2008. At the end of Phase 2b the same process was employed with 1 focus group held with students living in the combined strategy residences and 1 focus group with those living in the ecoMeter residences.

Following the implementation of Phase 2a and Phase 2b of the project, feedback from participating students was also sought using an on-line survey (http://www.surveymonkey.com/). A prize of five movie tickets was provided as an incentive to complete the survey. Students were asked a number of questions and also presented with some statements that allowed them to indicate their agreement/disagreement (see Appendix 8). For example they were asked, did the interventions help you reduce or be more efficient in your energy consumption, and did the interventions help you learn more about how to reduce energy use? Depending on the question or statement ranked response options ranged from ‘not at all’ to ‘always’, and ‘strongly agree’ to ‘strongly disagree’.
The role of the research assistant

A research assistant (RA) was employed three days per week during the study period of two years. The research assistant had a number of roles:

- Organise and participate in delivery of information sessions for research participants
- Contribute to development of social marketing strategies
- Deliver social marketing strategies
- Liaise with research participants and relevant staff on the Wagga Wagga campus
- Manage collection and storage of data
- Contribute to analysis of data
- Contribute to writing up
- Provide project administrative support

The RA played a key role in the project particularly in developing the posters, collecting and analysing data and liaising with Ampy ecoMeters to gain energy consumption data, and was critical in ensuring the timely delivery of weekly feedback reports and maintaining communication between researchers, students, university staff and sponsors. Perhaps, more importantly, the RA was a ‘human face’ to the research and may have performed as a role model.

LIMITATIONS

Our method did have some limitations. Whilst we used a quasi-experimental design with a control group we cannot be sure that the students in the control group had no contact with the students in the intervention groups, or that there wasn’t communication between the intervention groups. Contamination of the control group implies that the control group was influenced by students in the intervention groups and therefore possibly making some effort to reduce their own energy consumption. That is, the energy consumption data of the control group would be lower than the base line we hoped for. If this was the case, our results are an underestimate of the change that took place. Historical data (from 2006) shows that the cottages consumed higher levels of energy than found during the study, even our control group consumed less than previous years. The overall lower consumption might be a result of a flow on effect from the intervention groups or contamination of the control group, or this reduction might be a result of external factors such as increased media attention to climate change. The reduction is not a consequence of structural change to the dwellings because there were no major infrastructure changes to the cottages prior or during the study. The overall lower use of energy might have been a consequence of climate differences, and this is discussed more fully later in the report.

After the start of the project we identified that St Martins’ cottages had additional electrical appliances installed (washing machine and clothes dryer) which meant that we had four smaller sample groups rather than the three intended groups. We have included the results from St Martins’ though as despite additional appliances they have managed to sustain significant energy reductions. In addition, when we installed the thermometers during the second phase we noticed some small differences in the heating thermostat, and we are unsure as to whether this slightly different appliance would have had an effect.

In addition we weren’t able to collect energy consumption data prior to the first week of commencement of the study (implementation of the interventions) due to the technical problems involved in installing the meters. Previous years’ data show no statistically significant difference between the social marketing and ecoMeter group averages – unfortunately we don’t have any previous year data for the control cottages data.
RESULTS

During phase 1 we became aware that the St Martin’s cottages were different (particularly relating to supplied appliances) from the CSU cottages. As a result, the St Martin’s data has been analysed independently and is presented later in this section.

In all groups and phases, electricity and gas data were checked to ensure a complete set of data were recorded and/or that the electronic readings matched manual readings. Any data that was incomplete or inconsistent was removed from the sample for that phase. See Appendix 10 for further detail. Kruskal Wallis analysis was used to ascertain whether or not there was any significant difference between the intervention groups and the control group in their energy usage. This test was chosen to test the significance between the nominal variable of intervention group, and measurement variable of energy used which is not assumed to be normally distributed. We have reported the Kruskal Wallis results only when they are significant or very near significant (the probability (p) is less than 0.05). We also analysed the data for correlations between the number of students in a cottage who formally participated and the level of energy consumption / reduction for that cottage. Whilst each intervention was applied to whole cottages, different numbers of students in each cottage formally participated in the study. Formal participation means that the student attended an information session, and/or provided feedback through the focus groups. We were interested to know if the cottages which had higher numbers of formal participants achieved better energy savings than the cottages with fewer formal participants. We analysed the data using Spearman’s rank correlation.

**Electricity**

The average weekly electricity use for all the residences in each of the three groups during Phase 1 (October-November 2007) are presented in Figure 3. It should be noted that the three groups did not have equal numbers of residences so it was deemed inappropriate to compare the total electricity used by each group, thus the groups' average energy use per residence is compared.

Figure 4 illustrates that the ‘ecoMeter’ residences used 24% less electricity than the control group and the social marketing group used 17% less than the control group during the test period suggesting that both strategies had an impact and that the ecoMeter had a somewhat stronger effect. Indeed a Kruskal Wallis analysis indicates that the social marketing group and ecoMeter group consumed significantly less electricity than the control group (p=0.007). The increase in electricity use toward the end of Phase 1 among all the groups reflects increasing daily maximum temperatures during this time, probably associated with an increased use of electric air-conditioning and refrigerators using more electricity to stay cool.
Phase 2a of the project was implemented between February and June 2008 (with a data collection period of 8 weeks). The two intervention groups in this phase were the ‘combined strategies’ intervention group which had both the social marketing strategies and an ecoMeter installed in their residences, and the ‘social marketing’ intervention group which had only the social marketing strategy tools in their residences. The ‘control’ group of residences did not have any interventions. In this phase we aimed to test whether combining real-time feedback with social marketing strategies produced a better result than the two separate interventions.

The average weekly electricity use per residence by group during Phase 2a is presented Figure 5.
Figure 5 illustrates that the ‘combined strategies’ residences used 26% less electricity than the control and the social marketing group used 28% less than the control group. This result indicates that social marketing had a stronger effect, reversing the outcome from Phase 1.

The slight increase in electricity consumption by all groups in the latter part of the test period probably reflects the decreasing average maximum and minimum temperatures and may reflect changing behaviours such as increased use of microwave ovens and kettles to heat food and drink, and the use of fan heaters in individual student bedrooms, as the temperature dropped.

Phase 2b of the project was implemented between July and November 2008 (with a data collection period of 11 weeks). The average weekly electricity use per residence by group during Phase 2b is presented in Figure 6. Phase 2b used the same interventions as for Phase 2a with some modification to the ‘social-marketing only’ weekly report.

Figure 6 indicates that the residences receiving the interventions had consistently lower electricity consumption averages than the control group, with social marketing using 24% less electricity and the combined group using 22% less. In this phase social marketing had a slightly stronger impact than the combined approach. However a Kruskal-Wallis analysis found that the intervention groups’ electricity use was close to, but not significantly different to the control group during this test period (p= .0637). Whilst the statistical testing is perhaps unnecessary for this ‘whole population’ study it does reinforce the causal relationships between the interventions and energy consumption.
Comparing the electricity consumption across the phases indicates that an overall reduction in electricity consumption was achieved by each of the intervention groups. In Phase 2a the statistical test of Kruskal-Wallis suggests that both interventions can be confidently linked to the reduction (p=.0637). There is not, however, a clear indication as to whether one of the intervention types produces a greater impact than another.

**Gas**

Gas data were collected during all the research phases, however, due to some technical difficulties the gas data were not collected from as many residences as electricity. Technical issues were encountered with the communication from the gas meter back to the electric meter communications module and were due to lack of signal strength causing multiple retries and deteriorated battery life. Most cases were resolved with the fitment of a gain antenna on the transmit and receive modules and with the fitment of a new battery on the transmission module. This issue occurred as the system used in the trial was still being developed and all results/issues from the trial were fed into the final system design. Manual readings taken from the gas meters of the cottages were used to check that the smart meter data was correct. Where the manual read data varied from the smart meter data by more than 2% this data was excluded from the sample. Unfortunately, this reduced our sample sizes for much of the gas data across all three phases. See appendix 10. For these reasons we believe the gas data to be less robust than the electricity data, and recommend that these results be treated cautiously.

It should be noted that as for electricity the three groups did not have equal numbers of residences so it was deemed inappropriate to compare the total gas used by each group, thus the groups’ average gas use per residence is compared. The average weekly gas use for all the residences in each of the three groups during
Phase 1 (October-November 2007) is provided in Figure 7. In Phase 1 the social marketing residences and the in-house display residences used slightly more gas than the control group (2% and 10% respectively).
The weekly average gas use per residence by intervention group is presented in Figure 8 for Phase 2a. In this phase the social marketing residences’ average use is 3% less than the control group and the combination residences used an average of 13% less than the control group. For this phase the combined impact of social marketing and the ecoMeter was stronger than just the social marketing.
In Phase 2b the social marketing group used 22% less gas than the control group and the combination group used 19% less than the control group, as shown in Figure 9. In this period the ecoMeter does not seem to have had an additive effect to social marketing. The decline in gas use by all the groups from early October indicates an increase in temperatures and a reduction in heater use in the residences.

![FIGURE 9: PHASE 2B- GAS USE](image)

Over the three phases there was a gradual decline in gas use by the intervention groups compared with the control group, suggesting that the intervention strategies had an increasing influence on the students’ gas consumption behaviour, or possibly there was a building of a social norm around being more efficient.

**GREENHOUSE GAS EMISSIONS**

Across all the phases the GHG emissions were calculated based on the average electricity and gas consumption for each of the groups.

The charts are very similar but not identical to those shown previously because electricity use produces more GHG emissions than gas use. In Phase 1 the social marketing group of residences emitted on average 13% less GHG than the control group and the display group emitted on average 17% less than the control group. The results are presented in Figure 10. Whilst the intervention groups consumed a similar, or somewhat higher amount of gas than the control the major greenhouse gas savings were attained from electricity reduction. Consequently, for Phase 1 the reduced electricity use by both intervention groups resulted in a significant greenhouse gas reduction (Kruskal Wallis p=0.0051).
In Phase 2a all of the intervention groups reduced their GHG emissions further compared to Phase 1. In the case of the social marketing group they emitted 16% less than the control group and the combination group emitted 20% less than the control group (see Figure 11). The analysis of the combined 2a and 2b phases reveals a significant difference between the intervention groups and the control group for greenhouse gas production with a p=0.0318. Kruskal Wallis for electricity and gas were slightly above p=0.05 value indicating a likely although not provable relationship between the interventions and the reduced energy consumption.
In Phase 2b the social marketing group increased the percentage reduction in GHG to 23% less than the control group and the combination group maintained its reduction of 20% less than the control group (see Figure 12).

**FIGURE 12: PHASE 2B WEEKLY AVERAGE GHG EMISSIONS PER COTTAGE, BY INTERVENTION GROUP**

This data shows that across the phases one form of intervention does not consistently out-perform the other, but again the interventions consistently correlate with reduced energy and gas use.

**ST MARTINS’ RESIDENCES**

Nine St Martins’ residences were included in this study. These residences are located adjacent to the other CSU residences on the Wagga Wagga campus. The buildings are similar to the CSU residences and are of brick construction. The residences are managed independently of CSU by an on-site manager. Theses residences also accommodate eight students, however, and unlike the CSU residences, each residence has a service room with a washing machine and clothes dryer, while the CSU residences have shared laundry facilities separate to their accommodation. St Martins’ cottages also typically have a freezer, which only one participating CSU cottage (in the social marketing group) had. As a result of these additional electrical appliances, and some variation in the heating systems, it was decided to separate the St Martins’ data from the other CSU residences’ data. As with all the residences, St Martins’ electricity data were deemed to be more reliable than the gas data, due to relatively small sample sizes for the latter. In most of the phases data were collected from all nine St Martins’ residences for electricity and between four to seven residences for gas (see appendix 10 for an overview of the sample sizes in each phase).

The ecoMeters were installed in the St Martins’ residences during Phase 1 and during Phases 2a and 2b these residences had the combined approach (ecoMeters and social marketing tools).
Phase 1

In Phase 1 St Martins’ electricity use was slightly less (4%) than that of the control group, as shown in Figure 13. Given the additional electrical appliances in these cottages, this may be quite a good result.

FIGURE 13: PHASE 1 ELECTRICITY USE WITH ST MARTINS’

St Martins’ gas use in phase 1 was considerably higher than the control group, as shown in Figure 14. Across this phase the St Martins’ cottages used 195% (or nearly twice) the gas used by the control group and significantly more than the other cottages with ecoMeters, which averaged 110% of the control’s use.

FIGURE 14: PHASE 1 GAS USE WITH ST MARTINS’
St Martins’ greenhouse gas emissions during phase 1 reflected their high gas usage, and were 26% higher than those of the control group, as shown in Figure 15.

FIGURE 15: PHASE 1 GHG EMISSIONS WITH ST MATINS’

In Phase 2a St Martins’ cottages had the combination (social marketing and ecoMeters) intervention. St Martins’ residences experienced a 14% reduction in electricity, an 18% reduction in gas and 16% reduction in GHG emissions, compared to the control group, as shown in Figures 16, 17 and 18.

