Hug, Nudge, Shove or Smack?

Testing approaches to reducing peak energy consumption by consumers

Final Report

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> Orr, Lucy Jane (2016), "Hugging, Nudging, Shoving and Smacking Behaviour Change," Honours Thesis. Supervised by Prof. Rebekah Russell-Bennett and Prof. Uwe Dulleck. Queensland University of Technology.

Finally, we acknowledge visual designer Natalie Sketcher, some of whose work accompanies this report.

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EXECUTIVE SUMMARY

There is consistent pressure on consumers – particularly vulnerable consumers – generated by the consistent increase in energy prices. This pressure needs to be addressed in order to achieve sustainable electricity management at both the supply-side and demand-side.

There are therefore two sides that can be influenced by interventions – the demand-side (those using the electricity, such as energy consumers) or the supply-side (those supplying the electricity, such as generators, distributors and retailers). One key challenge that affects both sides is 'event days'. These days occur when the level of demand exceeds the ability to supply – for example, on a few very hot days each year. If the infrastructure cannot keep up with demand, then two options are available: 1) Improve or increase the infrastructure (an option that will increase costs for both the suppliers and consumers) or 2) Reduce the demand for electricity during event days, either by using voluntary or required demand control.

This research deals with the latter option, by examining how interventions/levers on the demand-side can encourage consumers to use less electricity during event days, reducing the load on infrastructure and helping to keep prices lower. In order to examine this issue, the current research combines behavioural economics and social marketing to generate multifaceted insights.

Two studies are referenced in this report. Study 1 was a behavioural economics experiment previously conducted by some members of the research team and Lucy Orr (2016) and examines a context of general energy efficiency with a student sample. This study is referenced throughout in order to provide a comparative lens for results. The second, and main, study reported here is a behavioural economics experiment that examines the specific context of peak demand with a sample of general population adults.

Three research questions were proposed to be addressed in Study 2, specifically:

RQ1. How do consumers respond to each of the four policy levers for demand control?

RQ2: How does the initial effect decay over time for each lever?

RQ3: What are the individual differences that influence consumer responses to the levers?

The four policy levers reported on here are Hugs (rewards), Smacks (punishments), Nudges (default choices), and Shoves (restricted choices) and are based on the Behavioural Forms Exchange Matrix (French, 2011). The same levers were tested in both Study 1 and Study 2. The results indicate that consumers in an energy efficiency context respond best to the moderate Shove (Study 1) – in particular when moderate to high reductions in consumption behaviour are required – which increases contribution amounts and does not decay over time. Study 2 also finds that a minor Shove is initially successful, but that both the Shove and the Smack lead to less pro-social behaviour when applied over time. In Study 1, pro-social propensity was shown to increase the amount that participants contributed (i.e., more pro-social behaviour). Study 2 examined the different facets of pro-social behaviour by including the three citizenship types, as well as other individual differences such as age, gender, education, income and household make-up, as well as questions designed to test citizenship, honesty and self-efficacy. Of these, notable significant differences were found in:

- Participatory citizenship: Participants with higher levels of participatory citizenship contribute larger amounts to the public good. $p < 0.01$.
- Age: As participants age increases, so does the contribution amount. $p < 0.1$.
- Taxes: The more a participant justifies cheating on their taxes, the less they will contribute. $p<0.05$
- Ethnicity: Participants who identify as Caucasian contributed higher amounts in this study. $p < 0.05$.
- Education: As education levels increase, contribution will also increase. $p < 0.05$.
- Employment: participants who are "Unemployed/looking for work," will contribute smaller amounts than participants who are employed. $p < 0.01$

The report includes a number of actionable insights for practitioners and policy-makers in the electricity industry, and provides three overarching recommendations for the path forward:

Recommendation 1: Communications

The results of the current study indicate that consumers are willing to act in a pro-social way when the case for behaviour change is clear to them. Indeed, the effect of being informed and being able to see community-level behaviour was just as strong as other levers such as limiting choices. Therefore,

it is important that consumers receive open and timely communication that clearly outlines the need, consequences, and actions for them and their community.

Recommendation 2: Interventions

This report includes the results of trials of four behavioural economics interventions/levers: Hug, Nudge, Smack and Shove. It indicates that the minor Shove can have initially positive effects, but that both the Smack and the Shove lead to reactance over time as consumers choose to use more electricity to gain their freedom back. Therefore, future interventions should lean towards positive interventions (Nudge, Hug), and seek to provide consumers a choice wherever possible.

Recommendation 3: Support

The behavioural economics games reported on in this document give evidence of the impact of technology. Usually there is a delayed feedback loop for electricity services, with bills arriving months after usage (and environmental/community impacts being even harder to determine). In this study, the technology provided consumers with instant financial and community-level feedback, allowing consumers to make informed decisions. Therefore, there is a role for technology that provides real time feedback in order to support consumer decision processes around peak demand.

In moving forward, we recommend that future studies should conduct real-world randomised controlled trials (RCTs) to test interventions and should seek to create positive options to support consumer decision-making through personalisation, instant feedback on individual and community-level behaviours, and appropriate levels of choice.

INTRODUCTION AND BACKGROUND

As societies strive to meet climate targets, electricity services necessarily affect societal as well as individual wellbeing. Governments worldwide have identified energy security, sustainability, and equity as the great trilemma of modern times (World Energy Council 2016). Importantly, electricity has a delayed feedback-mechanism (Rothschild and Gaidis 1981) from the action of electricity use whereby financial consequences are delayed (bills take up to 3 months to arrive) while physical comfort changes are instant. This fosters short-term thinking, where comfort takes priority over costs such as financial, societal, and environmental, as reinforcement is immediate. Researchers and industry representatives see technology as a potential solution for dealing with the energy trilemma and for making the social dilemma associated with electricity more visible (Capaccioli et al. 2017; Ford et al. 2017; Lovell, Pullinger, and Webb 2017).

In this report we examine the social dilemma that results from energy usage and incorporate a technology simulation to provide instant financial and social feedback on choices by using a behavioural economics social good game conducted in a lab. In doing so, we examine two groups of consumers and how they respond to behavioural economic levers in different behaviour contexts. Specifically, the studies discussed in this report are:

Study 1 (Orr 2016)* *Reported for comparative purposes*
Consumer Group: Students
Context: Energy Efficiency
Levers: Hug, Nudge, Smack and Shove

Study 2 (Current Study)
Consumer Group: General population adults (with responsibility for household electricity bill)
Context: Peak Demand
Levers: Hug, Nudge, Smack and Shove

Purpose and objectives

With pending tariff reform and the pressing need for policy-makers to influence changes in consumer behaviour, a concern emerges that non-evidence based implementation of policy levers for ToU pricing are likely to have adverse implications for consumers whose needs may not be considered.

Even if the changes implemented are sound from a policy perspective, the political fall-out and consumer rejection of the changes will ultimately disadvantage consumers in the management of their electricity bill and potentially lead to consumer rejection of tariff reform.

Therefore, this project aimed to identify strategies that can effectively change the behaviour of electricity consumers towards more efficient energy use – either in general (Study 1) or by reducing peak demand (Study 2). In a controlled environment we tested four behavioural economics policy levers, defaults (Nudge), rewards (Hug), penalties (Smack), and limitations/conditions (Shove) – for their effectiveness as well as for the level of political opposition these instruments may trigger.

Study 1 was conducted first (Orr 2016) and used university students as participants (without political considerations or real-world impact). Study 2 was conducted throughout 2018 and used general population adults as participants to increase real-world impact. Study 1 and is included to allow for comparisons to be drawn between the different participant groups and different contexts when the four levers are applied.

Three research questions are addressed in this report, with findings being provided for both Study 1 and Study 2:

RQ1. How do consumers respond to each of the four policy levers for demand control?

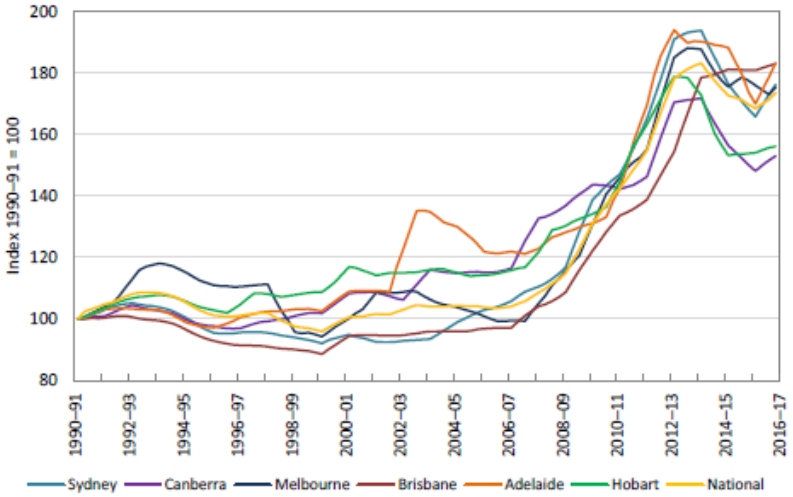
RQ2: How does the initial effect decay over time for each lever?

RQ3: What are the individual differences that influence consumer responses to the levers?

Electricity contexts: The challenge of energy efficiency and peak demand

There is consistent pressure on consumers – particularly vulnerable consumers – generated by the consistent increase in energy prices (see Figure 1). This pressure needs to be addressed in order to achieve sustainable electricity management at both the supply-side and demand-side. Tariff reforms are emerging as one way in which to reduce this pressure, and consumers are open to reforms such as Time of Use (ToU) pricing (Stenner et al. 2015). However, an evidence base is required in order to understand how consumers will react to such changes and how they may benefit consumers.

Figure 1: Increase in Australian Electricity Prices



Source: Data from ABS, Graph from ACCC: *Retail Electricity Pricing Inquiry – Preliminary Report*, 22 September 2017

Both the demand-side (those using the electricity, such as energy consumers) and the supply-side (those supplying the electricity, such as generators, distributors and retailers) can be influenced via policy levers. Of the challenges affecting both sides, one of the most crucial is 'event days' when demand exceeds the capacity of supply, something that may happen on very hot days for instance. In order to address this challenge, there are two options are available: 1) Improve or increase the infrastructure (an option that will increase costs for both the suppliers and consumers) or 2) Reduce the demand for electricity during event days, either by using voluntary or enforced demand control.

This research deals with demand control on event days by examining how interventions on the demand-side can encourage consumers to reduce their demand for electricity during event days, hence reducing the burden on infrastructure and potentially keeping prices lower. In order to examine this issue, the current research combines behavioural economics and social marketing to generate multifaceted insights.