FIGURE 16: PHASE 2A ELECTRICITY USE WITH ST MARTINS’
As occurred with the other intervention groups in this phase, the St Martins’ electricity reduction relative to the control was better than in the previous phase (although still not as good as the other intervention groups). In this phase St Martins’ used 14% less electricity on average compared to the control. As noted earlier, the social marketing and combination intervention groups used 28% and 26% less than the control group respectively.

FIGURE 17: PHASE 2A GAS USE WITH ST MARTINS’

Interestingly, having had the highest gas use in the previous phase of the project, in phase 2a the St Martins’ group used the least amount of gas. Their use was 18% less than the control, and lower than both the social marketing group (3% less than the control) and other combination intervention group (13% less than the control).

FIGURE 18: PHASE 2A GHG EMISSIONS WITH ST MARTINS’
The overall greenhouse gas emissions for St Martins in phase 2a were similar to the other intervention cottage results. St Martins emissions were 16% lower than those of the control, a result that was the same as the social marketing group and similar to the combination group (20% lower than the control).

In Phase 2b the St Martins’ residences demonstrated a 17% reduction in electricity, a 34% reduction in gas and, combined, a 27% reduction in GHG emissions, compared to the control group, as shown in Figures 19, 20 and 21.

FIGURE 19: PHASE 2B ELECTRICITY USE WITH ST MARTINS’

Again in phase 2b St Martins’ had interesting electricity results. Overall electricity consumption was very close to the CSU intervention cottages, despite their additional appliances. St Martins’ used 17% less electricity than the control group, compared to 24% less by the social marketing group and 22% less by the combination cottages.
Following the trend set in the previous phase, the St Martins’ cottages achieved the greatest reduction in gas use compared to the control in this phase. They used 27% less than the control, compared to a 22% reduction achieved by the social marketing group and a 19% reduction by the combination group.
Although St Martins’ energy reductions were more from lower gas use, than from their electricity results, it is interesting to note that the overall greenhouse gas reductions were achieved not only by the other two intervention groups during this phase but also by the St Martins group. In fact, St Martins’ produced the least GHG emissions of any of the groups in this phase, 27% less than the control (compared to 23% less for the social marketing group and 20% less for the other combination cottages).

GHG EMISSIONS ACROSS ALL TESTING PHASES

Figure 22 below summarises the results of the GHG emissions (from gas and electricity) for all the groups over the three phases illustrating that both interventions resulted in reduced emissions. As previously mentioned the gas data should be treated with caution due to the smaller samples. The actual amounts of GHG emissions (kg Co2) vary across the three phases because of the seasonal influences across the data collection periods. Phase 1 was conducted from October to November (a 7 week period), Phase 2a was conducted from April to early June (8 weeks) and Phase 2b was conducted from July to the end of October (11 weeks). The first phase is unsurprising in using the least energy as this phase is in spring when the temperatures tend not to be moderate. Phase 2b is across a period shifting from cool to cold, and so energy is increasingly being used for heating. Phase 2b is the longest study period starting in mid-winter and ending in mid-spring, and so heating plays a major part of energy use across this period.

FIGURE 22: SUMMARY GHG EMISSIONS (FROM GAS AND ELECTRICITY) WEEKLY AVERAGE PER COTTAGE, BY INTERVENTION GROUP

For comparison we include a chart of greenhouse gas production from electricity use only; because we had technical difficulties (see p. 14) in collecting gas data our average gas consumption figures are based on a smaller sample than used for electricity, and possibly less reliable (Figure 23). We provide the electricity data here to demonstrate that whether using electricity only data, or combined gas and electricity data, the pattern
of effect remains the same among the original intervention groups. St Martins’ cottages did not reduce their electricity use in phase 1 (with ecoMeters installed) as much as the other display cottages, however, their electricity use and therefore greenhouse gas emissions with the combined interventions in phases 2a and 2b showed greater reductions. This may reflect a significant effort on the residents’ part perhaps with heating and showers given that their cottages include freezer, washing machine and dryer appliances.

**FIGURE 23: AVERAGE WEEKLY GHG EMISSIONS FROM ELECTRICITY CONSUMPTION ONLY PER COTTAGE BY INTERVENTION AND PHASE**
TABLE 2: SUMMARY OF REDUCTIONS OVER THE STUDY PERIOD

<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th>Phase 2a</th>
<th>Phase 2b</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>SM</td>
<td>Eco-Meter (only)</td>
<td>St Martins’ Control (av weekly consumption)</td>
</tr>
<tr>
<td>average % reduction of electricity (% of control cottage average)</td>
<td>17% (83%)</td>
<td>24% (76%)</td>
<td>4% (96%) etc</td>
</tr>
<tr>
<td>average % reduction of gas (% of control cottage average)</td>
<td>Increase 2% (102%)</td>
<td>Increase 10% (110%)</td>
<td>Increase of 95% (195%)</td>
</tr>
<tr>
<td>average % reduction in ghg (% of control cottage average)</td>
<td>13% (87%)</td>
<td>17% (83%)</td>
<td>Increase of 26% (126%)</td>
</tr>
</tbody>
</table>

27
COST BENEFIT ANALYSIS

The following section provides estimates of dollar savings for both electricity and gas for each intervention group types per cottage per week for the three Phases. We have calculated savings based on the pricing of 10c per kWh for electricity and 1c per MJ for gas consumption.

In Phase 1 the actual dollar savings from reduced electricity and gas per cottage per group per week (see Table 3) were approximately $5.60 for the display group, $4 for the social marketing group and St Martins’ paid on average $10.80 more per cottage.

<table>
<thead>
<tr>
<th>Phase 1 Dollar savings, per cottage, by group, per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>elec $</td>
</tr>
<tr>
<td>Social Marketing</td>
</tr>
<tr>
<td>ecoMeter</td>
</tr>
<tr>
<td>St Martins’</td>
</tr>
</tbody>
</table>

In Phase 2a the actual dollar savings from reduced electricity and gas per cottage per group per week (see Table 4) were approximately $14 for both the display, $9 for the combination groups and $13 for St Martins’.

<table>
<thead>
<tr>
<th>Phase 2a Dollar savings, per cottage, by group, per week</th>
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</thead>
<tbody>
<tr>
<td>elec $</td>
</tr>
<tr>
<td>Social Marketing</td>
</tr>
<tr>
<td>ecoMeter &amp; Social Marketing</td>
</tr>
<tr>
<td>St Martins’</td>
</tr>
</tbody>
</table>

The actual dollar savings from reduced electricity and gas per cottage per group per week (see Table 5) were approximately $24 for the social marketing, $21 for the combination groups and $31.50 for St Martins’. The longer study period which occurred over the high use months reveals an increased benefit in terms of actual savings (10% of 100 is 10 cf 10% of 20 which is 2), but also it is possible that Phase 2(b) benefits from an accumulated impact of Phases 1 and 2(a).
### TABLE 5: PHASE 2B DOLLAR SAVINGS

<table>
<thead>
<tr>
<th>Phase 2b Dollar savings, per cottage, by group, per week</th>
<th>elec $</th>
<th>gas $</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Marketing</td>
<td>6.69</td>
<td>17.24</td>
<td>23.93</td>
</tr>
<tr>
<td>ecoMeter &amp; Social Marketing</td>
<td>6.15</td>
<td>15.27</td>
<td>21.43</td>
</tr>
<tr>
<td>St Martins'</td>
<td>4.66</td>
<td>26.89</td>
<td>31.55</td>
</tr>
</tbody>
</table>

The baseline data (CSU, 2007 Peter Taylor) collected prior to the commencement of the study indicates that each of the cottages were using about $1,000 of electricity and $2,000 of gas annually (ie $270,000 pa for 90 cottages). Based on the above estimated weekly savings in electricity and gas, and recognising that this project trialled the interventions for a relatively short period of time and the rate of energy use varied across semesters in response to the seasonal climate, we can provide some estimated savings. Energy use varies greatly throughout the year, but on average each cottage uses $1000 of electricity per year, and $2000 of gas per year (figures rounded up from 2006 data). The average percentage of electricity saved across the interventions is 19.5% or $195 each year. The average percentage of gas that was saved across the interventions was 18% (excluding phase 1), equivalent to $360 per annum. If these figures are extrapolated for all 90 cottages across CSU there is a potential to save up to $49,950 per annum.

**Costs of implementation**

The cost of implementing the different intervention strategies was estimated over the research period. It is estimated that the cost of developing and implementing the social marketing strategy was $1,782 per cottage and for the ecoMeters it was $1,874 per cottage (see Appendix AA). The social marketing intervention included the planning and delivery of information sessions, significant travel from Albury to Wagga Wagga, planning and facilitating focus groups, the Research Assistant’s time which was significant and the purchase of the social marketing tools. The ecoMeter intervention included costs such as the planning and delivery of information sessions, the Research Assistant’s time which was significantly less than the social marketing intervention and the cost of the ecoMeter, smart meter and its installation.

The actual implementation costs as part of the research project were similar for both interventions and they both reduced their energy consumption and GHG emissions by similar amounts. However, when the cost of implementing the two interventions as an ongoing strategy (not research) is estimated over 5 years for 90 cottages the costs decrease considerably. In the case of the social marketing approach the total cost for 5 years for 90 cottages is estimated to be $46,300 at an average cost over 5 years of $103 per cottage per year and if the ecoMeter approach was adopted the estimated costs over 5 years would be $238,000 with an average cost per cottage over 5 years of $529 per year.

The cost per cottage is significantly less for the social marketing approach because the tools are much cheaper than the purchase and installation of the ecoMeters and smart meters. Also, the research costs for the social marketing approach reflect the investment costs of this approach but this is a one off cost and won’t be required for ongoing implementation. The social marketing costs also included travel between Albury and Wagga Wagga, a cost which could be overcome by employing local personnel rather than across campuses. Overall these figures and the savings in energy and GHG emissions suggests more benefits would be gained from the installation of the social marketing approach across CSU. However, in the future consideration should be given to the ecoMeters as the price of these devices will probably be reduced, and their installation will probably become easier.
The costs of this project have been estimated in dollar terms, but we have not factored or tried to offset the environmental costs of the project. The environmental costs in implementing the project would have been most significantly in the researchers’ travel between Albury and Wagga Wagga and the cost of the production of the ecoMeters, and other devices used in the study. Travel between the campuses will certainly be minimised for any recommended roll out of these tools, and all the equipment will continue to be used.

Correlation between number of students and results
Using Spearman’s rank correlation we found that whilst there was no statistically reliable correlation for gas there was a statistically reliable correlation between electricity consumption and the number of students in the cottages (p=0.0094), and greenhouse gas production with the number of students in the cottages, p=0.0238. That is, the more students in a cottage that ‘signed up’ to the project the less energy that cottage consumed.

REPORTED ATTITUDE AND BEHAVIOUR CHANGE AMONG STUDENTS
Following the implementation of Phase 2a of the project, feedback from participating students was sought using an on-line survey (Figure 24). Students were asked a number of open-ended questions and also presented with some statements that allowed them to indicate their agreement/disagreement (see appendix 8). For example they were asked, did the interventions help you reduce or be more efficient in your energy consumption, and did the interventions help you learn more about how to reduce energy use? Depending on the question or statement ranked response options ranged from ‘not at all’ to ‘always’, and ‘strongly agree’ to ‘strongly disagree’. Twenty eight responses from students residing in either the ‘combined strategies’ or ‘social marketing’ residences were received. It should be acknowledged that this may represent a biased sample of students who were highly motivated and interested in changing their energy saving behaviour.

FIGURE 24: RESULTS OF THE ON-LINE SURVEY: STUDENT PERCEPTION OF TOOL EFFECTIVENESS PHASE 2A
Figure 24 presents the results of the participant on-line survey at the end of Phase 2a. Responses that were ‘strongly agree’ and mildly agree’ and ‘always’ and ‘often’ were aggregated to produce percentage of positive responses and are presented in Figure 24. Responses that were ‘not applicable’ were excluded from the results. Less than half the student responses indicated they found the interventions of thermometer, and weekly energy consumption reports as useful in helping to reduce energy consumption. The interventions that received the highest ratings were the night lights, shower timers and the posters; ecoMeters being the next favoured. About 85% of the students felt the night lights helped them to reduce or be more efficient in their energy consumption. The ecoMeter, as judged by the electricity data, encouraged reduced electricity consumption, but was not rated as highly as the posters, night lights and shower timers by the students. One student commented: ‘I think the shower timer was the best idea because it lets me know how long I’ve been in the shower for and not only helps me save water and energy but helps me get ready in time!’ and ‘The night lights were great. I liked them so much I have bought some for my family and we use them at home now!’

The results of the online survey with the students at the end of Phase 2b are shown in Figure 25 and indicate the night lights and posters were viewed as the most effective strategies in helping students to be more energy efficient. The posters were rated the highest item across all questions suggesting that a well designed and placed poster could have a significant effect. However, based on other feedback, it would also need to be changed regularly. Nightlights were consistently rated second highest suggesting that in situations such as shared dwellings the night light technology offers a convenient alternative to leaving lights on all night. The shower timer and ecoMeter alternated for third place also indicating that these technologies can help people change their behaviour around energy consumption. In line with the results from Phase 2a (Figure 24) all the
strategies except the thermometer rated highly in ‘now thinking that it is easy to reduce energy’. The thermometer, switch-off sticker and weekly energy consumption reports were rated as the least effective.

Additional feedback was attained from focus groups at the end of Phase 1 and Phase 2b reporting indicated some change in behaviour and attitudes towards energy use and consumption. The tangible tools of nightlights, shower timer and posters were considered the most useful in helping to reduce energy consumption followed by the ecoMeter. The night lights encouraged some students to turn off lights at night and the posters, particularly the one on the back of the toilet door were read and reported as being influential.

* I found the little reminders very useful in making me aware of the issue of energy consumption. It is not something you generally concern yourself with. Being able to read posters, and see action being taken to solve the issue, increased my awareness and motivation about actively taking a role in the reduction of energy use in my house.*

The weekly updates rated poorly. We found it difficult to get the right format for these reports and to set up a delivery system that was reliable. In hindsight the report could have been bolder and brighter, A3 instead of A4 size and coloured instead of black and white, and with clearer comparative information.

In contrast, the poster was the most effective learning tool regarding the importance and reasons for reducing energy consumption, and also in learning how to reduce energy consumption. Positive feedback was received on the poster located on the back of the toilet door,

*Posters in the toilet very effective ... found myself reading them each time*

and there were several comments about changing the information content on the posters, for example

*Change the posters so there are different "tips".*

The benefit of information posters is that they can be tailored to be specific and relevant to the particular target group, and it is relatively easy to ensure the information reminds and explains the benefits of behaviour change (McKenzie-Mohr & Smith, 1999; Shipworth, 2000). The night lights, ecoMeter and shower timer were also considered useful in helping people to learn how to reduce energy consumption, presumably as a result of their direct experience with the action and its consequence.

The feedback on the ecoMeter indicated the units facilitated a greater awareness of appliance energy consumption, and delivered a reminder to perform chosen behaviours (commonly switching off unused appliances or lights). Students indicated that the ecoMeters ‘only sometimes’ helped to reduce energy consumption but they had a greater impact on helping the students understand the importance of reducing energy, and the ease of reducing energy. It seems then that the ecoMeters, and the real time feedback they offer, do contribute to a greater awareness of energy usage and facilitate reduced energy consumption. The feedback offered by these instruments is internally comparative, that is, the reader is able to compare their own current use to past use. Several students suggested providing comparative feedback with other residences so that they had a clearer sense whether they were ‘doing well’ or not compared to others, in a sense they were asking to be benchmarked. We addressed this comment in Phase 2b for the social marketing group by adding the control usage data to the weekly usage reports. Interestingly, the students also suggested introducing a competition between residences or groups of residences to help motivate themselves toward a greater result. According to Abrahamse et al. (2005) giving comparative feedback can reinforce a sense of group identity, and provide a feeling of competition, social comparison and social pressure which may be particularly effective when important or relevant others are used as a reference group, however throughout this study we deliberately avoided using comparative feedback and other forms of competition or external rewards as competition can also be a de-motivator for those groups who are not ‘winning’.
The open ended questions revealed further detail on the students’ views of the interventions and the project. The students were asked if there was anything they found particularly useful about the interventions. Many students mentioned the value of the night lights as an alternative to keeping the residence lights on all night. Several students mentioned that they are or will use them in their own homes:

The night lights helped, we could walk around at night without turning all the lights on.

Night lights (were) useful for when one person is home late but you don’t want to keep the kitchen/living room lights on but want them to have some light to know where the couch etc is.

Loved the night lights, we use them at home now.

The night lights were a great idea I want to get some for when I move off campus

The posters were also well received because the students thought they were informative and easy to read.

Being able to read posters, and see action being taken to solve the issue, increased my awareness and motivation about actively taking a role in the reduction of energy use in my house.

The posters were great and very informative and easy to read.

The shower timers were also considered a useful tool to reduce hot water consumption, although many students seemed to use the clock capacity rather than setting a specific time for a shower.

Barely used the shower timer but just having the time there helped me remember just to be quick in shower.

The timer in the shower, especially considering it has a clock so that you can time without having a countdown timer, which is the only way I use it. I do not like feeling rushed or hurried, but if I am trying to reduce my time myself without a specific deadline it works much better.

The ecoMeters were mentioned by many students as a useful tool as a simple and easy way of monitoring their energy use.

(The) in-house unit very helpful. Often power was reduced because the unit displayed red.

I found the in-house display very useful. If I noticed that it had a high reading I would go around the cottage looking for things to turn off.

However despite these positive comments some students mentioned some of the negative aspects of the interventions such as the malfunction of shower timers and missing posters and night lights.

Only a small thing, but about half way through the year our shower timer stopped working properly. Up until then I had been finding it really helpful, but once it broke, I found myself taking longer showers again.

The students were asked if any of the interventions could be more effective. Most of the comments related to the weekly reports and the posters. In the case of the former the students mentioned the need to provide additional information about the actual costs of energy consumption and what appliances contributed most to the consumption. The students considered the posters could be improved by changing them regularly and providing new information. Several students suggested a competition between residences would be a useful approach.
Change the posters so there are different "tips". Have comparative posters between cottages - make a competition out of it.

More attention (should be) paid to weekly energy consumption reports and what contributed most to energy consumption

Further detail about how much it would cost in the real world on the ENERGY CONSUMPTION REPORTS.

A final comment from one student illustrated the value of the project as a long term strategy to educating and increasing students’ awareness of energy consumption both from financial and environmental perspectives.

It is definitely a good idea to get university students thinking about energy consumption now so by the time they move out into a house they can not only save on their electricity bill but also do good by the environment.

WEATHER OBSERVATIONS

How much energy we use in our homes, as Figure 26 demonstrates, is influenced by the current weather conditions. Figure 26 demonstrates that electricity consumption in the student cottages parallels the weather conditions (heating primarily uses gas); as the weather warms up electricity consumption increases. While the mean monthly maximum and minimum temperatures in 2006 (some baseline data was collected in 2006), 2007 and 2008 did not vary greatly, it should be noted that 2006 tended to have slightly lower mean minimum temperatures than 2007 and 2008 (see Figure 27) and slightly higher maximum temperatures (Figure 28). This might lead to less energy consumption in winter, and more in summer! As such we don’t believe that the weather has contributed to any significant difference in energy consumption over the three years.

FIGURE 26: AVERAGE WEEKLY ELECTRICITY USE AND TEMPERATURES, PHASE 1
FIGURE 27: AVERAGE DAILY MINIMUM TEMPERATURE 2006-2008 (JULY TO DECEMBER)

FIGURE 28: AVERAGE DAILY MAXIMUM TEMPERATURES 2006-2008 (JULY TO DECEMBER)
DISCUSSION

This study provided evidence of behaviour change through both quantitative data – electricity and gas – use as well as the qualitative data of focus groups and surveys. Previous studies have tended to focus on self report data (Abrahamse et al., 2005) – we had both self report and quantitative measures of energy consumption. As such we were able to measure the impact of the behaviour modification strategies on electricity and gas consumption. Note however, the gas data is drawn from a smaller sample and for this reason we discuss the impact on electricity and gas consumption separately.

Overall, each of the three types of interventions used in this study resulted in reduced electricity use and greenhouse gas emissions among the resident university students. Across the trialled strategies the social marketing intervention produced the best result in electricity reduction (up to 28% less than control), although the ecoMeter alone also produced a high result (24%). St Martins’, as expected has a higher electricity usage because of the installations of washing machines and dryers in the residences, but still was able to reduce their electricity to lower rates than the control, which in effect demonstrates a good overall effort. Interestingly the St Martins’ residences outperformed (i.e. used less) the control except in Phase 1 gas use, though to a lesser extent than the other residences. It should be noted that despite the fact that these residences had more high energy consuming appliances compared to the CSU residences they still experienced reductions in electricity, gas and GHG emissions relative to the control group. Although these reductions can be partially explained by the interventions, the St Martins’ results suggest an additional effect which we hypothesise is the development of a strong social norm. The combined approach (social marketing and ecoMeter) did not result in a greater reduction in electricity consumption but did seem to have a stronger effect with respect to gas consumption.

Our results support prior work (Abrahamse et al. 2005; Darby 2006; Van Houwelingen & Van Raaij 1989) indicating that feedback alone can facilitate reduced energy consumption. Students who did not have an ecoMeter installed in their residence requested ‘feedback’ on the effectiveness of their changed behaviours. We made an effort to give them weekly feedback which contained their own energy consumption and the consumption of the control group. One of the ‘rules’ of feedback is to make it relevant and given in a context that makes sense to them – ie give them some kind of comparison or benchmark – we made this benchmark the control group not the ‘other’ group (combination group) in the study. We were deliberately trying not to set up a competitive relationship between the social marketing and combination groups. The student requests for feedback indicates the importance of this information for the person attempting to change their behaviour. The average householder will receive feedback on their energy consumption through their bill but these arrive so far apart that it is easy not to pay a lot of attention to them and they can’t provide feedback that the action we might have done last week had an impact and was therefore worth continuing. Undoubtedly feedback was valued by the students and emerged as an important part of the learning process.

Although the gas data should be treated with caution we can validly compare St Martins’ gas consumption with the other two groups because the additional appliances in St Martins’ consume electricity not gas. That is, we would expect St Martins’ gas consumption to be on par with the CSU residences. We found, except with Phase 1 where all groups used more gas than the control, the amount of gas consumed was less than for the control group over Phases 2a and 2b for all groups. Interestingly gas consumption appears to improve (continue to go down) over the three stages with the best outcome for all groups in Phase 2(b). The social marketing group had a decrease of 3-22%, combination group’s gas consumption decreased by 13-19%, and St Martins’ gas use decreased by 18-34%. In the latter two phases the St Martins’ group (combined approach) provides the strongest effect with up to 34% decrease in consumption. This suggests that the combined strategies are having the greatest impact with respect to gas consumption. This is an interesting effect as the
ecoMeter displays were not giving feedback on gas consumption, but suggests that there is a flow on effect from the electricity data. The increasing improvement also indicates the possibility of the development of social norms around lower energy consumption.

Greenhouse gas emissions

The GHG emissions were calculated using the electricity and gas consumption for each of the groups. In all except St Martins’ Phase 1, the GHG emissions were less than the control. The combined approach of St Martins’ in Phase 2b had the strongest effect of 27% reduction in GHG than the control, and the social marketing group had the next strongest effect over the CSU combined group. The combined strategy applied by CSU residences compared to St Martins’ residences differs, with St Martins’ having the stronger effect, despite also consuming more electricity. It is possible then that there is an additional factor with the St Martins’ residences, which will be discussed later. These results also suggest that all three approaches: the ecoMeters, social marketing, and combined approach facilitated energy saving behaviour change. Whilst energy reduction is important in terms of less pressure on finite resources a key outcome is also on reduced greenhouse gases. The conversion of energy savings to GHG emission reductions may be a powerful way of presenting the value of such a program to institutions that wish to reduce their environmental impact (Abrahamse et al., 2005).

Physical tools

The benefit of physical tools such as those used in the social marketing strategy is that they provide ‘technical’ help and support for targeted behaviours. The tools selected in this study were chosen in response to the focus group feedback from the students, but were also selected because they were low cost and easy to implement. The student feedback on the social marketing tools indicated that some of the tools like the shower timers, nightlights and posters were very useful in helping students reduce energy as well as learning how to reduce energy. The ecoMeter was rated less highly by the students overall but was considered useful by the students in helping them understand the importance of reducing energy and the ease of reducing energy. This suggests that the ecoMeters and the real time feedback they provide contributes to a greater awareness of energy use and facilitate reduced energy consumption. The 17% to 28% decrease in electricity consumption compares well with other studies such as the overall 5% reduction and 30% reduction in peak times found in the Country Energy study (Hamilton nd; Riedy 2006); and the 32% reduction in electricity in student dormitories where feedback, education and incentives were used (Petersen et al, 2007). It should be noted that in the Country Energy study behaviour would also have been influenced by the ‘time of use tariff’ as well as the real-time feedback provided by display meters. In comparison Darby’s review on the effectiveness of feedback on energy consumption (2006) revealed that direct feedback savings can range from 5-15%, whereas indirect feedback can produce 0-10% savings.

Multiple strategies

One of the success factors identified by both Shipworth (2000) and McKenzie-Mohr (2000) was the tailoring of tools to the target group. Our approach was a direct response to factors raised by the students and were relatively unobtrusive but very accessible. In summary our strategies were:

- Real-time feedback - ecoMeters
- Information - posters
- Night lights
- Shower timers, and
Contribution to the development of social norms around energy reduction.