The policy issue: Tariff reform and consumer needs

Tariff reform requires consumers to align their interest with the interests of the major stakeholders in the electricity market. Specifically, regulators and networks seek to reduce long term cost pressures by reducing the need to extend network capacity. This requires changes in consumer behaviour in terms of when electricity is used at home. Research by CSIRO in 2015 has indicated that the preferred tariff to achieve this goal is time-of-use (ToU) pricing (Stenner et al. 2015) and recent research by members of the research team has confirmed that consumers are receptive to time-of-use pricing (Russell-Bennett et al. 2017). Policy-makers typically attempt to manage electricity use using policy levers that Nudge, Hug, Smack or Shove however there is limited hard data available about consumer reactions to these levers. However, despite consumer openness and the potential effectiveness of different policy levers, it is unwise to introduce policy changes – particularly in the electricity context, where political backlash is common – without first conducting tests of the levers with different groups of consumers in a simulated environment.

Benefits of this research for energy consumers

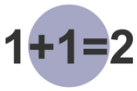
Conventional education and awareness approaches need to evolve to better meet the needs of today's consumers. This research will assist the energy industry (both retailers and networks), policymakers and stakeholders to understand the changing needs of today's energy consumers. It will provide a guidance specifically for the purposes of facilitating more efficient and effective education and awareness activity around peak demand, and inform policy in this regard. Our intent is to:

- Enable new energy behaviours within the community to ensure the benefits are realised
- Encourage, enable and support industry to make the shift to a genuine conversation with consumers
- Establish a social licence to support the introduction of peak demand pricing or other interventions.

Overall, if consumers understand peak demand and the benefits that can be captured by changing behaviours, they will have another tool available to them to respond to rising electricity prices for themselves. Furthermore, successful behaviour change will benefit consumers by reducing overall cost pressure on the sector and thus leading to lower prices for consumers.

BEHAVIOURAL INSIGHTS

The following section outlines the main behavioural insights generated not only by the results, but by discussion of the results with relevant stakeholders in conjunction with the ECA. Hence the following insights are evidence-based whilst remaining practical and consumer-centric.



Keep it short and simple

To achieve substantial reduction in energy demand in the short-term, i.e. in cases of emergency such as event days or times of exceptional load on the grid, it is most effective to engage a technical solution whereby the choices of all consumers are restricted (Shoves). However, the current study demonstrated that communication is imperative in order to ensure that consumers understand the nature of the situation and the specific requests being made of them – therefore in order for any intervention to work, consumers must be communicated with in clear and consumer-friendly language.

One for all and all for one (sometimes)

Pro-social people tend to act of their own accord but can be appealed to, so indicating to consumers that making changes to their electricity consumption during peak time benefits their neighbourhood/community may form part of the messaging for this change – but will only work on pro-social consumers. Among our general population sample in Study 2, a high number of personally responsible citizens were present, and this affected the round 1 results – it is therefore important to communicate to pro-social citizens not only before, but during the activities in order to maintain this positive effect.

One size does not fit all

While policy often seeks a solution that achieves the desired impact across multiple consumer groups and contexts, this is often not possible. This research supports this notion and finds that the nuances do matter to consumers – for instance, whether they are asked to be energy efficient *in general* or at *particular times* on event days. In addition, we illustrate the different consumer groups respond differently, as highlighted by the difference in the

effectiveness of the four levers for students (Study 1) and members of the general public with increased responsibility for paying an electricity bill (Study 2). Hence, despite the attractiveness of a silver bullet solution for policy and industry, consumers still need a personalised approach

Don't tell consumers what to do, ask them (nicely)

Consumers tend to like to have control of their choices, so 'set and forget' options that automate electricity management for consumers – while offering value through convenience – need to be introduced carefully and as a choice, otherwise consumers may feel that their freedom and agency is threatened. It should be noted that this research dealt with voluntary rather than network-controlled reductions, though those in the Shove group did experience restricted choices. Reactance theory can help explain this effect (Clee and Wicklund 1980), and elucidates why consumers in the Smack group reacted with a backlash.

Do not ask them all the time

The research found that while many consumers in the general public are willing to enact pro-social behaviours (Study 2), the stability of cooperation is variable. For instance, in Study 2 consumers were more likely to act pro-socially when initially asked (first round of the game), but this eventually declined. Even in Study 1, the effectiveness of all levers (except the Shove) declined over time, potentially pointing to fatigue if consumers are continually asked to alter their behaviour. The findings also indicate that specific, discrete actions more likely to be adhered to than a general, continuous commitment. Future research should examine the optimum frequency of behavioural requests/reminders to ensure consumers remain pro-social and fatigue does not set in.

If you Smack consumers, they will smack you back

In Study 2, an interesting phenomenon occurred – when consumers were exposed to the Shove and the Smack levers over the long term, their behaviour became the opposite of what was intended. That is, they tended to use *more* electricity and act in a less pro-social manner. This result can be explained by reactance theory, where consumers seek to regain freedom they perceive has been removed – often by acting in an opposite fashion to what is asked (Clee and Wicklund 1980). This indicates that invasive regulation should be avoided for the

context of high network stress. Policy-makers should be aware of the unintended effects of regulation.

Tread carefully with the way you hug consumers

While consumers do not wish to be Smacked, feedback from stakeholders also indicates the need to tread carefully with how Hugs are handed out. As the electricity industry is already the subject of media scrutiny and tends to be distrusted by consumers (Russell-Bennett et al. 2017), it is important that rewards given do not give the impression that the price was too high in the first place (e.g., discounts). Instead, small and relevant rewards should be applied. Beware of extravagance or irrelevance, as consumers will react poorly to both.

Behavioural context matters

When it comes to electricity consumption behaviours, there are different contexts to be considered. The policy response to consumer behaviour needs to consider how consumers react within each context. For instance, we examined general energy efficiency (Study 1) and a specific behaviour during a specific day/time (Study 2), and the findings indicate that these two contexts lead to different behavioural responses. In particular, consumers are more pro-social when asked for specific, discrete actions rather than an ongoing commitment. In fact, consumers are more likely to pull together of their own accord when it is a simple, specific (non-ongoing) request.

In Study 1, a moderate Shove was tested and proved to be the most effective lever over the long term (higher contributions and low rate of decay). In Study 2, a minor Shove was tested and worked in the first round but led to the increased electricity usage over the long-term. In fact, in Study 2 the baseline was already high, indicating that consumers were willing to contribute even without any interventions. Hence, in more general contexts a moderate Shove may help less pro-social consumers to contribute more, but in a specific context participants should be communicated with and *asked* to change their behaviour.

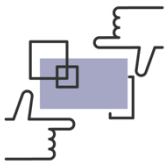
Consumers react differently

Two different groups of consumers were examined: students (Study 1), and the general public (Study 2). We found that these two groups of consumers responded differently, perhaps because the Study 2 cohort had more responsibility for the bill (in addition to being more likely to be employed and earning a higher income). In contrast, many in the student sample had low incomes, a lack of employment, and the majority did not know how much their electricity bill was. Findings indicate that students have a lower level of consideration for electricity management, as indicated by the lower baseline. This group benefited from a moderate Shove that restricted their choices to mandate higher contributions.

On the other hand, the general population sample had a higher baseline level of contributions (i.e., without any interventions), perhaps because of the high numbers of participatory citizens present in this group – this group are conscientious, honest, and believe in helping out when there is a need (Westheimer and Kahne 2004). It is likely that the behavioural context of peak demand appealed to this group.

Give consumers a crystal ball

The behavioural economics experiments also provided a test of support technology – that is, allowing consumers to close the feedback loop on electricity management by offering them instant and personalised feedback on how their individual decisions affected not only themselves, but also the community. This offers insight into the ability of technology to support consumers to make pro-social choices by 'closing the loop'. Offering consumers insights into their own and their peers behaviour is supported prospect theory (Kahneman and Tversky, 2013), which indicates consumers make decisions based on outcome certainty. As technology increases certainty by supplying instant usage information, this allows consumers to accurately consider prospects for financial wellbeing, and feel in control (Ryan and Deci 2000). This is further supported by reinforcement theory which indicates reinforcement should be provided as soon as possible (Rothschild and Gaidis 1981).



Measure it from multiple angles

The results reported here measured the efficacy of the different interventions by examining how consumer contributions to the community (willingness to use less electricity for the common good), changed across time. Insights from industry indicate that efficacy of programs should be measured with multiple instruments in order to provide holistic insights to guide program evaluation and evolution over time. For instance, in Study 2 we observed reactance from consumers who began using *more* electricity when their choices were restricted or punished over long periods. Hence, in addition to hard measures like reduction in KwH at key times, programs should also measure consumer sentiment and value in order to understand consumer decisions and provide them with appropriate support.

POLICY AND INDUSTRY IMPLICATIONS OF THE INSIGHTS

There are a number of implications flowing from this work. These implications provide guidance for distributors, retailers, consumer advocates, and policy makers, and were workshopped with key stakeholders at a session with ECA, industry and government representatives in October of 2018. The following section provides these implications.

Keep terminology consumer friendly

One thing that was evident not only from the effort that went into refining the clarity of the experiment instructions, but also from the participant reports on the day regarding their initial confusion, is that consumers do not know what peak demand is and how it relates to them. There is a dire need to ensure that all terminology is based on consumer-friendly language. This experiment was unique in that it allowed consumers time to focus on just this issue, to read the instructions, and to experience the outcomes of theirs and their peers' choices in real time. When enacted in the real world, consumers will not have the luxury of time to develop an understanding of the concept of peak demand. Therefore, all communications must be clear, consumer-friendly, and be delivered in an appropriate and interesting way – after all, electricity usage is generally not a priority for consumers. One suggestion may be to offer animations as a way of increasing consumer understanding and engagement.

Make sure their behaviour (and everyone else's) is visible

As societies strive to meet climate targets, electricity services affect societal as well as individual wellbeing. Governments worldwide have identified energy security, sustainability, and equity as the great trilemma of modern times (World Energy Council 2016). Thus, wellbeing is at the core of electricity services, making electricity an innately transformative service. Electricity has a delayed feedback-mechanism (Rothschild and Gaidis 1981) from the action (electricity use) whereby financial impacts are delayed (bills take up to 3 months to arrive) while physical wellbeing changes (i.e., comfort) are instant. This fosters short-term thinking, where physical wellbeing takes priority as reinforcement is immediate.

In addition to closing the reinforcement gap by allowing consumers instant access to feedback on their own behaviour, it will also be useful to allow them access to aggregate behaviour of relevant others – for example, allowing them to compare their data to their neighbourhood, city, or State. This makes social norms visible for this usually privately-consumed service. However, a word of caution here is that this may have an anchoring effect whereby consumers use information about the average to define what is acceptable in their own behaviour – if the average is less than their own usage this works well, but if the average is high then the social norms here will perpetuate negative behaviour by giving consumers permission to use more.

Show them the consequences

Related to the previous point is the concept of awareness of consequences; there is a disconnect between the action of using excess electricity during peak demand times, and the consequence of blackouts. Indeed, even if consumers do realise this (e.g., perhaps they just turned on the microwave when the power goes out), there is a diffusion of responsibility that allows consumers to blame others and fail to take responsibility for their own actions. Programs for peak demand should generate awareness of relevant consequences (e.g., local consequences like consumer comfort, not psychically distant consequences like grid stability or global warming). Indeed, most consumers in this sample were personally responsible citizens, meaning any requests for behaviour change should be focused on the individuals' immediate environment and behaviours.