Clearly we have limited the diversity of values and attitudes in our respondent group by focusing on the specific population of students in self-catered residences, however the varied responses to the tools reveal that having a mixture of tools and strategies is useful in encouraging behaviour change. The literature (Stern, 1999; Shipworth, 2000) suggests that a mixture of strategies works because there is more likely to be at least one strategy in the mix that will have an impact on someone in the targeted population (Shipworth, 2000).

Social norms

We hypothesise that social norms may have played a role in the project, and might be the contributing factor that explains St Martins’ high performance. Social norms are the behavioural expectations and cues within a society or group and the rules that a group uses that guide values, beliefs, attitudes and behaviours (Dulauf and Blume, 2008), sometimes producing compliance and conformity (McKenzie-Mohr & Smith 1999). Pro environmental social norms have been fostered by inducing individuals or communities to perceive pro environmental behaviours positively; the pro environmental atmosphere is established through techniques such as role modeling and the block leader approach (McKenzie-Mohr & Smith, 1999; University of Toronto, 2006). Many studies have demonstrated the importance of social norms in shaping pro-environmental behaviour (Aronson & O’Leary, 1983; Oskamp et al., 1991; Tucker, 1999, McKenzie-Mohr & Smith, 1999). For a number of reasons the nine St Martins’ cottages are likely to have a stronger sense of identity and social norm development than the CSU cottages. The St Martins’ cottages are smaller in number, have a core philosophical base (Christian providers), and have regular community events and interaction among the residents. As a result of the overall greater group cohesion it is possible that social norms that encouraged and supported energy saving behaviour were established contributing to the high performance of this group of cottages.

The study also provided evidence that the more students that ‘bought in’ to the project the more effective were their energy saving behaviours. It is possible that this effect is simply the result of the greater number of individual efforts within a cottage, that is, 5 people taking shorter showers and turning off their computers compared to only one or two. It is also possible that the larger number of participants in a cottage had an influential effect on other students in that cottage who had not initially been interested in the project. Further work needs to be done to explore this matter, but certainly the work of Aronson & O’Leary (1983), Oskamp et al. (1991), Tucker (1999) and McKenzie-Mohr & Smith (1999) suggests that facilitating social norms within each student cottage will have a desirable effect.

At a broader scale, the project contributed in making energy saving a public issue particularly on the Wagga Wagga campus by drawing students’ (and some staff’s) attention to the issue through regular updates and contact, presentations, surveys, focus groups and visibility of the tools. These were aspects of the project extraneous to the specific interventions. Participant involvement was encouraged through processes of consultation about the barriers and benefits of energy related behaviours. The students were also kept up to date with project progress with a mid-project information session, and their comments were used to modify strategies across the phases. In addition we drew on the student body, the Residential Advisors, to help facilitate change behaviour by provide information and context for students. Other studies have demonstrated the value of ‘block leaders’ and residential advisors (Newsom & Makranzy, 1978; Hooper & Nielsen, 1991; Coltrane, Archer & Aronson, 1986) providing face-to-face communication with program participants, information, support, prompts and sometimes training. Shipworth (2000) has suggested that personal face to face communication through social networks can be a good way to enhance program effectiveness. The study supports Stern’s (1999) view that there is high value in involving the students in research process as well as the implementation of the interventions. In this way we were using social networks which are seen as trustworthy; we know that information received from friends receives attention because of the similar socio-demographic
profile (what is relevant to them is relevant to me) and ability (what they can do I can do) to take energy actions (Costanzo et al., 1986; Shipworth, 2000).

Institutional norms

In this study the physical tools were installed free of charge by the project, and in some cases may have been perceived by the students to have been provided by the university. The university was mentioned in the information sessions in relation to their target of being greenhouse neutral by 2015 (CSU, nd). The posters also noted this information. We were building the perception that the university is concerned about the need to reduce energy consumption for environmental reasons. It is possible that this perception provided additional motivation among the students and also created a social norm of ‘caring for the environment’ among the students. Students revealed that any indication that the university was not demonstrating responsibility for their environmental actions was a strong de-motivator for environmental actions. Institutional action around energy saving or other pro-environmental activity will be seen by energy users as part of a larger institutional strategy and confirm for energy users that the larger organisation also ‘cares for the environment’ and is making a contribution. This supports the findings of other studies that indicate that an organisation promoting or marketing ‘green’ actions or products should have an excellent environmental reputation and practice what they preach (Crane, 2000; Shipworth, 2000; Burgess, 2003; Diaz-Rainey & Ashton, 2008). Consistent actions by an institution will help assist the creation of a social norm among all its constituents. Further research to assess the impact of this organisational support needs to be undertaken. Should CSU, for example, improve on the structural features of the residences such as improved insulation, installation of low energy light bulbs, energy efficient appliances or better fitting, thermal window coverings, an opportunity would exist to evaluate the influence of factors outside the students’ control on their attitudes and behaviour.

In a sense social norms are a confounding factor to the research as it is possible that this interaction also influenced student’s behaviour. Ideally we would have used a second control group which would have received the information about the project but would not have been given any intervention strategies, essentially splitting our population into four groups instead of three. We initially chose not to do this however because we felt that the size of each group would be too small to give reliable data. Other authors (Stern, 1999; Shipworth, 2000) advocate continual monitoring and amendment of strategies which is an approach we adopted. We had continual monitoring of the strategies using focus groups, online surveys and informal feedback from students and other stakeholders. This was valuable because we were provided with information that enabled us to fine tune the strategies.

Intrinsic motivators

The tools used in this study were not imposed on the students; they could choose whether or not they would use them or not. The literature (Stern, 1999; Hines et al., 1986/7) suggests that individuals are more likely to take environmental actions if they have locus of control. The voluntary nature of the project was not only essential because we were testing the strategies’ impact on intrinsic motivations but also it potentially increased the impact. However undoubtedly some students would not have ‘engaged’ or done much to change their behaviour, suggesting there is still potential for further energy reductions. An important finding of this study is that reduced energy consumption does not require the use of extrinsic motivators such as rewards or an associated energy bill. In a review of nine studies that included intrinsic motivation categories De Young (2000) found there were three intrinsic satisfactions relevant to the discussion of environmental sustainability: “1) satisfaction derived from striving for behavioural competence, 2) frugal, thoughtful consumption and 3) participation in maintaining a community” (p.516). He suggests that the role of intrinsic motivations in influencing pro-environmental behaviour requires further exploration as no single motive has
universal appeal or is effective in all situations. Providing real-time feedback for example to households that do pay for their energy might produce a greater energy reduction, which is a question for further research. Other research opportunities exist to trial both direct feedback tools and social marketing tools with other social markets where extrinsic factors such as billing can be utilised. The use of extrinsic motivators should be used with caution however as previous studies have shown that providing extrinsic motives can erode existing intrinsic motives (de Young, 1993; Dwyer et al., 1993; Kohn, 1993). For example, if I am motivated to reduce my energy in order to produce less GHG and I see that as meaningful, and then I get told that for a certain period I can win or earn a movie ticket for every kg of GHG I reduce I may become motivated to win the movie ticket and focus on that, and become less concerned about the greenhouse gases. When the program ceases and there are no more movie tickets I will probably have less concern to reduce just for the sake of the environment; I will have become focused on movie tickets. This suggests that any program intending to use extrinsic motivators will need to continue their use to maintain behaviour change. The problem also with competition is that it might motivate some of the participants but can demotivate others; losers can think ‘well what’s the point’, and even the ‘winners’ can be demotivated as other studies have shown that people ‘doing well’ can think ‘well I’m already the lowest energy consumer so I don’t have to reduce anymore’.

Cost benefit

At this current time we estimate that the social marketing intervention is more cost effective than installation of real-time metering. The social marketing intervention is costly to develop because it requires careful research into the target group’s response to the desired behaviours before any strategies can be implemented. Once this research has been done, in this project we estimate it is more cost effective to implement over a long time period. However, the costs of installing and maintaining the ecoMeters is higher because the ecoMeters first require the installation of smart meters on each residence, and the cost of both instruments in relatively high. These relative costs may change in the future as these technologies are more widely adopted. This approach also needs ongoing technical support which can be at a higher cost than social marketing personnel costs. These findings suggest that there are benefits in using ‘low tech’ tools, but that cost-benefit analyses should be re-evaluated as technology changes and opportunities for real-time feedback becomes more accessible, as undoubtedly feedback is an important part of the behaviour change process.

The estimated savings in dollar terms (up to $49,950 saved per annum for 90 cottages) suggest that there is the opportunity to make considerable yearly savings on both gas and electricity. These findings provide evidence that the implementation of the interventions has the capacity to influence individuals’ behaviour and thereby reduce energy costs. The financial savings are a strong motivator for organisations and institutions to implement energy saving interventions programs.

Given the ecoMeter’s and gas communication are still in their infancy and have not reached the cost benefits of mass production (at this stage) we recommend, as a first step, to an institution such as Charles Sturt University an expansion of the social marketing strategy. The results provide clear evidence that relatively low cost strategies can facilitate reduced energy consumption, and it is now possible to roll these strategies out to a broader student population achieving an average 20% reduction in energy use across all residences. The strengths of the social marketing approach are that it offers a multi-pronged approach, is likely to result in greater knowledge of the issues, requires personnel to install, check and update the interventions which gives a human face to the strategy, and has the added bonus of confirming the organisation’s commitment to environmental goals. The technical problems associated with the implementation of the social marketing, for example, missing night lights or posters that had fallen down, were generally of less consequence (because there were several strategies in place) than a malfunctioning ecoMeter (no ecoMeter issues were found during the trial). With respect to the interventions themselves we would recommend regular changes to the poster content and design, reasonable quality devices such as nightlights and shower timers and some system to give the students regular feedback.
Use of the eco-Meters clearly resulted in reduced energy consumption in the residences where they were installed exceeding Darby’s (2006) findings of 5-15% reductions. Undoubtedly display units such as the ecoMeter can make our ‘invisible’ energy consumption visible (Kempton et al., 1992) and therefore more amenable to immediate control. They can act as a prompt to users with the flashing lights although the literature suggests that prompts are generally not very reliable and their novelty can wear off (De Young, 1993). The ecoMeters provided immediate feedback to the students which is considered the most effective form of feedback (Van Houwelingen and Van Raaji, 1989) and we believe that ecoMeters or other direct feedback tools such as the internet offer opportunities for influencing household energy behaviour in the future when more financially accessibly and easy to use.

We received mixed feedback from students on the ecoMeters. Feedback from students confirmed what is already known – that feedback needs to be simple, relevant and timely. We assumed that an in-house display unit would be of interest and easy to use for our technologically savvy study participants, however some of them found the display confusing and were unsure how to interpret or use what it was telling them. Whilst the display was not difficult to use this feedback emphasises the need for any technology to be ‘foolproof’ if we want to avoid discouraging people from using it. The strongest impact the ecoMeter had was through the display lights rather than using the more detailed functions of the meter and tracking how they were doing over time. Students didn’t use this function unless they were highly interested and motivated.

Implications for general households

What do these results imply for the general household? Can we compare an eight bedroom student cottage with the average Australian home? Previous research (Hamilton nd; Riedy 2006) suggests that installation of ecoMeters can result in up 30% reduction in household peak energy consumption suggesting that even though the living conditions are different the potential energy reduction is similar. Assuming that the application of a real-time feedback system such as the ecoMeter OR provision of supportive mechanisms such as those developed through a social marketing approach will produce a similar outcome in Australian households then we have the potential to reduce Australian’s domestic energy consumption from 402PJ per annum (DEWHA 2008) by 23% to 309 PJ per annum. In addition, the 23% reduction in consumption will result in a lower energy bill for household consumers, potentially counteracting or ameliorating the recent and probably ongoing increase in energy costs as a result of the introduction of an Emission Trading Scheme or similar over the forthcoming years. The energy suppliers, it seems, are developing new ‘products’ in response to the need to reduce green house gas production, and desire to influence demand (eg flattening out demand). Their products now include smart meters, real-time feedback meters, intelligent network systems, and purchase of energy from the household producer. Arguably the energy supply companies are selling an energy ‘service’ which is as much about providing the consumer with the cleanest, safest, efficient energy as it is about simply providing them with electricity or gas. As part of the role of service provider suppliers could well be employers of facilitators with a suite of social marketing tools (or developing other approaches) to meet these needs of the consumers.

Infrastructure design

The residences used in the study were brick veneer constructions designed with no conscious effort to minimize energy use other than the installation of insulation in the roof cavity. In comparison recent student accommodation has been built giving consideration to north-south orientation, natural lighting, automatic lighting in occasionally used common areas such as the bathroom, low flow shower heads and toilets, the collection of rainwater for toilets and grey water for irrigation; incorporation of cross ventilation for some
cooling; installation of efficient hydronic, in-slab heating; and roof and window shading to minimise solar heat gain. It will be useful to compare energy consumption per student between these two types of residential accommodation; undoubtedly infrastructure design is an important element of energy consumption. However the findings of this study suggest that design elements will send a message to students and contribute to the development of a culture that cares about energy consumption. This culture, however, needs to be ‘active’, that is be followed up by ensuring that any broken appliances or fittings are repaired, and that there is regular and sustained effort to continue improving practice through the installation of window fittings, introduction of composting bins and communication that ‘energy’ (or the environment) is an important issue. This project also suggests that future buildings / residences would benefit from the incorporation of visible energy metering so that students will know when their actions are having an impact or not.

Difficulties

While the results of this study provide positive findings with respect to success of the interventions in facilitating reduced electricity consumption and suggest some opportunities for further work in this field, there were difficulties experienced by the project team in relation to some of the technical aspects of the project. For example the gas consumption data collected via the smart metering did not provide as reliable data as anticipated (see p. 14) so while we have included it in this report the data should be treated with caution. At the end of Phase 1 considerable technical repairs were needed to the smart meters. There were also problems associated with the ecoMeters requiring maintenance, students or cleaners unplugging the ecoMeters, and the removal or malfunction of the shower timers and night lights. These issues were time consuming and costly for the project and may have influenced the results, but nonetheless are real world issues and are likely to occur in future ‘real’ implementation. Despite these challenges the students that received the interventions reduced their electricity consumption.
CONCLUSION AND RECOMMENDATIONS

The project had two goals: research into the effective behaviour change strategies, and trialling a strategy at a small scale before committing to large scale implementation. As a result of this project Charles Sturt University has made a commitment to roll out the social marketing strategy to all cottage residences on all campuses.

The quantitative and qualitative data both reveal evidence of behaviour change with respect to electricity and gas use leading to reduced production of greenhouse gases from the student residences’ energy use. Both strategies – the ecoMeter & social marketing - contributed to this change and both deserve consideration and further development.

We believe that one of the strengths of this project (trial) was the use of multiple approaches which were able to engage students with varied values. The ecoMeter obviously had an impact on the students and this was probably around its immediacy and ‘being in their face’ so they were constantly informed of when a lot of energy was being used. Other devices, such as the night light, solved safety concerns for some students, and the shower timer was a simple device to remind the individual how long they were spending in the shower. Other students indicated that they were supportive of the project and we suggest the project had an overall reinforcing effect on their values and behaviours. A multiple approach is useful because it targets this mixed audience.

The project also demonstrated that intrinsic motivations can be triggered. We very deliberately ensured that no elements of competition, reward or punishment were part of the project. The intention was to stimulate and provoke intrinsic motivations only. The results show that this does work. Undoubtedly stimulating extrinsic motivations can also have an effect (De Young, 2000) eg offering a prize, or increasing the bill if they use more, but work on motivation shows that where you introduce extrinsic motivations then you may also impact negatively on the intrinsic motivation (Kohn 1992, 1993).

An added benefit of the project was the usefulness of the energy use data to managers of the facilities in identifying breakdowns in appliances. This happened when one of the managers noticed that there was an extremely high gas bill in the warmer months and found a heater running in the summer period.
RECOMMENDATIONS

As a consequence of this study we recommend that:

- An additional study of the CSU halls of residence be undertaken to develop effective strategies in this context. Whilst the student population is highly likely to be similar to the current study, the housing conditions and elements of control are different, and we therefore cannot assume that the same barriers and benefits exist. At the time of writing this report this is a commitment the university has made.

- Any energy saving program should aim to foster student involvement. The effect is going to be greater the more each student ‘buys’ into the task of reducing energy and for this reason it is desirable to have strategies that will foster energy reduction as a social norm. One way to achieve this is to encourage student involvement in the task at numerous levels.

- Maintenance problems in the cottages are repaired quickly e.g. dripping taps because if this is not done students feel as though CSU doesn’t care. The focus groups with students revealed some strong environmental values and students would point out the leaky taps, and express concern and disappointment about the delay in repairs. They felt that if the university didn’t care about issues such as water or energy then why should they; to them water and energy were all part of the big picture around the environment.

- Social marketing strategies should be installed across all CSU student cottages. At the time of writing this report this is a commitment the university has made.

- Feedback technology be installed when it is more accessible. For Charles Sturt University this means also considering whether they want smart meters on all cottages as individual metering is currently a prerequisite for the ecoMeter installation.

Again, many thanks to all those that participated and supported this project.
As a result of this project we estimate that: 

1,804,700 black balloons of GHG were saved during the 26 weeks of testing of this project\(^2\).

---

\(^2\) Phase 1: 7 weeks x (SM 40kg/week x 15 cottages) + 7 x (display 53 kg/week x 9 cottages) 7 x (St M -51kg/week x 9 cottages) = 4,200 + 3,339 + -3,213 = 4,326 kg (4.3 tonnes CO2-e)

Phase 2a: 8 x (SM 86kg/wk x 16 cottages) + 8 x (combination 108kg/wk x 9 cottages) + 8 x (St M 87kg/wk x 9 cottages) = 11,008 + 7,776 + 6,264 = 25,048 (25.0 tonnes CO2-e).

Phase 2b: 11 x (SM 159kg/wk x 16 cottages) + 11 x (combination 144kg/wk x 9 cottages) + 11 x (St M 188kg/wk x 9 cottages) = 27,984 + 14,265 + 18,612 = 60,861 (60.1 tonnes CO2-e)

Total for project = 89.4 tonnes CO2-e

Based on control use during this time

1: 34*7*305=72,590  6% saving

2a: 34*8*552=150,144  16.7% saving
REFERENCES


Australian Bureau of Statistics (2008b) Year Book Australia, 2008 1301.0


Kohn, A 1993 *Punished by rewards : the trouble with gold stars, incentive plans, A’s, praise, and other bribes*. Houghton Mifflin, Boston


APPENDICES

APPENDIX 1: AN EXAMPLE OF AN INFORMATION STATEMENT PROVIDED TO THE STUDENTS WHO ATTENDED THE FOCUS GROUPS.

Information Statement

Facilitating energy saving behaviours among university student residents

Charles Sturt University has made a commitment that by the year 2015 the campus will operate with a neutral greenhouse gas balance. This means the university is committed to reducing overall energy consumption and engaging in strategies that will reduce greenhouse gases in the atmosphere. The commitment from organisations such as universities is essential for the world to successfully address global warming and a range of subsequent environmental and social issues.

This research will explore the effectiveness of two energy saving approaches: a social marketing approach and use of immediate feedback (through in-house displays and real-time meters) as tools to facilitate energy reduction amongst students who reside in the Wagga Wagga campus residential houses. Social marketing involves identifying the barriers and benefits to particular behaviours and finding ways to make the benefits more widely known, and minimise the barriers. The final stage of the project will be to develop an energy savings program that can be rolled out across all CSU campuses, and be used to assist Country Energy in developing energy reduction strategies and better energy management processes.

This is a joint Charles Sturt University and Country Energy project, funded by the NSW Department of Environment and Climate Change.

As residents of the Wagga Wagga cottages we are seeking your involvement in this project. This would mean participating in reducing your household energy consumption, completing short demographic and environmental attitude questionnaires, and participating in focus groups at the end of the study which will explore your experience and seek your feedback. Some members of the group that is involved with the social marketing strategy will be asked to participate in a focus group, and short interview. Notes will be kept of the focus group discussions, and the interviews will be tape recorded. You are not obliged to reduce your energy consumption and there will be no penalty if your energy consumption either decreases or increases. Your feedback on the strategies used to encourage reduced energy consumption will be welcomed though.

Maintaining confidentiality is important in this research. No names will be put on any publications. Data from the project will remain confidential. No findings that could identify any individual participant will be published. Only the combined results of all participants will be published.

The project notes will be stored for 5 years as prescribed by university regulations.

You may withdraw from this research project at any time simply by informing us. You will not be required to give a reason. Not participating at all or withdrawing will not have a negative effect on your involvement in this project.
Charles Sturt University’s Ethics in Human Research Committee has approved this study. If you have any complaints or reservations about the ethical conduct of this project, you may contact the Committee through the Executive Officer:

Executive Officer  
Ethics in Human Research Committee  
Academic Secretariat  
Charles Sturt University  
Private Mail Bag 29  
Bathurst NSW 2795

Phone: 02 6338 4628  
Fax: 02 6338 4194

Any issues you raise will be treated in confidence and investigated fully and you will be informed of the outcome.

You are also welcome to contact the researchers involved with the research at any time.

Principal Investigators:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>School of Environmental Sciences</th>
<th>Address</th>
<th>Phone</th>
<th>Fax</th>
<th>Email</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karen Retra</td>
<td>Researcher</td>
<td>Charles Sturt University</td>
<td>PO Box 789</td>
<td>02 6051 9774</td>
<td>02 6051 9897</td>
<td><a href="mailto:kretra@csu.edu.au">kretra@csu.edu.au</a></td>
<td>0428 629 099</td>
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<td>Senior Lecturer</td>
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<td>02 6051 9983</td>
<td>02 6051 9897</td>
<td><a href="mailto:rblack@csu.edu.au">rblack@csu.edu.au</a></td>
<td></td>
</tr>
<tr>
<td>Dr Penny Davidson</td>
<td>Senior Lecturer</td>
<td>Charles Sturt University</td>
<td>PO Box 789</td>
<td>02 6051 9764</td>
<td>02 6051 9897</td>
<td><a href="mailto:pdavidson@csu.edu.au">pdavidson@csu.edu.au</a></td>
<td>0408 672 087</td>
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</tbody>
</table>
APPENDIX 2: INFORMED CONSENT FORMS COMPLETED BY STUDENTS ATTENDING FOCUS GROUPS.

Informed Consent Form

Group A – In-house displays and social marketing

Facilitating energy saving behaviours among university student residents

I agree to take part in the above project which aims to develop strategies to encourage students to reduce their household energy consumption. I have had the purpose of the project explained to me, and I have read the Information Statement, which I will keep for my records. I understand that agreeing to take part means that I am willing to:

- participate in the training session on the use of the in-house displays
- complete a short demographic survey, and environmental attitude questionnaire
- participate in a focus group or interview towards the end of 2007, nearing completion of phase 1
- participate in the project, which may or may not mean personally reducing my energy consumption but will involve CSU and Country Energy monitoring the overall energy consumption of the cottage I live in

I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party.

I also understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Charles Sturt University’s Ethics in Human Research Committee has approved this project (2007/165).

I understand that if I have any complaints or concerns about this research I can contact:

Executive Officer
Ethics in Human Research Committee
Academic Secretariat
Charles Sturt University
Private Mail Bag 29
Bathurst, NSW 2795

Phone: 02-6338 4628
Fax: 02-6338 4194

Name: ………………………………………………….

Signature ……………………………………………….

Date………………………………………………..

Email: ……………………………………………….

Cottage number: …………………………………..
Informed Consent Form

Group C – Social marketing

Facilitating energy saving behaviours among university student residents

I agree to take part in the above project which aims to develop strategies to encourage students to reduce their household energy consumption. I have had the purpose of the project explained to me, and I have read the Information Statement, which I will keep for my records. I understand that agreeing to take part means that I am willing to:

- complete a short demographic survey, and environmental attitude questionnaire
- participate in a focus group or interview towards the end of 2007, nearing completion of phase 1
- participate in a focus group(s) that explores benefits and barriers to changing behaviour that results in reduced energy consumption
- participate in the project, which may or may not mean personally reducing my energy consumption but will involve CSU and Country Energy monitoring the overall energy consumption of the cottage I live in.

Several people will also be asked to participate in a short interview to verify benefits and barriers.

I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party.

I also understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Charles Sturt University’s Ethics in Human Research Committee has approved this project (2007/165).

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Executive Officer
Ethics in Human Research Committee
Academic Secretariat
Charles Sturt University
Private Mail Bag 29
Bathurst, NSW 2795

Phone: 02-6338 4628
Fax: 02-6338 4194

Name: ....................................................

Signature ..................................................

Date........................................................

Email: ....................................................

Cottage number: ........................................
APPENDIX 3: SOCIO-DEMOGRAPHIC SURVEY

These were completed by students who attended the information sessions and signed up to participate in any of the phases.

FACILITATING ENERGY SAVING BEHAVIOURS AMONG UNIVERSITY STUDENT RESIDENTS

Background information questionnaire

We would like to ascertain that we have roughly equivalent types of students across our two study groups, so we would like you to complete this brief questionnaire. This data will be aggregated and can not be used to identify any individual.

Could you please complete the set of questions below by ticking the box that best represents you, or completing the blank.

1. What cottage number do you currently reside in?

________________________________________

2. Are you:
   Male  □    Female  □

3. Which age category best describes you:
   14-17 years  □
   18-24 years  □
   25-34 years  □
   35-49 years  □
   50-59 years  □
   60-69 years  □
   70+ years  □

4. Are you studying full-time or part-time:
   Full time  □    Part time  □

5. What year did you begin your study at CSU?
   1998  □    2003  □
   1999  □    2004  □
   2000  □    2005  □
   2001  □    2006  □
   2002  □    2007  □

6. Have you previously completed any other tertiary courses?
   name: ____________________________________________
   level: ____________________________________________
7. What is the name of the course that you are enrolled in:

______________________________________________________________________

8. How many years have you lived in:
   a major metropolitan city (eg Brisbane, Canberra) _________
   a rural or regional centre (eg Albury, Shepparton) _________

9. What is your country of birth:

   Australia  □  Italy  □  Germany  □
   UK  □  Vietnam  □  Greece  □
   Ireland  □  China  □  New Zealand  □
   USA  □  Japan  □  Canada  □
   Other  □  _____________________
**APPENDIX 4: NEW ECOLOGICAL PARADIGM (NEP) SURVEY**

These were completed by the students who attended the information sessions and signed up to participate in any of the phases.