Talk about what is in it for *them*

Insights generated from key stakeholders in conjunction with the research team indicate that consumers are focused on their own problems and what has value for them, rather than considering problems for electricity networks or the government. Therefore, any programs requesting behaviour change should not discuss concepts like ensuring stability of the grid and reducing the need for network investment, but rather on concepts that have value for consumers – cost and comfort, as well as the positive feelings associated with doing the right thing and helping their neighbours and community.

Get the context right

Our research has illustrated that consumers respond differently depending on the context – in particular, responding better to discrete, specific requests for change rather than requests for an ongoing commitment. In the context of specific requests, consumers may be willing to alter behaviour without intervention – provided the communication is appropriately framed and relevant to them. Consumer fatigue will set in if asked for changes continually. Likewise, an ongoing commitment (Study 1), requires interventions to mandate the changes.

Beware compensatory behaviour

Discussions also highlighted the importance of avoiding the compensatory behaviour that consumers tend to engage in when feeling that they have made positive changes. Consumers who feel they have acted in a pro-social way feel as if they have accrued 'brownie points', such as in the example of solar – consumers feel that in installing solar they have made a good financial and environmental decision, and so tend to increase their energy usage (i.e., "I've earned it."). This is why social marketing is needed, so we can understand what motivates consumers to act as they do. Consumers are not rational and can be very creative in how they achieve what they want and value.

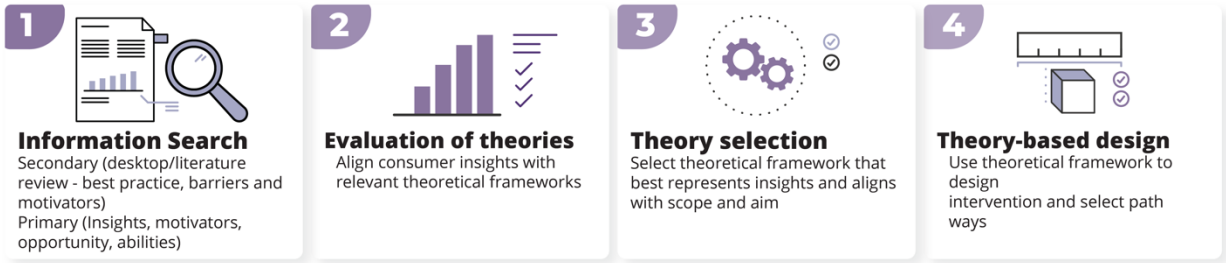
Do not look for a silver bullet

The findings for individual differences in this research, in addition to how consumer responses depend on the context of behaviour change requests, indicate that there is no silver bullet approach. Consumers respond differently depending on their own preferences and characteristics, and on the context for behaviour change. Options are needed for choice and personalisation in order to ensure optimal outcomes.

THEORETICAL FRAMEWORKS

This project followed the Social Marketing Theory-based (SMT) Approach (Manikam and Russell-Bennett 2016) process for developing theory-based approaches (see Figure 2: Stages of the SMT Approach).

Figure 2: Stages of the SMT Approach



Stage 1: Information search. The first stage of the SMT approach is to identify theories used in previous behavioural economics or social marketing campaigns, studies, or programs. This information search stage includes published research, relevant government or industry reports and campaign evaluations.

Stage 2: Evaluation of past interventions and theories. The purpose of this stage is to critically evaluate theories uncovered in stage 1 to identify the circumstances in which the theory is effective. In particular, each theory is evaluated based on the effectiveness of outcomes and its focus on behaviour rather than attitudes. These are important criteria, as social marketing and behavioural economics require a behavioural outcome rather than a change in attitudes or awareness. Programs that focus on behavioural outcomes are more effective than attitude/awareness-based campaigns (Carins and Rundle-Thiele 2014; Thornley and Marsh 2010).

Stage 3: Theory selection. Behaviour change programs achieve stronger impact when the program is designed around theory (Fry and Neff 2009); however, “theories and models for social marketing

abound, with little formal consensus on which types of models for what types of social problems in what kinds of situations is [sic] most appropriate" (Lefebvre 2000, p. 32).

Stage 4: This final stage involves using the selected theories to guide development of intervention. After following this process in the current project, three theories/frameworks were selected to guide the research. Firstly, the research was based within a social dilemma framework to accurately reflect the context of this research – that is, the trade-off required between individual and societal needs, and how pro-social behaviour can offer mutual benefit.

Within the context of a social dilemma, ideas to encourage pro-social behaviour should follow the well-established EAST framework (Behavioural Insights Team 2013) to ensure that behaviour is Easy for consumers, Attractive to enact, Social in its context and Timely in when resources are delivered. In the current project, social and timely aspects were delivered via method (public goods game utilising behavioural economics technology in a 'neighbourhood' context), while the easy and attractive elements were delivered via the levers utilised as interventions in the public goods game.

Specifically, these levers are based on the Behavioural Forms Exchange Matrix (French 2011) which posits that different interventions/levers are required depending on whether the behaviour is passive or active, and whether consumers should be rewarded or punished. This provides four levers: Hug, Nudge, Smack, and Shove.

Each of these three theories/frameworks is now discussed in greater depth over the three sections below.

Social Dilemma Framework

Understanding electricity demand as a social dilemma opens up new ways to consider communication and behavioural economic interventions. A social dilemma service-setting involves the use of a service whereby an individual benefits at the expense of the collective (Kollock 1998). See Figure 3 for a visual illustration of the social dilemma. Examples of this type of context are inappropriate use of public health services such as hospitals (e.g. using emergency services for minor injury), overuse of water in drought conditions (e.g. watering the lawn when dam levels are low) and use of electricity at peak demand times (e.g. using heat/cooling and increasing demand on electricity service possibly creating a blackout). Electricity use is a social dilemma as each consumers' demand choices affect not only his or her comfort but have implications for the community and for electricity systems with respect to the costs of generation and system reliability. It is a social dilemma as the individual contribution to reduce costs and increase system reliability comes at a cost to the individual, as reduced electricity use requires either (i) investment in more energy efficient devices, (ii) changing the settings of existing appliances such as air conditioners, or (iii) changing the times at which energy-hungry appliances like washing machines and ovens are used. The changes come either as financial expenses or at the cost of reduced comfort/convenience for the individual, meanwhile the benefits accrue to the community through higher system reliability and over the medium term reduced electricity prices. With this framework in mind it becomes clear that communication of the situation plays a role as do the behavioural economic interventions that may help to increase coordinated behaviour change.

Figure 3: An illustration of the social dilemma framework

EAST Framework

The EAST framework was developed by the UK Behavioural Insights Team (Behavioural Insights Team 2013; Halpern 2015) for the purpose of designing behavioural research informed policy interventions. The framework builds on Richard Thaler's and Cass Sunstein book Nudge (Thaler and Sunstein 2012) which argues that the systematic biases documented by the research of Daniel Kahneman and Amos Tversky as well as others (Kahneman 2012) should lead policy makers, governments and industry to engage in choice architecture. Choice architecture is the careful design of decision environments that take into account behavioural biases. The aim of a good Nudge/good choice architecture, is to enable citizens and customers to make better decisions for themselves and as judged by themselves (Thaler and Sunstein 2012).

The EAST Framework provides four ways to achieve better decisions (see Figure 4).

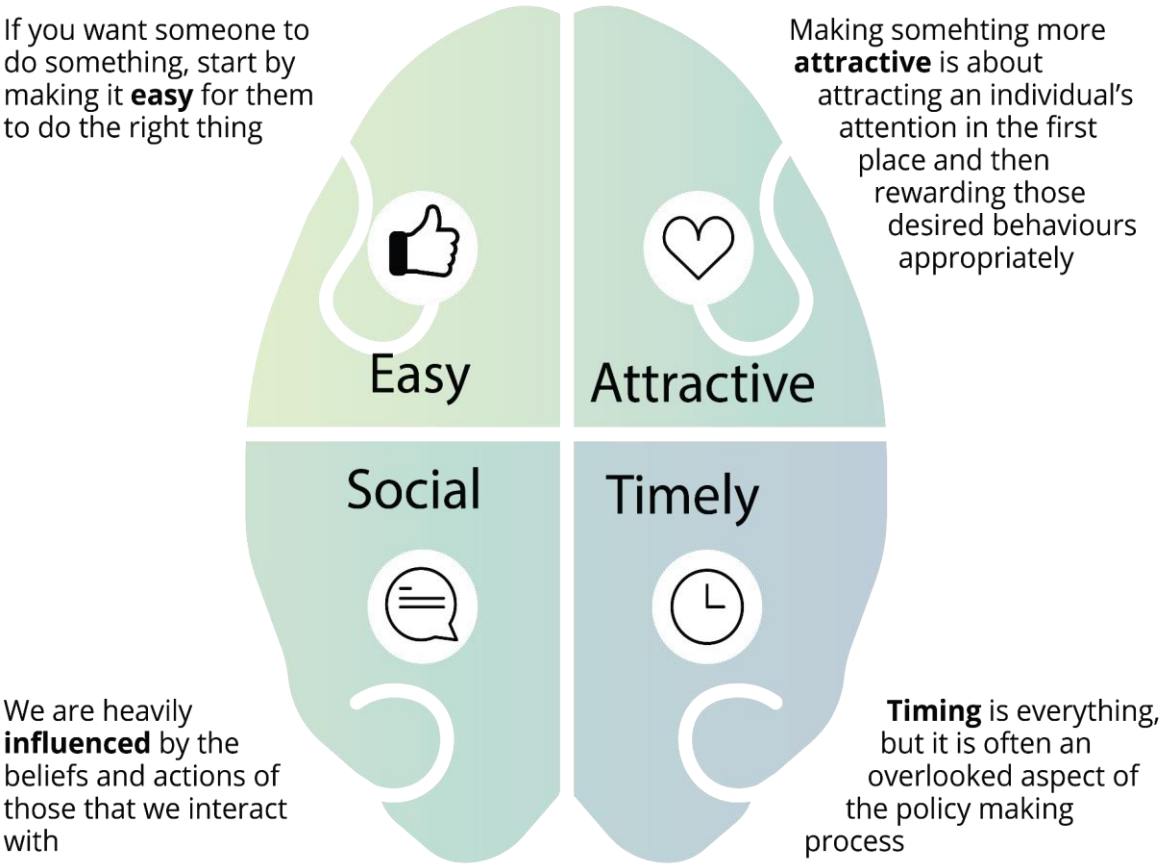
- E – Easy: Decisions that are beneficial from a policy perspective but also for the individual if he or she would have the time and resources to make a reflective and fully informed decision, should be easy, while making a mistake should be hard. The instruments considered here are defaults – the "most likely" best option should be the default as change is always hard. For example, automatic enrolment in the social security network, with an option to opt out – is one such illustration of a default being used.

- A – Attractive: Achieving behaviour change requires attention, awareness, and action on the part of the individual – a breakthrough is required (Cialdini 2014). Attractive Nudges can be a case of better presenting information, but can also involve small incentives. The latter can be seen as traditional economic or policy interventions (see also the Behavioural Forms Exchange Matrix; French, 2011).

- S – Social: To achieve behavioural change as well as to gain attraction it is useful to take into account the extent to which we depend on social cues. Whether it is learning from behaviours of others or our need to be part of a group. Thus, successful behavioural economic interventions can use communication about the behaviour of other members of our group. Similarly clarifying consequences for the group or providing incentives on a group level can be used to achieve the intended behavioural change.

T – Timely: Given that Nudges are usually low powered interventions, i.e. communication, minor incentives, tools for coordination, it is particularly important that they reach the decision maker at a time when they matter. Reminders that reach a decision maker 2 weeks before a decision has to be made will often not lead to immediate action, while a reminder 2 days before a deadline may trigger the required action. Similarly, if information or incentives are provided, they need to be salient at the time of the decision.

Figure 4: EAST Framework

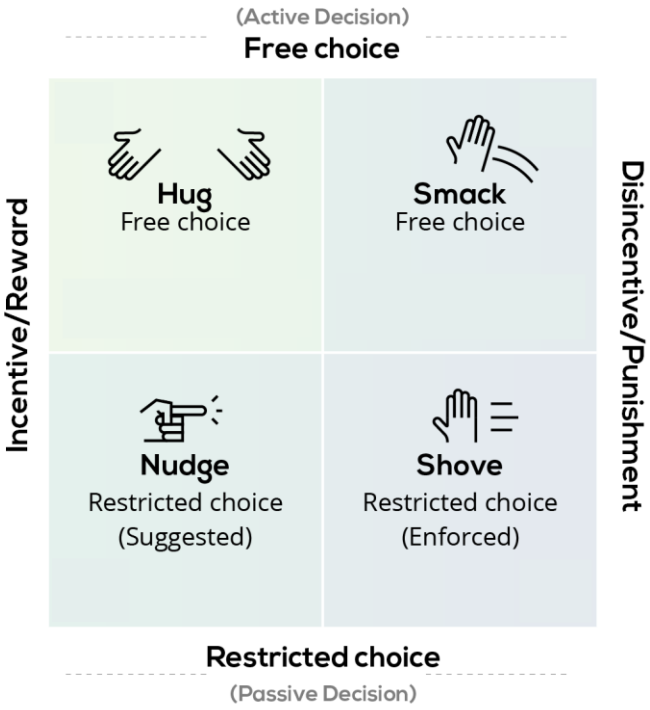


Source: adapted from Behavioural Insights Unit, 2013

Behavioural Forms Exchange Matrix

The Behavioural Forms Exchange Matrix (French 2011) was utilised in this research to guide the design of the interventions used in the experiments. This framework is made up of four quadrants into which messages and other triggers may fall (see Figure 5). The French (2011) matrix posits four different styles of interventions or policy levers that vary based on whether the person is making an active or a passive choice, and whether the desired intervention should be a punishment or a reward. For a positively framed approach, a Hug (reward) would be chosen for active choices and a Nudge (gentle push in the right direction) for passive behaviours. On the side of disincentives, a Smack (punishment) is appropriate for active choices, while a Shove (restriction of choice), is more suited for passive choices.

Figure 5: Behavioural Forms Exchange Matrix



Source: Adapted from French, 2011

METHOD AND APPROACH

This research utilised a traditional behavioural economics method – a social dilemma game conducted via a laboratory experiment – while applying social marketing theory to determine the conditions that participants would be exposed to (i.e., French's Behavioural Forms Exchange Matrix) and how the message would be designed.

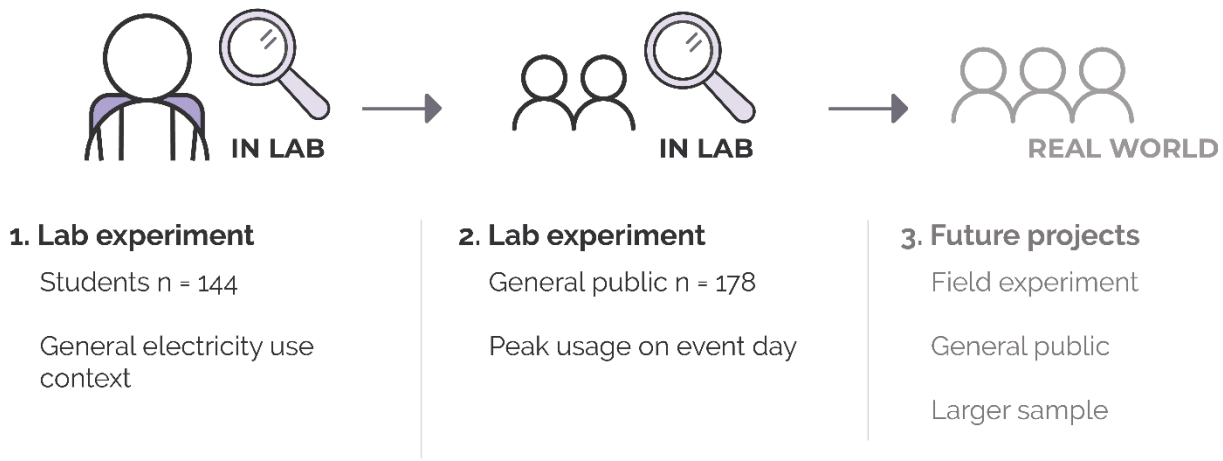
The Social dilemma and laboratory experiments

Social dilemmas lend themselves to testing in a laboratory setting which allows for individuals to be sorted into groups and to make decisions and receive feedback in a controlled environment. Behavioural economics studies in social dilemmas show that while participants may initially consider their community, this effect tends to deteriorate over time (Kagel and Roth 1995) and only few communities succeed in achieving societally optimal, high contributions (Fischbacher, Gächter, and Fehr 2001). The electricity industry provides an interesting example showing how short and long-term considerations interact with the individual vs community trade-off. The adverse effect on the community, given the public policy nature of the infrastructure investments, also affects the long-term financial burden for the individual.

Stages of the research

This work follows on from Study 1 which examined four levers (Hug, Smack, Nudge and Shove) and the response they were able to elicit from students during non-event/general electricity usage days. The current study (Study 2) goes further than the original by including general population adults who have a responsibility for paying an electricity bill, and by focusing on event days in particular. This report will present comparative results between the first and second studies of this research. The next potential phase (see Next Steps) would be a real-world field experiment (see Figure 6).

Figure 6: Project Process across Study 1, 2 and Future Phases



In Study 2, the experiments were conducted in order to examine the influence of four different levers on electricity consumption decision-making during peak times. The instructions for participants were developed in consultation with key ECA stakeholders, and attendees of the workshop organised with the support of Energy Consumers Australia earlier this year.

Lab experiments

Two lab experiments were conducted. Study 1 was conducted previously by Orr (2016) and is reported here for comparative purposes. The following sections summarise the two studies and the differences between them.

Overview of lab experiment for study 1 – Applying the Behavioural Forms Exchange Matrix

Study 1 (Orr 2016) included student participants, many of whom had no or little responsibility for the payment of an electricity bill. Participants in this group were asked about general electricity efficiency rather than a specific context, and received one of five possible interventions, all of which were manipulated by either:

a) Increasing or decreasing the final payout participants received depending on whether they exhibited pro-social behaviour or not, or

b) Restricting participant choices or adding default selections to their choices.

These options are based on the Behavioural Forms Exchange Matrix first proposed by Jeff French (French 2011). The five interventions all involved participants being asked how many tokens (representing reduced electricity usage), they would contribute. The higher the number of tokens contributed, the more the pro-social behaviour was exhibited. The conditions were:

1. Baseline: No manipulations were made for this group.

2. Hug: A Reward (participants had free choice but received a greater payment for selecting higher amounts – i.e., more pro-social behaviour).

3. Smack: A Punishment (participants had free choice but received a 'fine' for selecting lower amounts – i.e., less pro-social behaviour).

4. Nudge: A Gentle Push (participant choices defaulted to a higher level automatically, unless participants chose otherwise).

5. Shove: Restricted Choices (participant choices were automatically restricted to higher levels). In this study a 'moderate Shove' was used, with 5 being the lowest level of contribution that could be selected (out of 9). The coding behind each of these conditions was based on the mathematical formulas presented in Table 1.

Table 1: Operationalisation of experimental treatments

Study 1 – Student sample Context: Energy efficiency			Study 2 – General population sample Context: Peak demand		
Treatment	*Payoff (reward/punishment)*	*Choices*	***Treatment***	*Payoff (reward/punishment)*	*Choices*
Baseline	*Payoff = (10 – x)+ [¼ *(x+y)]*1.6*	*1,3,5,7,9*	***Baseline***	*Payoff = (10 – x)+ [¼ *(x+y)]*1.6*	*1,3,5,7,9*
Hug	*Payoff = (10 – x)+0.1x+ [¼*(x+y)]*1.6*	*1,3,5,7,9*	***Hug***	*Payoff = (10 – x)+0.1x+ [¼*(x+y)]*1.6*	*1,3,5,7,9*
Nudge	*Payoff = (10 – x)+ [¼ *(x+y)]*1.6*	*1,3,5,7,9 (automatically lands on 7)*	***Nudge***	*Payoff = (10 – x)+ [¼ *(x+y)]*1.6*	*1,3,5,7,9 (automatically lands on 7)*
Shove	*Payoff = (10 – x)+ [¼ *(x+y)]*1.6*	*5,7,9 (lower options removed)*	***Shove***	*Payoff = (10 – x)+ [¼ *(x+y)]*1.6*	*3,5,7,9 (option of 1 removed)*
Smack	*Payoff = (10 – x) * 0.9 + [¼* (x+y)]*1.6*	*1,3,5,7,9*	***Smack***	*Payoff = (10 – x) * 0.9 + [¼* (x+y)]*1.6*	*1,3,5,7,9*

Overview of lab experiment for study 2 – Applying the Behavioural Forms Exchange Matrix

Building on the findings of Study 1, participants in these experiments were adults with a level of responsibility for the payment of an electricity bill in order to increase realism and external validity. Participants were exposed to one of five possible conditions, each of which was the same as in Study 1, with the exception of the Shove (in this instance a more minor shove was used, where the restrictions were set slightly lower than in Study 1). Again, the five conditions all involved participants being asked how many tokens (representing reduced electricity usage during peak time), they would contribute. The higher the number of tokens contributed, the more the pro-social behaviour was exhibited.

Experimental procedure

The same experimental procedure was followed for both Study 1 and Study 2. To capture the social dilemma situation, participants in our simulated environment were put in groups of four, representing

their neighbourhood. Each participant chose how much they would contribute in order to reduce peak electricity demand. While this choice was made in the abstract, it was clearly communicated what costs of the choice was to the individual and what were the benefits to the group of this choice. All costs were described in the form of either financial burden or discomfort and benefits where translated in expected benefits in financial terms to the community.