**Facilitating energy saving behaviours among university student residents**

As part of the project we would like you to complete this brief survey on level of environmental concern. Please tick the box that best matches your response to the statement.

Your cottage number: _______________________________

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Mildly agree</th>
<th>Unsure</th>
<th>Mildly disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are approaching the limit of the number of people the earth can support</td>
<td></td>
<td></td>
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<tr>
<td>Humans have the right to modify the natural environment to suit their needs</td>
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<tr>
<td>When humans interfere with nature it often produces disastrous consequences</td>
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<tr>
<td>Human ingenuity will insure that we do NOT make the earth unlivable</td>
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<tr>
<td>Humans are severely abusing the environment</td>
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<tr>
<td>The earth has plenty of natural resources if we just learn how to develop them</td>
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<td></td>
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<tr>
<td>Plants and animals have as much right as humans to exist</td>
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<tr>
<td>The balance of nature is strong enough to cope with the impacts of modern industrial nations</td>
<td></td>
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<tr>
<td>Despite our special abilities humans are still subject to the laws of nature</td>
<td></td>
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<td></td>
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<tr>
<td>The so-called 'ecological crisis' facing humankind has been greatly exaggerated</td>
<td></td>
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<tr>
<td>The earth is like a spaceship with very limited room and resources</td>
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<tr>
<td>Humans were meant to rule over the rest of nature</td>
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<tr>
<td>The balance of nature is very delicate and easily upset</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Humans will eventually learn enough about how nature works to be able to control it</td>
<td></td>
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<tr>
<td>If things continue on their present course, we will soon experience a major ecological catastrophe</td>
<td></td>
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APPENDIX 5A: FOCUS GROUP QUESTIONSPOSED PRIOR TO PHASE 1.

FOCUS GROUP QUESTIONS (Davidson and Black)

Focus group questions for Group B (social marketing)

INTRODUCTION TO FOCUS GROUP

Hi, my name is XXX. We’re holding two focus groups with students who are in the social marketing cottages here at Wagga to find out about your views on energy consumption, your energy behaviour, the barriers and benefits associated with changing your behaviour. In this project, we’re going to be targeting three behaviours – having shorter showers, turning off the lights when you’re not using them and turning off the standby on appliances. Targeting these three behaviours will reduce energy use and reduce greenhouse gases.

Overall, we are going to speak to about 15 students and I know that’s only a small sample of all the students involved in the project – but we hope that your views and ideas will be representative of all the students on resi.

WHILE EATING PIZZA

1. Firstly, we hear a lot about the global warming, greenhouse gases and energy use these days. Generally speaking, where are you hearing about these issues?
2. Are these issues important to you? and if so why?

As I mentioned we’re planning to target three behaviours - the first behaviour we’d like to target is turning off the lights when you’re not using them. An average household uses 5% of their energy on lighting (9% greenhouse gases)

If you think about all the students on resi. Do you think most people turn off the lights when they’re not using them? What percentage do you think turn off the lights when they’re not using then versus those who don’t?

Would each of you please describe the single most important reason why you think students don’t turn off the lights when they’re not using them?
Are there any other reasons you can think of? Is that a perception that each of you hold?
What do you think the benefits of having shorter showers are?

CHECK

Are there any more barriers or benefits that we haven’t mentioned and put up on the board?

Barriers
What makes it difficult to turn off lights?
What makes it easy to turn off lights?

Benefits
What positives are associated with turning off lights?
What negatives are associated with turning off lights?

Social norms
Apart from us, is there anyone currently who encourages you to turn off the lights, and how much do you care about their opinion?
Who discourages or doesn’t care if you turn off the lights, and how much do you care about their opinion?
The second behaviour we’re going to target is taking shorter showers. An average household uses 27% to heat water (28% greenhouse gases).

If you think about all the students on resi. Do you think most people have short or long showers? What percentage do you think have short showers versus long showers?

Would each of you please describe the single most important reason why you think that students have long showers?
Are there any other reasons you can think of? Is that a perception that each of you hold? If so, what do you see as? about shorter showers?
What are the benefits of taking shorter showers?

CHECK

Are there any barriers or benefits that we haven’t mentioned and put up on the board?

Barriers
What makes it difficult to have shorter showers?
What makes it easy to have shorter showers?

Benefits
What positives are associated with having shorter showers?
What negatives are associated with having shorter showers?

Social norms
Apart from us, is there anyone currently who encourages you to take shorter showers, and how much do you care about their opinion?
Who discourages or doesn’t care if you have shorter showers, and how much do you care about their opinion?

The third behaviour we’re going to target is turning off the standby on all appliances. An average household uses 4% of energy on standby (7% of greenhouse gases)

If you think about all the students on resi. Do you think most people turn off the standby on appliances? What percentage do you think turn off the standby on appliances versus those who don’t?

Would each of you please describe the single most important reason why students don’t turn off the standby on appliances?
Are there any other reasons you can think of? Is that a perception that each of you hold?
What do you think are the benefits of turning off the standby?

CHECK

Is there any other barriers or benefits that we haven’t covered?
Barriers
What makes it difficult to turn off the standbys?
What makes it easy to turn off the standby?

Benefits
What positives are associated with turning off the standbys?
What negatives are associated with turning off the standbys?

Social norms
Apart from us, is there anyone currently who encourages you to turn off the standbys, and how much do you care about their opinion?
Who discourages or doesn’t care if you turn off the standbys, and how much do you care about their opinion?
Ok, that’s the end of the questions. Does anyone have any further comments about anything we’ve covered in the focus group?

What will happen next is that we’ll have a look at all the barriers and benefits of each of the three behaviours and then consider what tools or strategies we can use to address each of the behaviours. We’ll only be using the ones that are feasible in terms of time and resources and then we’ll implement them.

Does anyone have any questions about the project or the process from here on?

Thanks very much for coming along to the focus group – we really appreciate your time and interest in the project.
FOCUS GROUP QUESTIONS (Davidson and Black 2008)

Focus group questions for Thurgoona campus (heating and cooling)

INTRODUCTION TO FOCUS GROUP

Hi, my name is XXX. Thanks for coming along this evening to be part of this focus group, we really appreciate your time and interest. This focus group is part of a research project looking at how we can influence the energy behaviour of students who live in residence on campus. The project is based on the Wagga campus and last semester we started the project with 3 groups of cottages – one a control group where nothing happened, a second group that had in-house displays in the cottages that showed them how much electricity they were using and a third group where we used what we call social marketing strategies to assist and encourage the students to modify or change their energy behaviour. For example, using things like posters, shower timers and night lights. Last year we targeted three behaviours – having shorter showers, turning off the lights when you’re not using them and turning off the standby on appliances. We’re continuing the project this year and want to target behaviours associated with heating and cooling.

We’ve decided to hold focus groups here so we don’t influence the behaviour of the Wagga students who are part of the project.

So we’re holding two focus groups this evening to find out about your views on energy consumption, your energy behaviour, the barriers and benefits associated with changing your behaviour.

Overall, we are going to speak to about 15 students and I know that’s only a small sample of all the students involved in the project – but we hope that your views and ideas will be representative of all the students on resi.

SPLIT GROUPS - ask: in general, both with heating and cooling. Do you think you do more than others to reduce your energy use? For example, would you put on a jumper before turning the heating on or in summer when it’s hot, change into cooler clothes rather than putting on the air conditioning?

HAND OUT SHEET TO STUDENTS

So the way we’d like to organise it is – for each of the questions we’d first like you to write down your own ideas and thoughts on the sheet I’ve just handed out and then we’ll discuss the same question as a group – and we’ll work through all of the questions that way. Is that ok? Does everyone understand the process?. We’ll put all the ideas we discuss up on the butchers paper and also collect up your sheets – so we get everyone’s ideas.

WHILE EATING PIZZA

The first behaviour we’d like to target is using less cooling like air conditioning. An average household uses 14% of their energy on cooling and heating, that’s about 39% of their greenhouse gas emissions.

If you think about all the students on residence and your own behaviour. How do you or did you keep cool in the residences? Please can you rank them based on how commonly you did them?
What did others do to keep cool? Please can your rank them based on how commonly you think others did them.

Thinking hypothetically about using air-conditioning now (in the Wagga cottages they have air conditioning which is just an on and off thing, there’s no thermostat), can each of you tell me the single most important reason why you think students wouldn’t turn off air conditioning when they’re not using it?

Are there any other reasons you can think of? Is that a perception that each of you hold?

What do you think the benefits of turning off the air conditioning are when you are comfortable?

Apart from us, is there anyone currently who encourages you to turn off the air conditioning, and how much do you care about their opinion?

Who discourages or doesn’t care if you turn off the air conditioning, and how much do you care about their opinion?

**The second behaviour we’re going to target is using less heating.**

If you think about all the students on residence and your own behaviour. How do you or did you keep warm in the residences? Please can you rank them based on how commonly you did them?

What did others do to keep warm? Please can your rank them based on how commonly you think others did them?

Thinking hypothetically about using heating now (in the Wagga cottages they have heating with a thermostat which they can turn down or off) can each of you please tell me the single most important reason why you think students wouldn’t down/turn off the heating when they are not using it?

Are there any other reasons you can think of? Is that a perception that each of you hold?

What do you think the benefits of turning down/off the heating are when you are comfortable?

Apart from us, is there anyone currently who encourages you to turn down/off the heating, and how much do you care about their opinion?

Who discourages or doesn’t care if you turn down/off the heating, and how much do you care about their opinion?

Ok, that’s the end of the questions. Does anyone have any further comments about anything we’ve covered in the focus group?

What will happen next is that we’ll have a look at all the barriers and benefits for each of the behaviours and then consider what tools or strategies we can use to address each of the behaviours. We’ll only be using the ones that are feasible in terms of time and resources. The tools or strategies will be installed into some of the Wagga residences and we’ll monitor their influence on the student’s energy behaviour over the next 9 months.

Does anyone have any questions about the project or the process from here on?

Thanks very much for completing the forms and coming along to the focus group – we really appreciate your time and interest in the project.
Appendix 6A: Social marketing tools; Phase 1 information posters
(3, each on A4 size paper)

Are you shower savvy?

Did you know …

• Heating water accounts for 30% of household energy use in the average Australian home. Most of this is used in the shower.

What’s the impact of your shower?

<table>
<thead>
<tr>
<th>Total water used (litres per shower)</th>
<th>5 mins</th>
<th>10 mins</th>
<th>15 mins</th>
<th>30 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse gas emissions (annually)</td>
<td>387 kg</td>
<td>774 kg</td>
<td>1,161 kg</td>
<td>2,322 kg</td>
</tr>
<tr>
<td>Cost per year (if you were paying the bill)</td>
<td>$127</td>
<td>$254</td>
<td>$381</td>
<td>$792</td>
</tr>
</tbody>
</table>

These figures are per person based on a number of assumptions (for example if you did live all year on campus!).

The good news is that your hot water heater here on campus runs on gas – an electric system would not only cost more, it would emit almost four times more greenhouse gases.

A bit more about greenhouse gases …

• The average Australian emits 3.5 tonnes (3,500 kg) of greenhouse gases relating to household electricity and fuels every year (ie just from the energy used in your home, not transport, food, other consumption, leisure or other activities).
• Shortening your shower from 15 minutes to 5 minutes could decrease your personal household energy emissions by a fifth!

What can you do?

• Check out the shower timer
  You’ll find a timer in each shower. Take a look and see how long you spend under the water.
  • Maybe you’d like to set yourself a challenge to reduce your shower time
    This will save you time and conserve energy, but it will also give you an idea how much money, water and greenhouse gases you could save in the future.

Could you cut a minute off your shower time each week? … Or what about a goal to reduce your shower time by 50%?

• Keep an eye on the noticeboard for weekly updates on your cottage’s energy use.

We’d really like to hear what you think about this initiative. If you would like to provide us with feedback (a short conversation at the end of semester is all that’s required please contact Karen Retta by email: irena@csu.edu.au or internal phone: 13074 or talk to your PA.

This poster is part of a project supported by the NSW Government’s Energy Savings Fund.
Lights – use them or turn them off!

Did you know …

• Lighting accounts for over 10% of greenhouse gases generated in the average Australian home.

• It’s a myth that it takes more energy to switch lights on and off than leave them on. This was true a long time ago, when fluorescent tubes were new, expensive and their life was shortened by frequent switching. But for modern tubes and compact fluorescent lights, an hour switched on is an hour’s energy saved.