The participants proceeded through the following process on arriving for their experimental session. The process that participants experienced in illustrated in Figure 7.

Step 1. Participants were assigned into groups of four players.

Step 2. Participants were given a copy of the instructions and some test questions.

Step 3. Participants played 16 (Study 1) 8 (Study 2) rounds[1] of the game whereby they were asked how much of their own electricity usage they would willingly reduce during event days.

Step 4. After playing all eight rounds, a short survey was administered.

Figure 7: The Experimental Process

[1] A reduced number of rounds were used in Study 2 for the context of peak demand to represent the short-term discrete nature of peak demand days compared to the ongoing nature of energy efficiency.

Scoring

Participants were given a choice of how many tokens they would like to contribute, from 1-9 with 9 indicating that they would willingly reduce their use of electricity 100% of the time, and 5 indicating that they would willingly make this reduction about 50% of the time. Those in the Shove group only had options from 5 to 9 (Study 1) or 3 to 9 (Study 2), and hence were restricted to higher levels of contribution.

The experiments were performed, and data analysis conducted in order to find which of these conditions is (in)effective at increasing the pro-social behaviour of voluntarily reducing electricity consumption during peak time, hence increasing the likelihood that the grid can support the needs of all.

FINDINGS

Once the data had been collected, it was cleaned and analysed using Stata and SPSS software via a range of techniques, including descriptive analysis, group difference tests, correlations, and regression analyses. The results for the current study were also compared with the original study that inspired this project. For clarity these will be referred to as Study 1 (the original study) and Study 2 (the current study).

Three research questions were examined as part of Study 2 study, specifically:

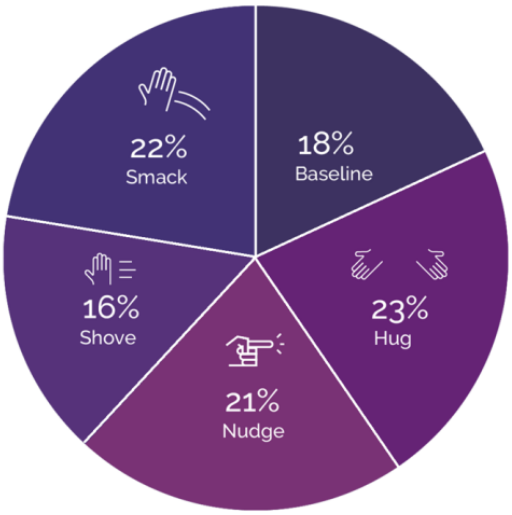
- RQ1. How do consumers respond to each of the four policy levers for demand control?
- RQ2: How does the initial effect decay over time for each lever?
- RQ3: What are the individual differences that influence consumer responses to the levers?

Sample characteristics: Demographics

In Study 1 the sample of student participants included 144 people who provided useable data. Study 2 saw a total of 182 general population adults take part across the ten experiments, and once data cleaning was complete, the total useable sample was 178 participants. In both studies, participants were randomly allocated to one of the five treatments. As an illustration, the breakdown of participants receiving each intervention for Study 2 can be seen in Figure 8.

The sample for Study 2 also had some key differences from the Study 1 sample, due to the general population sample used, and the higher responsibilities amongst this group for utilities bills. The differences between the two samples are illustrated in Figure 9 and a full description of the Study 2 sample characteristics is provided in Appendix 1.

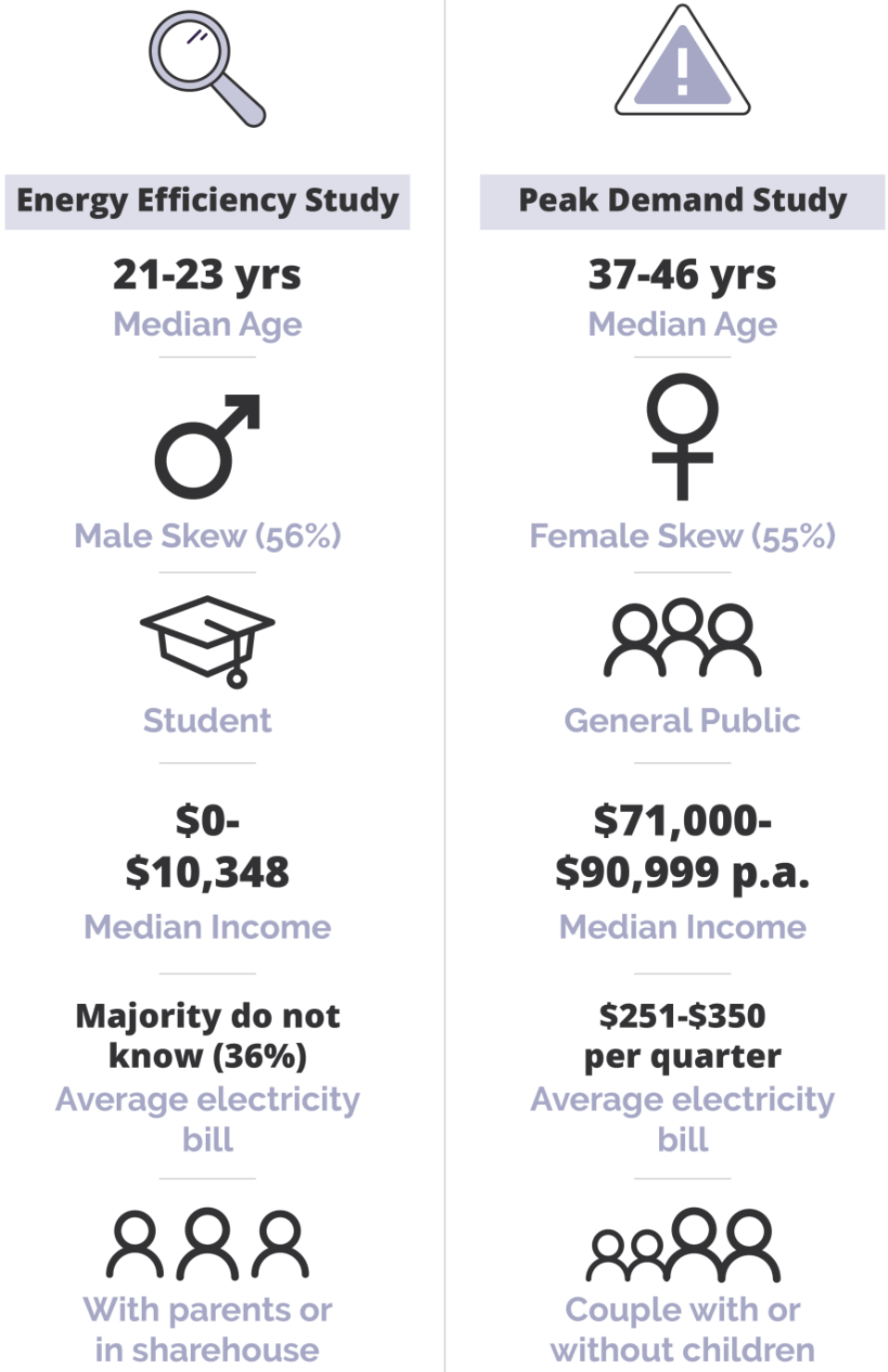
Figure 8: Breakdown of Participants receiving each intervention – Study 2



The sample was a balance of males and females across both studies – though slightly more males in Study 1 and slightly more females in Study 2. The median age in Study 1 was 21-23 years while in Study 2 it reflected the more general population focus with a median age of 37-46 years. Likewise, median annual income was lower in Study 1 ($0-$10,348) than in Study 2 ($71,000-$90,999 p.a.).

Finally, while the median electricity bill was $251-$350 per quarter in Study 2, the majority of participants in Study 1 indicated that they did not know how much their electricity bill was for (36%). These sample characteristics are indicative of the choices made in these studies, and show that as planned, we have one group with low responsibility for the bill (students) and one with high responsibility for the bill (general population).

Figure 9: Comparison of Study 1 and Study 2 Samples



Findings RQ1. How do consumers respond to each of the four policy levers for demand control?

T-tests were used to identify if the difference in mean scores occurred by chance or by the different policy levers. The * in the significance column indicates that the mean difference was significant different (caused by the policy lever not by chance) and the number of * indicates the confidence level (*= only 5 out of 100 (5%) experiments of this type would show an effect if this effect is purely random, ** = <0.01 (1 in 100) probability that the result occurred by chance and *** = < 0.001 (1 in 1000) probability that the result occurred by chance). See also Table 2.

Table 2: Peak Demand: The Shove at Round 1 (Study 1 and Study 2)

Round 1	Mean	SD	T-stat	Significance
Energy Efficiency Context (Study 1) – Moderate Shove				
Shove vs	5.937	1.34		
Baseline	3.750	2.81	-3.664	0.009**
Shove vs	5.937	1.34		
Hug	5.625	2.66	0.593	0.000*
Shove vs	5.937	1.34		
Nudge	4.500	1.90	3.494	0.001*
Shove vs	5.937	1.34		
Smack	5.25	2.47	1.381	0.038*
Peak Demand Context (Study 2) – Minor Shove				
Shove vs	6.07	1.59		
Baseline	4.94	2.41	-2.1202	0.019*
Shove vs	6.07	1.59		
Hug	4.45	2.02	3.5423	0.000**
Shove vs	6.07	1.59		
Nudge	5.37	1.79	1.6526	0.048*
Shove vs	6.07	1.59		
Smack	4.6	2.36	3.0732	0.001**

1.1 Consumers willing to conserve energy for peak demand but not in general

The mean result for the peak demand baseline group in round one was 4.94/9 which indicated they were willing to give away half of their energy use. This was much higher than the energy efficiency baseline group where the mean result was 3.75/9.

The findings indicated that no intervention/lever made a significant difference over the long term to conserving energy for peak demand (Study 2) however the moderate Shove was effective in general for energy efficiency (Study 1). It is especially important to note that in this group (Study 2 – peak demand context) the baseline was high, perhaps indicating that people are willing to contribute to the public good in these conditions. This was different to Study 1 (energy efficiency context) which had a lower baseline indicating that people were more self-interested.

1.2 The Shove works but only in the short-term

When examining the findings for the first round (short-term) the Shove led to higher conservation of electricity in both the energy efficiency (Study 1) and peak demand (Study 2) contexts compared to the baseline, Hug, Smack and the Nudge. Please see also Table 2.

Findings RQ2: How does the initial effect decay over time for each lever?

Research Question 2 was concerned with the level and amount of decay over time for each lever. As can be seen in Figure 8, in Study 1 study there was decay over time for every condition – including the baseline – except for the moderate Shove, which showed it was effective even over 16 rounds. In contrast, the current study found no indication that the level of cooperation was deteriorating over time in the given decision situation.