What’s the impact of unused lights?

<table>
<thead>
<tr>
<th>Light type</th>
<th>watts</th>
<th>kgs (annual)</th>
<th>cost (annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hallway or bathroom light left on for 6 hours</td>
<td>60</td>
<td>13.8 kgs</td>
<td>$3.37</td>
</tr>
<tr>
<td>1 incandescent bedside lamp left on for 5 hours</td>
<td>60</td>
<td>10.8 kgs</td>
<td>$1.83</td>
</tr>
<tr>
<td>1 common room or kitchen light left on for 6 hours</td>
<td>52</td>
<td>207 kgs</td>
<td>$20</td>
</tr>
<tr>
<td>Both common room lights left on for 6 hours</td>
<td>100</td>
<td>414 kgs</td>
<td>$35</td>
</tr>
<tr>
<td>Both hallways’ lights and both bathrooms’ lights left on for 6 hours</td>
<td>203</td>
<td>460 kgs</td>
<td>$44</td>
</tr>
<tr>
<td>1 night light (if run 24 hours per day)</td>
<td>0.4</td>
<td>4 kgs</td>
<td>$0.38</td>
</tr>
</tbody>
</table>

Fortunately, your cottage lights are efficient – these modern fluorescent lamps (both tubes and compact fluorescents) use only a quarter of the energy of standard incandescent bulbs and half the energy of halogens to produce the same amount of light.

Every little bit counts:

If all Australian households simply turned off unused lights and appliances on standby at the power point Australia’s emissions would be reduced by at least 5 million tonnes per annum.

The greenhouse gas savings would be equivalent to taking 1.5 million cars off the road for a year.

What can you do?

• Turn off unused lights

Think about which lights are actually being used and switch the unused ones off.

• Use a night light in the hallway

We’ve installed night lights in each hallway. If you are concerned about not having any light during the night, perhaps this will solve the problem and allow you to turn the fluorescent lights off. Night-lights will come on automatically when it gets dark.

The night lights use very little energy. Even if the night light runs all day, when you turn just one hallway light off for 10 minutes longer per night, you’re saving energy and greenhouse gases!

• Keep an eye on the notice board for weekly updates on your cottage’s energy use.

We’d really like to hear what you think about this initiative. If you would like to provide feedback (a short conversation at the end of semester is all that’s required) please contact Karen Retra by email: kretra@csu.edu.au or internal phone: x19774 or talk to your RA.

This poster is part of a project supported by the NSW Government’s Energy Savings Fund.
Say goodbye to ‘standby’!

Did you know …

- In the average Australian home ‘standby’ power use accounts for about 11% of electricity use and 7% of total household energy greenhouse gas emissions.
- ‘Standby’ is when appliances are not in use but are not switched off entirely. If an appliance has a light glowing when you think it’s off it’s actually on standby.
- Appliances on standby typically use anywhere between 1 and 20 watts each. And most people have many items that can standby – phone chargers, TVs, DVD players, camera chargers, computers, printers, speakers and all sorts of other appliances.

What’s the impact of appliances on ‘standby’?

<table>
<thead>
<tr>
<th>Appliance</th>
<th>watts</th>
<th>g/kg (annual)</th>
<th>cost (annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>desktop computer</td>
<td>54</td>
<td>493 kg</td>
<td>$47</td>
</tr>
<tr>
<td>laptop computer</td>
<td>30</td>
<td>276 kg</td>
<td>$25</td>
</tr>
<tr>
<td>small LCD monitor</td>
<td>19</td>
<td>176 kg</td>
<td>$17</td>
</tr>
<tr>
<td>television</td>
<td>49</td>
<td>442 kg</td>
<td>$42</td>
</tr>
<tr>
<td>VCR*</td>
<td>13</td>
<td>120 kg</td>
<td>$11</td>
</tr>
<tr>
<td>Microwave*</td>
<td>3</td>
<td>26 g</td>
<td>$3</td>
</tr>
<tr>
<td>Stereo</td>
<td>12</td>
<td>109 kg</td>
<td>$10</td>
</tr>
</tbody>
</table>

These figures are for appliances that are left on standby all day. Of course there’ll be less standby power, but more power used overall, when you are actually using them.

* Note that some appliances have a secondary use, for example, if you use the clock on a microwave or the VCR. In this event they aren’t on ‘standby’ if you are using them. But if you don’t use it, you’d save energy and emissions by switching it right off!

Every little bit counts:

If all Australian households simply turned off unused lights and appliances on standby at the power point Australia’s emissions would be reduced by at least 5 million tonnes per annum.

The greenhouse gas savings would be equivalent to taking 1.5 million cars off the road for a year.

What can you do?

- **Turn off unused appliances – don’t just use ‘standby’**
  
  Think about which appliances you (or someone else) is actually using, and switch the unused ones off entirely, at the power point.

- **Could you be smarter when you ARE using your appliances?**
  
  Many people don’t want to turn off their computer because it takes a long time to reboot. Using the ‘hibernate’ function can dramatically cut your energy use and allows you to instantly return to what you were doing. Likewise, screens use a huge amount of energy. Note that ‘screen savers’ do not save any energy. Set your screen to switch off when not used for a certain amount of time (or do it manually) and you’ll save energy and emissions.

- **Keep an eye on the notice board for weekly updates on your cottage’s energy use.**

*We’d really like to hear what you think about this initiative. If you would like to provide feedback a short conversation at the end of semester is all that’s required please contact Karen Rtera by email: kreta@csu.edu.au or internal phone: x19774 or talk to your RA.*

This poster is part of a project supported by the NSW Government’s Energy Savings Fund.
APPENDIX 6b: PHASES 2A AND 2B INFORMATION POSTER (ON A0 SIZED PAPER):

Energy: every little bit counts
(When it comes to reducing energy use, initiating small actions can bring big results.)

How each of the 10% energy update kits have deployed and projected how much energy your household is using.

How the little bit can add up to big things
(Half Australian households spend a tenth of their energy on lights and appliances on standby. Australian emissions would be reduced by about 120 million tonnes per annum. The greenhouse gas savings would be equivalent to taking 1.4 million cars of the road for a year.)

Showering your home from 4 minutes to 3 minutes could mean your energy consumption was lowered by a third.

Last year alone, energy usage reduced by 1.5 million tonnes of CO2e equivalent. This problem has caused noticeable declines in our nation’s climate, use... so your efforts make a difference.

Lights – use them or turn them off
(Keeping your cottage’s climate comfortable)

Did you know...
• Lighting accounts for 10% of households energy consumption.
• It’s a myth! Lighting more energy to switch on lights and use all the time.
• It’s an ideal time to reduce your energy consumption.

What’s the impact of unused lights?

<table>
<thead>
<tr>
<th>Lighting type</th>
<th>watts</th>
<th>energy saved</th>
<th>cost saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>6W halogen bulb</td>
<td>6W</td>
<td>12.5%</td>
<td>$5</td>
</tr>
<tr>
<td>11W incandescent bulb</td>
<td>11W</td>
<td>15%</td>
<td>$10</td>
</tr>
</tbody>
</table>

Fortunately, your current lights are... (Select the light type to find out more)

- 6W halogen bulb
- 11W incandescent bulb
- 18W fluorescent bulb

What can you do?
• Turn off unused lights!
• Use a compact fluorescent light bulb in your home.

The right light is the energy. The right light is not all day, when you can use a bulb that’s high efficiency old equipment. It’s a way to reduce energy use.

We’d really like to hear what you think about this initiative. If you would like to provide feedback please contact Karen Refra (karena@aus.gov.au) or 1800 10774 or see our PA.

This poster is part of a project supported by the NSW Government’s Energy Savings Fund.
APPENDIX 6C: THE IN-HOUSE DISPLAY – AMPY eCO METER

APPENDIX 6D: SHOWER TIMER

APPENDIX 6E: NIGHT LIGHTS
APPENDIX 6F: EXAMPLE OF A WEEKLY REPORT PHASE 1

Weekly Energy Update

Here’s a chart of your cottage’s electricity use this week:

... And here’s a chart of your cottage’s gas use this week:

So how are you going? Let’s compare your energy use over the past seven weeks ...

... And what does that mean in terms of greenhouse gas emissions? (Remember, electricity use creates more emissions than gas!)

This will be the last weekly energy update for 2007. For those of you returning to live on campus next year, we might see you again then! Thanks to everyone for participating.
What does the weekly update tell you?

Reading the charts

Each line on the chart is the amount of energy used in a half hour period.

- At what times of the day does your cottage use the most, and the least, energy?

- How much energy is being used when you consider most things to be ‘off’?

- Do you think the cottage with this chart used the air-con at all during this week?

- When was the (gas) heating on in this cottage?

- Can you tell what time of the day most people shower, based on the gas chart?

Electricity

So what’s a realistic energy goal?

Even if you aren’t “using” anything, your cottage typically consumes 0.3 kilowatts of electricity to keep the fridges cold (they cycle – that is, run when they get too warm) and about 2 kilowatts of gas to keep the hot water warm in the tank (same deal – it kicks in when the temperature drops). Both also increase if you use them more — opening the door of the fridge or using the hot water increases their energy use (so do these colder winter days).

So, this is your baseline – getting below it for any extended length of time is pretty difficult. Take a look at where it sits on your own weekly update charts.

BUT, we’d like you to try and get to it when you aren’t using anything (like when you’re asleep), considering the advice on the poster about standby, lights, heating/cooling and shower length may help.

And, of course, be energy-minded when choosing what you do use – every little bit does count!

Gas

What is a kilowatt hour?

We measure electricity use in kilowatt hours; it’s calculated by multiplying the watts drawn by an appliance by the amount of time it is in use for. This makes it important how much energy an appliance uses but also, how long it uses it for. As your standby information suggests, small rates of use over a long time can add up to a lot of wasted energy!

For example, my DVD player uses 4 watts on standby and 40 watts when being used. Let’s say I leave it on standby on average 23 hours a day and use it for 1 hour a day.

**Standby energy use:**

\[ 4 \text{ watts} \times 23 \text{ hours} / 1000 = 0.92 \text{ kilowatt hours per day} \]

**Operating energy use:**

\[ 40 \text{ watts} \times 1 \text{ hour} / 1000 = 0.04 \text{ kilowatt hours per day} \]

In this scenario, my DVD player is using over twice as much energy on standby each day as it does to actually play DVDs!

In your cottage each of these scenarios would use 1 kilowatt hour of power:

- Having the air con on for 1 hour (1000w x 1 hour / 1000)
- Turning on all the ‘shared’ lights (halls, bathrooms, common room and kitchen) for 2 hrs 39 minutes (180w x 2.65 hours / 1000)
- Boiling the kettle for 33 minutes (1,800w x 0.55 hours / 1,000)
- Running 2,500 right lights for 1 hour (2,500 x 0.4w x 1 hour / 1,000)

Gas is measured in megajoules (MJ) but we convert it to kilowatt hours so you can directly compare them in your update!
**APPENDIX 6H: EXAMPLE OF A WEEKLY REPORT PHASE 2B**

**Weekly Energy Update - Cottage 362**

Your cottage’s energy use, week by week:

What does that mean in terms of greenhouse gas emissions?

How do your cottage’s emissions compare to other cottages?
APPENDIX 7: QUESTIONS POSED IN THE FOCUS GROUPS AT THE END OF PHASE 2B.

Focus group questions – these were tailored to the audience, according to which intervention group they were from

Interventions

Were you aware your house had an in-house display unit?
Was it working?
Did you look at the in-house display? How often did you look at the display?
Were you aware your house had:
   - Night lights
   - Poster
   - Shower timer
   - Reminders to turn lights off

Were the items in good working order? If not did they get replaced?
Did your house use the night lights?
Where? How often?
Did the night-lights change your behaviour and if so how? What about other people’s behaviour?
Did you use the shower timer?
How? How often?
Did the shower timers change your behaviour and if so how? What about other people’s behaviour?
(Social marketing group were asked: Did you look at the weekly reports? How often did you look at the weekly reports?)
Did these change your behaviour? What about other people’s behaviour?
Did you look at the posters? How often did you look at the posters?
Did these change your behaviour? What about other people’s behaviour?
Did you look at the reminders to turn lights off?
Did these change your behaviour? What about other people’s behaviour?

Behaviour

Did you change your behaviour in any way?
In what way(s)?
Do you intend to reduce energy consumption in the future? If so what specifically and why?

Knowledge

Did you learn anything or become more aware of issues around energy consumption? (be more specific?)

Attitude

Do you think your attitude towards energy use and consumption has changed even if you haven’t changed your behaviour yet? If you’ve changed your attitude, what do you think has stopped you from changing your behaviour?
Do you think that the amount of energy that is consumed in households is an issue in Australia – for energy sources reasons? Why? For greenhouse gas reasons? Why?
Other

What other impacts did the intervention (provide specific name here) have on you? (we’re looking for other impacts, perhaps how it made them feel)
Were you aware of energy consumption most days?
How did you find the intervention? Was it intrusive? Was it useful?
Comments specifically on the poster – would you rather one large poster or smaller posters dealing with each specific topic?
How did others in your cottage respond to the in-house display? Did they look at it? Did it influence their behaviour?
Can you think of any ways that we could make the intervention more effective?
Can you think of other interventions / things we could do to support you in reducing energy consumption?
Did you have any interaction with the Research Officer – Karen Retra?
Did her presence / information / assistance influence your behaviour (help you to change your behaviour) in any way?
Did you attend the information session at the beginning of the semester?
Was that useful?
APPENDIX 8: SURVEY MONKEY QUESTIONS PHASE 2B

What is the number of the cottage that you live in?

Which of the items below were you aware were installed in your cottage

- Night lights
- Shower timer
- Thermometer
- Posters (in toilet)
- Switch off' sticker on light switch
- In-house display unit (some cottages only)
- Weekly energy consumption update reports (some cottages only)

Response options were: I was aware; I was NOT aware; not applicable.

Did these interventions help you to reduce or be more efficient in your energy consumption?

- The night lights
- The shower timer
- The thermometer
- The posters
- Switch off sticker
- In-house display unit (if applicable)
- Weekly energy consumption update reports (if applicable)

Response options were: not at all; only sometimes; about half the time; often; always; and not applicable

Please indicate whether you agree or disagree with the following statements:

- The NIGHT LIGHTS have resulted in me thinking it's important to reduce energy use
- The SHOWER TIMER has resulted in me thinking it's important to reduce energy use
- The THERMOMETERS have resulted in me thinking it's important to reduce energy use
- The STICKER has resulted in me thinking it's important to reduce energy use
- The POSTER has resulted in me thinking it's important to reduce energy use
- The IN-HOUSE DISPLAY UNIT unit has resulted in me thinking it's important to reduce energy use (if applicable)
- The WEEKLY ENERGY CONSUMPTION UPDATE REPORTS have resulted in me thinking it's important to reduce energy use (if applicable)

Response options were: strongly disagree; mildly disagree; unsure; mildly agree; strongly agree; and not applicable
Please indicate whether you agree or disagree with the following statements.

- After using the NIGHT LIGHTS I now think it is easy to reduce energy use
- After using the SHOWER TIMERS I now think it is easy to reduce energy use
- After using the THERMOMETERS I now think it is easy to reduce energy use
- After using the LIGHT STICKER I now think it is easy to reduce energy use
- After reading the POSTERS I now think it is easy to reduce energy use
- After using the IN-HOUSE DISPLAY UNITS I now think it is easy to reduce energy use
- After reading the WEEKLY ENERGY CONSUMPTION UPDATE REPORTS I now think it is easy to reduce energy use

Response options were: strongly disagree; mildly disagree; unsure; mildly agree; strongly agree; and not applicable.

Did the interventions help you learn more about HOW to reduce energy use?

- The night lights
- The shower timers
- The thermometers
- The light switch sticker
- The posters
- The inhouse display unit (if applicable)
- The weekly energy consumption update reports (if applicable)

Response options were: not at all; only sometimes; about half the time; often; always; not applicable.

Did the interventions help you learn more about the IMPORTANCE of reducing energy use?

- The posters
- The inhouse display unit
- The weekly energy consumption update reports

Response options were: not at all; only sometimes; about half the time; often; always; not applicable.

Was there anything you found particularly useful about the interventions? If so, what?

Was there anything you found particularly negative about the interventions? If so, what?

How might the interventions be changed to be more effective?

Did you have contact with the project's research officer, Karen Retra, at all during this semester?

- Yes
- No
- Not sure
If you had contact with the project officer, did this contact help motivate you to use less energy in any way?

- Yes
- No
- Not sure
- Not applicable

If yes, please specify in what way/s

Do you have any other suggestions or comments about the interventions?

Do you have any other suggestions or comments about the project?
APPENDIX 9: SURVEY MONKEY DATA – RESPONSES TO OPEN ENDED QUESTIONS, PHASE 2B

Was there anything you found particularly useful about the interventions? If so, what?

Open-Ended Response

The night lights helped, we could walk around at night without turning all the lights on

Shower timers were a great idea, especially coupled with the poster in the toilet about water use (and showers). Nightlights were also particularly helpful.

The inhouse display unit and shower timers

Posters - it’s good to actually have information and figures there on what effect changes can have.

Posters in the toilet very effective. found myself reading them each time. in-house unit very helpful. often power was reduced because the unit displayed red

I found the inhouse display very useful. If I noticed that it had a high reading I would go around the cottage looking for things to turn off.

I found the little reminders very useful in making me aware of the issue of energy consumption. It is not something you generally concern yourself with. Being able to read posters, and see action being taken to solve the issue, increased my awareness and motivation about actively taking a role in the reduction of energy use in my house.

The inhouse meter... I found it interesting

The night lights were a great idea I want to get some for when I move off campus

The details about how much it would cost to do certain things as noted on the POSTER.

Timers good for showers

Interesting

The inhouse display units are great. They are simple but are an easy way for students to monitor their energy usage.

Not having to turn lights on at night 'cause you could see with the night light

Night lights useful for when one person is home late but you don’t want to keep the kitchen/living room lights on but want them to have some light to know where the couch etc is.

I fond the night light useful as you didn't have to turn on a bigger light when going to the bathroom of a night

Big fan of posters and night lights. The thermometer gave solid reason to use aircon when necessary.

The posters were great and very informative and easy to read. The night lights made it more comfortable for some members of my house to turn off the lights at night time.

Loved the night lights, we use them at home now.
By having the night lights it encouraged me to turn off any lights that other housemates usually leave on overnight.

the sticker on light switch, simple but it worked on me. barely used the shower timer but just having the time there helped me remember just to be quick in shower

The timer in the shower, especially considering it has a clock so that you can time without having a countdown timer, which is the only way I use it. I do not like feeling rushed or hurried, but if I am trying to reduce my time myself without a specific deadline it works much better

night lights. good to use when coming home late and not wanting to wake up the whole house

Was there anything you found particularly negative about the interventions? If so, what?

Open-Ended Response

With the night lights they were not bright enough and had to switch on the lights anyway.

Only a small thing, but about half way through the year our shower timer stopped working properly. Up until then I had been finding it really helpful, but once it broke, I found myself taking longer showers again.

I take short showers anyway so didn't find the timer useful...it's not really "negative" but that's why in my responses I've said they didn't really help.

No, All interventions had a positive effect

the poster!! the percentages do not add up! it bugged me!!

Not really.

no

Not really, didn’t really pay much attention to the switch off sticker near the lights or the thermometer.

The shower timers weren’t a great help, as ours had the wrong time on it and we couldn’t work out how to change it so it was kind of annoying. I used it as a timer maybe once or twice then it became obsolete as I tend to have the same length showers every day, and they are usually under 5 minutes.

nope

I didn't hear anything about workshop or talks on how to use the inhouse display units which resulted in me not noticing them often.

night light didn't really do a lot. poster fell down and disappeared after a while.

Our nightlight down our end of the house went missing, but I was still conscious in turning most of the lights out and just leaving one on.

How might the interventions be changed to be more effective?

Open-Ended Response

Have 2 or 3 nightlights in common room.

Perhaps if the in house display unit couldn't be unplugged. .. competition between cottages maybe?
Change the posters so there are different "tips". Have comparative posters between cottages - make a competition out of it.

fix percentages... where does the other 14% come from?

more attention paid to weekly energy consumption reports and what contributed most to energy consumption

Further detail about how much it would cost in the real world on the ENERGY CONSUMPTION REPORTS.

I think using the RA’s to constantly reinforce the intervention. As the Ra’s live in the blocks they can constantly be reminding students to turn off lights at night etc... (p.s. I’m an RA this year!)

Fresh posters.

Maybe make it so the shower timers have a 4 or 5 minute alarm programmed in them so we only have to press one button when we get in the shower instead of having to press in how long they want the timer for. This would encourage more people to use them because it is much simpler.

brighter night lights or make main lights go off at a particular time at night. make sure posters don’t fall down and disappear. put something about appropriate clothing for the time of year on the posters or something, because the temperature in these cottages never really changes all year round, so put something about wearing warm/cool clothes and using air con/heating less.

Prizes for least energy used in a cottage. Even if its just a token, uni students can get very competitive. If there was a prize, better advertising of it.

If you had contact with the project officer, did this contact help motivate you to use less energy in any way?

If yes, please specify in what way/s

I thought about it more but I don’t know if it made me more worried about it

When it’s on your mind you tend to do the little things like switching off a light when you leave a room

Just the information (through the talks and feedback session) she provided.

made me think about it more, and be aware

Do you have any other suggestions or comments about the interventions?

Open-Ended Response

possible feedback on how out cottage compares with others would be good

maybe more publicised?

no

One of the biggest problems I have found with the night lights is that the location of the power points make them unsuitable. This may be something out of the league of this intervention, but the night lights in the bathrooms don’t light the hallways and therefore we still leave one of the bathroom lights on at night. The same for the common rooms, we leave the laundry light (smallest one!) on at night as the night lights aren’t bright enough to see safely at night.

No
I said some things in Q10.

Do you have any other suggestions or comments about the project?

Open-Ended Response

Would work better if the cottage had better insulation and better heaters/coolers

I think it is a really good project however I think its effectiveness is really dependent on each individual. Some people just don't care about the environment or how much energy they use.

good work!!

pin up the weekly energy reports, showing how much energy was used where eg. showers, lights etc. so everyone can see them

good project

Perhaps competitions to see who can reduce their consumption by the most. Again, get the RA’s on side and encourage them to push the message through. In order to be effective the message has to be constantly reinforced.

No

It is definitely a good idea to get university students thinking about energy consumption now so by the time they move out into a house they can not only save on their electricity bill but also do good by the environment.

good work. =)
APPENDIX 10: SAMPLE SIZE – FINAL SAMPLE USED IN ANALYSIS OF ELECTRICITY AND GAS DATA

Due to some technical problems gas and electricity data could not be used from all the cottages. The final sample sizes with usable data for each of the groups is provided below.

**Phase 1 Sample size used in analysis: number of cottages with usable data**

<table>
<thead>
<tr>
<th></th>
<th>Cottages with electricity data</th>
<th>Cottages with gas data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Marketing</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Display</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Control</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>St Martins’</td>
<td>9</td>
<td>7</td>
</tr>
</tbody>
</table>

Electricity: Social marketing n=15, Display n=9, Control n=14.

**Phase 2A Sample size used in analysis: number of cottages with usable data**

<table>
<thead>
<tr>
<th></th>
<th>Cottages with electricity data</th>
<th>Cottages with gas data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Marketing</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Combination</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Control</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>St Martins’</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

Electricity: Social marketing n=16, Combination n=9, Control n=13

**Phase 2B Sample size used in analysis: number of cottages with usable data**

<table>
<thead>
<tr>
<th></th>
<th>Cottages with electricity data</th>
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</tr>
</thead>
<tbody>
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<tr>
<td>Combination</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Control</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>St Martins’</td>
<td>9</td>
<td>5</td>
</tr>
</tbody>
</table>

Electricity: Social marketing n=15, Combination n=9, Control n=13
APPENDIX 11: ESTIMATED RESEARCH PROJECT COSTS FOR IMPLEMENTING THE SOCIAL MARKETING AND ECOMETER STRATEGIES OVER FIVE YEARS

Social marketing strategy

<table>
<thead>
<tr>
<th>Research project costs</th>
<th>Costs per residence $</th>
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</thead>
<tbody>
<tr>
<td>Social marketing tools</td>
<td>55</td>
</tr>
<tr>
<td>Travel for focus groups3</td>
<td>18</td>
</tr>
<tr>
<td>Travel general</td>
<td>45</td>
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<tr>
<td>Travel information sessions</td>
<td>27</td>
</tr>
<tr>
<td>Accommodation</td>
<td>40</td>
</tr>
<tr>
<td>Food for focus groups</td>
<td>64</td>
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<tr>
<td>Research Assistant’s time</td>
<td>1,533</td>
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<tr>
<td><strong>Total cost per residence</strong></td>
<td><strong>$1782</strong></td>
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</tbody>
</table>

EcoMeter strategy

<table>
<thead>
<tr>
<th>Research project costs</th>
<th>Cost per residence $</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoMeter</td>
<td>150</td>
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<tr>
<td>Smart meter</td>
<td>900</td>
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<tr>
<td>Installation labour</td>
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</tr>
<tr>
<td>EcoMeter installation</td>
<td>15</td>
</tr>
<tr>
<td>Travel general</td>
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<tr>
<td>Travel information sessions</td>
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<tr>
<td>Accommodation</td>
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</tr>
<tr>
<td>Research Assistant’s time</td>
<td>271</td>
</tr>
<tr>
<td><strong>Total cost per residence</strong></td>
<td><strong>$1876</strong></td>
</tr>
</tbody>
</table>

3 Travel costs would have been lower if a Wagga Wagga-based facilitator had been used.