2.1 The Shove works for some people, the only when used sparingly

When compared with the Study 1 results, it can be seen that in this previous study the 'Moderate Shove' was the clear option to select, whereas in the current study the minor Shove is effective only if used once and not repeatedly (see Figure 10 and Figure 11). This change could be due to the different characteristics of the participants, and also to the high baseline that was seen in the current study.

2.2 General population has a greater stability of responses than students

Indeed, the high baseline may indicate that when it comes to event days – rather than general electricity behaviour – consumers are happy to band together for the common good (provided this is not a continued request, and that they are not subjected to any 'punishments'). These participants also seemed to benefit from having data on their own behavioural as well as that of their community/peers. This may indicate a greater stability of response in the general population, as opposed to the student sample utilised in Study 1.

Figure 10: Study 1 Results over Time

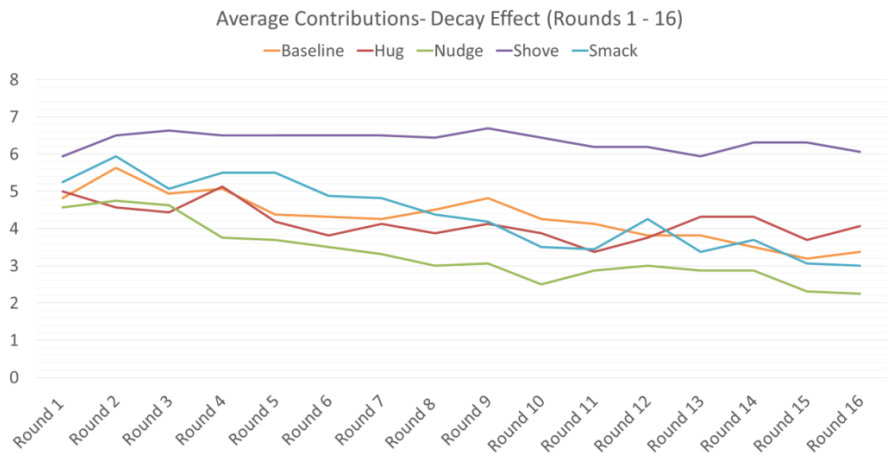
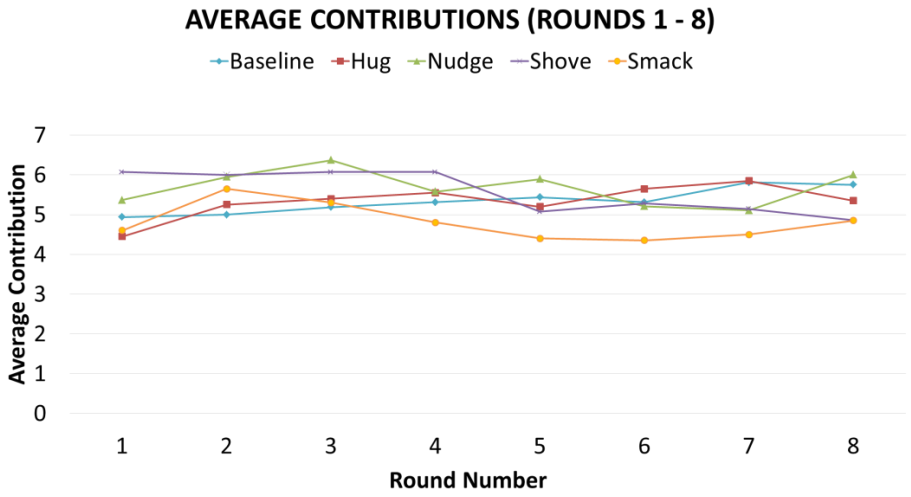


Figure 11: Study 2 Results over Time



Findings RQ3: What are the individual differences that influence consumer responses to the levers?

A number of individual difference variables were also tested. In both Study 1 and Study 2, it was found that those who believe in being good citizens and 'pitching in' more also tend to contribute more. This is not surprising as it can be expected that those who generally believe in acting for the common good would also act the same way in the scenario of reducing electricity usage for the good of others.

3.1 Individual Difference Matters

Other individual difference variables tested in Study 2 included demographics such as age, gender, education, income and household make-up, as well as questions designed to test honesty and self-efficacy. Of these, notable significant differences were found in:

Age: As participant age increases, so does the contribution amount. $p < 0.1$.

Taxes: The more a participant justifies cheating on their taxes, the less they will contribute. $p<0.05$

Ethnicity: Participants who identify as Caucasian contributed higher amounts in this study. $p<0.05$.

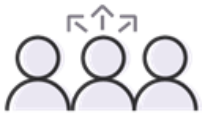
Education: As education levels increase, contribution also increases. $p < 0.05$.

Employment: Participants who are "Unemployed/looking for work," will contribute smaller amounts than participants who are employed. $p < 0.01$

The full results of the regression analyses undertaken to examine these individual difference variables is provided in the appendix. It should be noted that the regression considers contributions from

rounds 4-8, as this allows for a 'learning period' to occur amongst participants during the first few rounds and therefore increases confidence in the results. It is a common reality within public goods games that participants only start to fully understand all the dynamics of the game after observing results over the first three rounds.

3.2 Citizenship matters



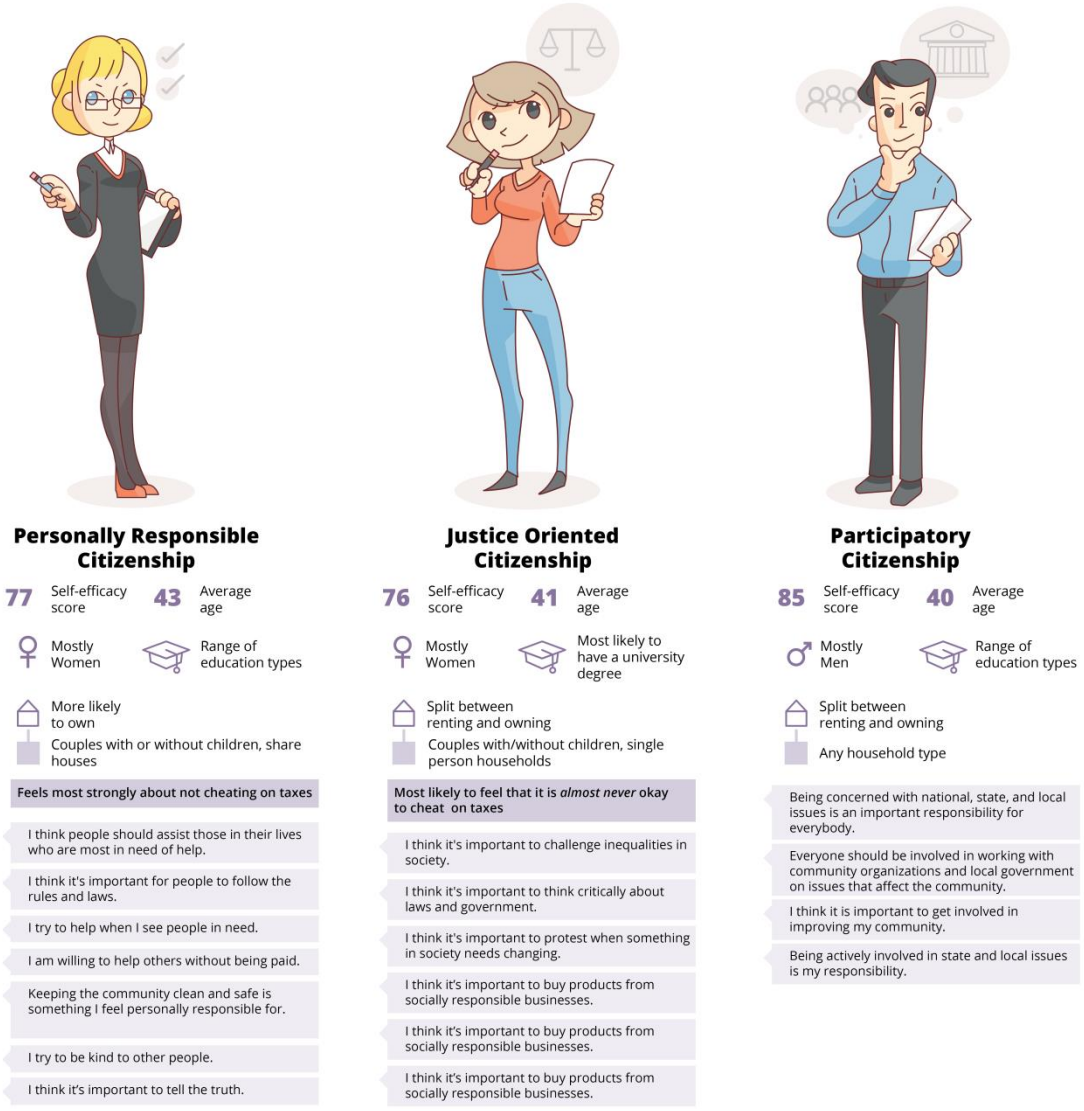
In Study 1, highly pro-social customers were more generous. That is, those with higher levels of other-oriented empathy made higher contributions. Therefore, in Study 2 we examined the concept of pro-sociality with even greater depth in order to expose any nuances in this relationship. To do this we included measures of the three types of citizenship.

The three types of citizenship include: personally responsible citizenship, participatory citizenship, and justice oriented citizenship, each reflecting a different facet of the 'pro-social personality' of consumers (Westheimer and Kahne 2004). First, personally responsible citizens believe in ensuring their own behaviour is responsible, conscientious and kind. This type of citizen focuses on ways in which their behaviour can influence society for the better (for example paying taxes, recycling, volunteering when required). The participatory citizen is an active community member and focuses on collective effort and takes the lead in order to drive change (for example, organising community efforts, sending submissions to Government). Finally, the justice-oriented citizen seeks the betterment of society through systems and structures, and actively finds the root cause of problems in order to drive long term change in the system (for example, joining a large consumer action group, seeking positions in government and NGOs that allow them to be part of task forces, etc). As an illustration of the differences between the three, consider waste issues – while the personally responsible citizen always recycles, the participatory citizen organises local 'clean up the neighbourhood' days, and the justice-oriented citizen is engaged with understanding the causes of waste and landfill, and has joined a task force to address these causes.

Within this study, the most common type of citizenship was personally responsible citizenship (N = 107), followed by justice-oriented citizenship (N = 59), and participatory citizenship (N = 7). There were a number of people who had 2 or more dominant types of citizenship (N = 4), but these

participants were excluded from the citizenship analysis to ensure clear results. A summary of the characteristics of these three groups is included in Figure 12.

Figure 12: Types of Citizenship in Study 2



Source: Adapted from Weistheimer and Kahne, 2004 – data is from Study 2 of the current research

A set of correlation analyses were conducted and found that higher levels of any of the three citizenship types are correlated with higher levels of individual contributions in the public goods game (personally responsible: r = .165, p = .027; participatory: r = .208, p = .005; justice oriented: r = .166, p

= .027. Likewise, age and self-efficacy are correlated with all three citizenship types. Finally, the citizenship types are also correlated with each other, which indicates that despite consumers having a dominant level of one citizenship type, they will still exhibit some characteristics of the others as their secondary and tertiary types.

Finally, an ANOVA was conducted to examine the impact of citizenship types over the different rounds (i.e., to see if citizenship increased contributions over all the rounds, or whether its' influence was likely to decay). The results indicated that while there are trends evident for the different types of citizenship influencing the responses to the different levers throughout the eight time points, this relationship is only significant in round 1, $F(2,172)=6.34$, $p = .002$. In particular, during round 1 those with dominant participatory citizenship contribute significantly more ($M= 7.285$, $SD = 2.13$) than the other two citizenship types, justice oriented ($M = 5.406$, $SD = 1.99$) and personally responsible citizenship ($M = 4.71$, $SD = 2.10$). Thereafter this effect ceases to be significant, perhaps indicating that consumers may be influenced by the social cues provided in the feedback.

Limitations

As with all research projects, a number of limitations should be taken into consideration when reviewing the results of Study 2. First, while the lab environment provides a solid research context for ensuring control, it also brings with it a number of limitations. Specifically, a computer experiment can only really provide first evidence into real world behaviour – in order to ensure external validity, a field study should follow.

The field study will also help address the other limitations – confusion, low stakes, and Hawthorne effect. Having real general population participants is one step towards ensuring external validity, but as this is the first time that some of these people have been exposed to a lab environment, there is also the potential for confusion to occur. Likewise, while there were 'stakes' in the experiment given participants were provided real money based on their game play, these stakes were still relatively low when compared to those in the real world. Finally, there is also the chance that the Hawthorne effect played a role in the results, where participants may wish to show more of a particular behaviour if they realise it is being observed.

We therefore propose that the logical next step for continuing this work is a field study whereby each of the levers are tested in the real world as part of a Randomised Controlled Trial (RCT). For any such trial, communication will be important – consumers are willing to help one another (and themselves) but do not respond well to being asked to solve problems that they do not perceive as being their doing, such as network issues with supply and demand. In addition, this study has shown the influence of individual and peer-level feedback, so this should form a part of the communication for any program tested via RCTs.

RECOMMENDATIONS FOR REDUCING PEAK DEMAND BY CONSUMERS

There are three main recommendations arising from this report with regards to how electricity use during peak time may be addressed via a program of social change and/or policy. These options will be discussed in greater depth over the coming pages. In summary, these three potential directions of influence are:

Recommendation 1: Communications

The results of Study 2 indicate that consumers are willing to act in a pro-social way when the case for behaviour change is clear to them. Indeed, the effect of being informed and able to see community behaviour was just as strong as other levers such as limiting choices. Therefore, it is important that consumers receive open and timely communication that clearly outlines the need, consequences, and actions for them and their community.

Recommendation 2: Interventions

This report includes the results of trials of four behavioural economics interventions/levers: Hug, Nudge, Smack and Shove. It indicates that the minor Shove can have initially positive effects, but that both the Smack and the Shove lead to reactance over time as consumers choose to use more electricity to gain their freedom back. Therefore, future interventions should lean towards positive interventions (Nudge, Hug), and seek to provide consumers with a choice wherever possible.

Recommendation 3: Support

The behavioural economics games reported on in this document gave evidence of the impact of technology. Usually there is a delayed feedback loop for electricity services, with bills arriving months after usage (and environmental/community impacts being even harder to determine). In this study, the technology provided consumers with instant financial and community-level feedback, allowing consumers to make informed decisions. Therefore, there is a role for technology that provides real time feedback in order to support consumer decision processes around peak demand.

1 – Communications

Comparing the data from two studies conducted as a part of this research gives a strong indication that communicating the need for behaviour change clearly is of paramount importance, particularly for the general public cohort over the student cohort. That is, consumers need to be aware that without behaviour change a risk of a blackout prevails – using too much electricity is therefore a risk not only to their financial wellbeing, but also to their physical wellbeing in the event of a blackout affecting the level of comfort possible in their household and community. In the experiments the scenario clearly informed consumers about the consequences of using too much electricity during peak times, and we observed that the behaviour of other consumers led to significant reductions in energy consumption, this effect was as strong as minor positive incentives or limiting choices of consumers.

With regards to how to communicate, messages should be positively framed, ask for specific actions, and relate the consequences directly to consumer cost, comfort, and community. The types of messages that are used in behavioural research typically relate to norms, framing and appeals:

- Social norms: descriptive (what people do) v prescriptive norms (what people should do)
- Framing: positive (benefits) v negative (fear, guilt and threat)
- Message appeals: informational (facts and figures) v moral (ethical reasons) v emotional (feelings).

All of these should be considerations when designing messages, and all messages should be pre-tested to ensure appeal and efficacy. Often the source of information is as important as the message itself, as different sources will elicit varying perceptions of trustworthiness and acceptance. For example, research on change undertaken by consumer advocacy agencies and universities is more likely to be accepted than research performed by the electricity companies exclusively.

Generally speaking there are a number of principles that should be applied in best practice communication for behaviour change. A brief summary of the evidence-base on communication in behaviour change reveals what works and what doesn't (see Table 3).

Table 3: What works and what doesn't in communications for behaviour change

What works	What doesn't work
Communications integrated with complementary support programs	Awareness-only communications
Full integration of traditional and digital media campaigns	Communication without support tools
Traditional media can help drive awareness	Fear and guilt appeals
Edutainment approach with behavioural messages embedded in interactions	Non-credible or unreliable sources
Establishing partnerships with organisations and people who have social influence boosts participation	Mass messages that are not tailored for the audience
Engaging content with clear calls to action	

Benefits of a communications approach

Communications interventions are in most cases easy to implement by relying on traditional policy levers and consumer-facing communication channels. Behavioural approaches can help to increase effectiveness and the present research provides evidence of how to best achieve results based on messaging. Messages in this context will attempt to assist consumers to make better decisions for themselves (and by extension their community) without restricting or penalizing them for their choices, as the evidence provided in this report indicates that reactance will ensue from any perceived reduction in consumer freedoms.

Disadvantages of a communications approach

Pure messaging often has only a limited effect and usually requires some additional interventions to augment to communications mix. Pure messaging only works where awareness of relevant issues is low or non-existent and the pressure to change behaviour is high. If that is not the case, personalisation to increase relevance of the messages is needed and increases the cost of interventions. To ensure effectiveness of a messaging approach, other complementing support is necessary to achieve substantial behaviour change. In the present case, behaviour seems to depend

to a substantial extent on the behavioural context for change, in particular the specificity of actions required during peak demand event days, and hence only very targeted messages that are relevant for peak demand behaviours should be considered.

Next steps for implementing a communications approach

Any messaging strategy should be evaluated using a Randomized Controlled Trial approach. This evaluation method picks two or several regional areas that are a) similar and b) separate enough from each other, and then uses different messages on these groups to identify the effectiveness of the approaches chosen compared to a control group (status quo).

2 – Interventions

Defaults (Nudges) as well as small incentives in the form of rewards (Hugs) or penalties (Smacks) can be seen as behavioural economic interventions. It is important to point out that the incentives need to be minor to not restrict consumer choice but rather place control in the consumer's hands wherever possible in order to minimise reactance and increase consumer ownership of their own behaviour and consequences. We find that Smacks may lead to reactance and over time have a negative effect, i.e. increase demand. Nudges and Hugs can have a positive effect. With respect to restricting choices (Shoves) these are effective when limiting choice – i.e. an invasive rather than a behavioural intervention - but lead to reduced energy savings behaviour (complacency) when the enforced energy saving behaviour is below community choices. The clear communication of the need for action can achieve stronger changes in behaviour than a limited forced reduction in demand.

The behavioural economic interventions that are likely to be effective for electricity management are interventions that are positive and that reduce cost while maintaining consumer comfort, with community impact offering a secondary benefit to more pro-social consumers. Traditional policy interventions rely on regulation and pricing levers. Research in behavioural insights shows that such policies may not achieve the desired effect as decision making by individuals may be less reflective or rational than assumed by the traditional economics informed policy design. In the EAST framework, small rewards or disincentives, if communicated and implemented correctly, can achieve behavioural change by changing the awareness to the available options, i.e. they can help to increase the Attractiveness of an option that is in the best interest of the decision maker. Note, these interventions always require a certain level of monitoring in order to administer the interventions, evaluate consumer responses, and then adjust the interventions if required.

Benefits of an intervention approach

Economic interventions are a standard policy lever that has been used in the past and as such are well-known instruments with few implementation risks. In the case of rewards (Hugs), backlash is likely to be limited provided these are set within appropriate levels. Penalties are not a recommended intervention in this context, as our results indicate that consumers react poorly to long term use of punishments (Smacks) or restricted choices (Shoves). Such approaches must be applied equitably in order to be well received by consumers. Finally, rewards and/or Nudges could provide a strong complement to strategy when used in conjunction with a communications approach.

Disadvantages of an intervention approach

Interventions come with costs, for instance program costs (monitoring and measuring impacts, and then allowing for the cost of staff time to manage this process) and budgeted costs for rewards.

Establishing the appropriate level of rewards may also require additional information, in order to ensure that levels are high enough to offer value, but not so high as to generate suspicion of how rewards are being funded. Shove approaches (electricity usage restriction – perhaps via demand control) can be difficult to implement as demand control technology and access to smart meters in every consumer household is required.

Monitoring and measurement costs could be mitigated to some extent by using also a support approach that uses technology to close the feedback loop and place control back in the hands of the consumer, i.e. the new technology implemented may reduce monitoring costs.

Next steps for implementing an intervention approach

As with any messages and communication strategies developed, interventions should also be tested and evaluated using a randomized controlled trial approach. Similar regions would be randomly allocated to diverse interventions utilising different rewards, choices, and monitoring regimes (e.g., Nudge, Shove, Smack, Hug) to be offered and implemented. Data can then provide insights into the costs and effectiveness of different interventions.

3 – Support

Electricity has a delayed feedback-mechanism (Rothschild and Gaidis 1981) from the action (electricity use) whereby financial consequences are delayed (bills take up to 3 months to arrive) while physical comfort changes are instant. This fosters short-term thinking, where comfort takes priority over costs (financial, societal, environmental) as reinforcement is immediate. Researchers and industry representatives see technology as a potential solution for dealing with the energy trilemma and for making the social dilemma associated with electricity more visible (Capaccioli et al. 2017; Ford et al. 2017; Lovell, Pullinger, and Webb 2017).

In this research we showed that technology that provides instant feedback that highlights the consequences of electricity behaviours can help close this loop for consumers and help support their decision-making. In addition, this technology offered feedback on the behaviour of others as well, allowing consumers to think not only as individuals but as communities. This is particularly important as societies strive to meet climate targets: electricity services affect societal as well as individual wellbeing, and so require the ability to see how others are acting and coordinate accordingly.

There is an extensive evidence-base that shows communication and messaging on its own cannot generate effective behaviour change however when combined with services or tools, communications work very well (Briscoe and Aboud 2012; Carins and Rundle-Thiele 2014; Catalan-Matamoros 2011; Wakefield, Loken, and Hornik 2010). This is because while communication creates an awareness of the problem and may increase motivation to change, without the *ability* to change and without access to tools and the *opportunity* to change, the motivation is not translated into action. Digital support channels can be relatively cost effective, adaptable, and provide the necessary augmentation for messaging.

A good case example of the effectiveness of combining communication with support and tools is Reduce your Juice. Reduce Your Juice was an eight-week behaviour change program for low income renters that involved Powerhacks, a Facebook Community, videos on YouTube. SMS communications and a mobile app with three games (Swinton et al. 2016). Each of the games was released every two weeks and the purpose of the game was focussed around one energy efficiency behaviour. The behaviours selected were those that were the most modifiable by renters that would have the most impact on energy efficiency. Mass media campaigns aiming to change behaviour can be successful,

but often need sustained funding to do so and are far more likely to be effective if corresponding programs or services are being undertaken.

Benefits of a support approach

In particular, support options based on available digital technology can be used to inform and provide support for decisions that electricity consumers need to make at different times of the day and even different times of the year. Technology can be scaled, provided that the necessary data is available (e.g., smart meters that can feed data into an app). Such tools would be cost-effective complements to messaging strategies, offering an easy and attractive way to gain feedback on individual and community-level behaviour, and timely triggers for a behavioural change (particularly in the case of peak demand on event days).

The technology would make electricity decisions easier for consumers by providing them with an opportunity to control their actions and see the consequences of their electricity management behaviours (either positive or negative). Technology can help to provide monitoring and measurement tools complementing approaches utilising communications or interventions.

Disadvantages of a support approach

Aside from internet-based tools and support installation and service would require substantial human resources implying relatively high cost to governments and industry stakeholders. If the cost was to be passed onto the electricity consumers there would be resistance and much slower uptake, meaning a significant risk of program failure.

Next steps for implementing a support approach

Tools and support can be tested and evaluated using a randomized controlled trial approach. Similar regions would be randomly allocated to different tools and technologies to be offered an implemented. Consumer responses (including behavioural and attitudinal) can then be measured and used to provide insights into the costs and effectiveness of different tools.

CONCLUSION AND THE PATH FORWARD FOR RESEARCH

This research has examined four possible policy levers – Hugs, Nudges, Shoves, and Smacks – across two experiments and has found that the Shove is particularly useful when appealing to general energy efficiency behaviours, or short-term requests (e.g., event days), but also that when dealing with standalone requests such as event days, bill-paying consumers may already be willing to help without the aid of an intervention. In this regard we have made recommendations around appropriate messaging, interventions strategies, and ensuring value for consumers through technologically-enabled support options.

Our results show that ensuring that consumers understand the social dilemma situation is likely to significantly reduce electricity demand during peak time. The effect of such an intervention is similar to the effect of small incentives (Hugs, Smacks) and outperforms low pre-set electricity use defaults (Shoves). This is interesting in particular given that the latter would be a technology solution and require installation of specific equipment thus the evidence so far pointing in the direction of limited effectiveness would recommend against such a policy option.

Behavioural economic interventions using defaults or incentives need to consider potential unintended consequences. An economically insignificant penalty may lead to reactance, reducing energy efficient behaviour. Similarly, low levels of forced energy saving behaviour may lead to compensating actions as a consumer may feel he or she has done his, her part. Positive Nudges, small incentives can help to increase energy conservation in peak times.

Future steps for this research would necessitate a field experiment utilising a Randomised Controlled Trial (RCT) that examines the efficacy of interventions in real life. This will not only add a layer of richness to these results, but will overcome the natural limitations of laboratory experiments (e.g., low stakes for participants).

Some of the insights discussed can be tested in the field. A communications strategy establishing the need to practice electricity conservation behaviours and explaining and identifying the social dilemma situation could easily be tested in the field and even on a State level. In cooperation with retailers and in States with smart meters, offer discounts or new tariffs can implement Hug or Smack strategies. Regulators can implement certain Shoves, like the regulation of energy efficient lighting bulbs or the requirement in minimum star ratings for new tapware, which restrict consumer choices. Similar regulation could be utilised to limit minimum settings for air conditioners or maximum settings for

heaters. More intensive would be a regulation that allows time restrictions of use for high usage appliances.

For any intervention of this list, one could easily randomize consumers into a control and treatment group. Such a randomization may happen on the individual level or on geographic location – if one perceives a risk that it would be difficult to communicate an intervention to households without having spill-overs between groups. Stratifying the sample to have no differences in observable characteristics, like household size, socio-economic characteristics, etc., will allow to get reliable forecasts for size of the effects of the strategies on peak household electricity demand complementing the present result that only provides evidence on whether an intervention may potentially be effective.

Another avenue for future research may include examining other intervention types, for instance by looking at ways to increase value for consumers through new product and messaging strategies – such as, by allowing consumers to access electricity in the same way they access telecommunications services through a capped plan (though the time-specific nature of demand would require further examination of this one).

This report has provided insights on the efficacy of different behavioural economics interventions/levers to address consumer peak demand electricity use. In doing so, this report provides guidance going forward regarding consumer responses to different levers for reducing peak demand – particularly on event days. In working together, it is hoped that the interests of all parties can be aligned to help ensure a stable and sustainable energy future.

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APPENDICES

Appendix 1: Additional detail from quantitative analysis – Study 2 demographics

Table: Demographic Characteristics of the sample

Variable	Baseline	Hug	Nudge	Shove	Smack	Total	% of Sample
Sex							
Female	16	28	14	18	22	98	55.06%
Male	16	12	24	10	18	80	44.94%
Age							
17-26	4	6	5	2	9	26	14.61%
27-36	11	10	8	10	11	50	28.09%
37-46	4	6	7	4	5	26	14.61%
47-56	6	5	8	8	5	32	17.98%
57-66	5	8	8	4	7	32	17.98%
67-76	1	5	2	0	3	11	6.18%
77-86	1	0	0	0	0	1	0.56%
Employment Status							
Employed full time/part time	27	27	24	24	27	129	72.47%
Homemaker	0	2	3	0	1	6	3.37%
Other	1	2	3	3	3	12	6.74%
Retired	3	6	5	0	6	20	11.24%
Student	0	1	1	0	1	3	1.69%
Unemployed/looking for work	1	2	2	1	2	8	4.49%
Household Income (Yearly)							
Less than $11,000	0	1	1	0	0	2	1.12%
$11,000 to $30,999	2	5	3	1	5	16	8.99%
$31,000 to $50,999	3	2	3	4	2	14	7.87%
$51,000 to 70,999	4	5	3	1	9	22	12.36%
$71,000 to $90,999	4	11	7	5	8	35	19.66%
$91,000 to $110,999	5	3	6	5	5	24	13.48%
$111,000 to $150,999	7	4	10	4	6	31	17.42%
$150,000 and above	4	8	5	8	4	29	16.29%
Not sure	2	1	0	0	1	4	2.25%
Prefer not to answer	1	0	0	0	0	1	0.56%
Number of Occupants							
1 Occupant (Lives alone)	2	7	6	6	5	26	14.61%
2 Occupants	13	21	13	10	19	76	42.70%
3 Occupants	11	4	9	8	8	40	22.47%
4 Occupants	4	6	6	3	5	24	13.48%

Variable	Baseline	Hug	Nudge	Shove	Smack	Total	% of Sample
5 Occupants	2	2	2	1	1	8	4.49%
6 Occupants	0	0	2	0	2	4	2.25%
Type of Household							
At home with my parents/guardian	1	0	0	1	4	6	3.37%
Group or shared household	8	4	7	6	10	35	19.66%
One parent family	0	3	2	4	2	11	6.18%
One-person household	3	8	6	6	7	30	16.85%
Other	0	0	1	2	1	4	2.25%
Part of a couple with children	12	10	14	6	11	53	29.78%
Part of a couple without children	8	15	8	3	5	39	21.91%
Electricity bill frequency							
Bi-monthly	0	1	1	1	0	3	1.69%
Monthly	4	6	2	4	4	20	11.24%
Quarterly	28	33	35	23	36	155	87.08%
Size of Bill (per month)							
$150 or less	7	7	3	5	6	28	15.8%
$151-$250	5	9	3	7	8	32	17.9%
$251-$350	5	13	7	6	8	39	21.9%
$351-$450	7	4	8	6	7	32	18.0%
$451-$550	3	4	5	1	6	19	10.7%
$551-$650	1	1	6	2	2	12	6.7%
$651-$750	3	2	6	1	0	12	6.7%
$751-850	0	0	0	0	1	1	0.6%
$851-$950	0	0	0	0	1	1	0.6%
$1050 or above	1	0	0	0	1	2	1.1%

Appendix 2: Additional detail from quantitative analysis – Study 2 regressions

Table: Regression results for Individual Difference Variables on Contribution (rounds 4-8)

Contribution	Coefficient (t-value)
Treatment Dummy – Baseline Reference	
Hug	-0.27
	(-0.96)
Nudge	0.01
	(0.04)
Shove	-0.52*
	(-1.66)
Smack	-1.37***
	(-4.94)
Gender Dummy – Female Reference	
Male	-0.01 (-0.05)
Personally Responsible Citizenship	0.00 (0.01)
Participatory Citizenship	0.01*** (3.39)
Justice Oriented Citizenship	-0.00 (-0.48)
Self-Efficacy	0.00 (1.21)
Bill Amount	0.03 (0.50)
Age	0.02** (2.23)
Cheating on Taxes	-0.26*** (-2.68)
Renter Dummy – Owner Reference	
Renter	0.36* (1.66)
Education Level	0.12** (2.17)
Household Income	-0.18*** (-2.89)
Type of Household Dummy – At home with parents Reference	
Group or shared household	-0.70 (-1.21)
One parent family	-1.63** (-2.12)
One-person household	-1.38** (-2.18)
Other	-2.64*** (-3.21)
Part of a couple with children	-1.19** (-2.02)
Part of a couple without children	-1.54** (-2.49)
Ethnicity Dummy – White/Caucasian Reference	
Asian	-1.45*** (-3.14)

Hispanic	0.27 (0.32)
Other Ethnicity	-0.83* (-1.93)
Employment Dummy – Employed Reference	
Homemaker	-0.64 (-1.24)
Other Employment	0.83** (2.29)
Retired	-0.21 (-0.57)
Student	-0.94 (-1.23)
Unemployed/looking for work	-1.29*** (-2.94)
Bill Period Dummy – Bi-monthly Reference	
Monthly	-0.90 (-1.25)
Quarterly	-1.37** (-2.00)
Constant	6.22*** (5.05)
N	890
Prob. > F	0.000