SAVE (Solent Achieving Value from Efficiency)

Report 1 - Lessons learnt on Energy Efficiency & Behavioural Change

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Lessons Learnt on Energy Efficiency & Behavioural Change

For Southern Electric Power Distribution (SEPD) as part of the SAVE (Solent Achieving Value through Efficiency) project

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1 EXECUTIVE SUMMARY

Solent Achieving Value from Efficiency (SAVE) is a Low Carbon Network Fund (LCNF) project that aims to robustly trial and establish to what extent energy efficiency measures can be considered as a cost effective, predictable and sustainable tool for managing peak demand as an alternative to network reinforcement. Given the project's focus on customer behaviour change, it has commenced with a thorough review of customer engagement in both the energy sector and wider industries, in the UK and internationally, to evaluate which measures have been most effective in terms of motivating behavioural change and which have worked less well. This should ensure that the project can build on previous learning in the field and not repeat previous mistakes.

The findings from projects reviewed have been analysed through the Cabinet Office 'MINDSPACE' framework that provides a guideline for policies that aim to change behaviour. The project has adapted this framework to use it as a guidline to analyse lessons learned from past reasearch. The trial design for the SAVE project will also use the MINDSPACE framework to help structure the measures it takes. This report begins by explaining the MINDSPACE framework and the methodology for this project review.`

Although findings from the projects reviewed are at times contradictory, and the great variety of trial approaches and contexts often makes it difficult to compare their different results, some trends have emerged. These trends are summarised in section 3 into eleven key findings as follows:

1. Customer segmentations should actively assist in targeting campaigns effectively by focusing on differences in energy use, personal values and preferred methods of communication. Customers connected to the electricity distribution network cannot be engaged with as one group; the way in which people react to attempts to change their energy behaviour differs and engagement needs to be tailored appropriately without resulting in prohibitative costs.
2. Customers need to understand how they can reduce their energy usage and be educated appropriately. These can be through a combination of physical equipment, information and advice.
3. Parties delivering messages to customers need to be seen and recognised as both trustworthy and authorities in the subject matter. These attributes are not necessarily found in one entity and partnership between energy companies and trusted groups such as local organisations and community groups can be a way of overcoming this difficulty. Also effective is to allow multiple organisations to deliver messages that are consistent on a theme yet approached from their different perspectives.
4. Financial incentives can be effective but potentially need to be relatively large and impacts are often not sustainable over time; non-financial incentives should also be considered.
5. Normative comparisons between households have been shown to be very successful when based on intelligent like-for-like comparisons and combined with effective messaging.
6. Opt-out designs should be applied where possible as they are typically more effective than opt-in approaches, for example if offering energy advice visits or competitions.
7. Novel and creative techniques for sharing information can be used to effectively capture customer attention.
8. There is a delicate balance to be struck between using negative concepts such as 'waste' or 'loss' while also making customers feel good about themselves.
9. Customer commitments through setting goals and targets can be very effective to achieve longer-term behaviour change, but often need strong incentives to give them meaning.
10. Leading by example in promoting energy efficiency improves the perception of customers and increases the credibility of the project and its communications.
11. Energy efficiency results need to be analysed within the context of wider factors such as the wider economic and regional context, the number of participants and the level of focus on peak demand.

The report goes on to describe the projects reviewed through the MINDSPACE framework describing how projects have used different aspects of the framework and the levels of success they have demonstrated. This includes specific reviews of projects from non-energy sectors, in particular focusing on particularly interesting and creative ways that behaviour change has been successfully achieved, as well as those LCNF projects where domestic customer engagement has taken place.

Through creating this report we have found that although many energy efficiency projects have been carried out and have delivered some interesting findings, there is still much more to do to achieve a comprehensive understanding of how different measures affect different types of consumers in different ways and in different scenarios. Many trials have found a core group or customer segment whose behaviour is very difficult to change. Successful ways of engaging with this segment, which tends to be the largest single group, would add significantly to the knowledge base in this area. In order to be effective, approaches will need to draw on successful approaches, perhaps outside the energy sector and trial novel ways of encouraging change. The SAVE project will use the findings from this report to design trials that will add to the knowledge base on energy behavioural change and push existing knowledge further.

The review undertaken and described in this document provides the evidence base for developing customer engagement trials in the SAVE project. It is clear that the greater the understanding of the customer from the outset, the greater the possibility the project has of successfully tailoring approaches that will motivate the customer to act. The SAVE project seeks to produce results that are robust and statistically representative of the demographic connected to the network in the Solent area so the results can be replicated in other network areas. Therefore a statistically robust representative sample set will be recruited by a marketing agency, on which further analysis will be conducted to understand the segments that make up that sample set based on characteristics that are likely to influence energy behaviour. This will enable the project to effectively target and tailor information and maximise the chances of successful behavioural change while still delivering statistically relevant findings.

Projects reviewed repeatedly demonstrated that customers need more than one reason to engage and change behaviour. Careful thought will be required to construct programmes that layer and combine measures to provide a compelling behaviour change proposition. However, this also needs to be carried out carefully to ensure that there is enough control to still be able to distinguish the impact of different measures. This will be one of the major challenges for the SAVE project. A further challenge will be to successfully segment customers while maintaining general enough categories so that measures are still relevant if applied on a wider-scale.

2 INTRODUCTION

2.1 The SAVE project, Energy Efficiency and Behavioural Change

Solent Achieving Value from Efficiency (SAVE) is a Low Carbon Network Fund project that aims to robustly trial and establish to what extent energy efficiency measures can be considered as a cost effective, predictable and sustainable tool for managing peak demand as an alternative to network reinforcement. The project will target domestic customers only in the Solent and surrounding area in the South of England, which is representative of much of the UK, and the measures to be trialled will include deploying a technology, offering a commercial incentive and taking an innovative approach to engagement.

Energy consumption in itself is not behaviour, but rather a consequence of behaviours, such as switching on the kettle or turning on the washing. Core to achieving energy efficiency in this project is to successfully persuade people to change their behaviour, their lifestyles or their existing habits that have an impact on their electricity consumption.

During the bid stage the project team began to identify previous projects both in the UK and internationally that could provide insights into trial design for the SAVE project. Significant prior learning on customer behaviour change linked to energy efficiency measures was discovered, and the project team decided to commence the SAVE project with a thorough review of this learning.

Therefore, to inform the development of efficient and effective customer engagement that drives energy efficiency during the project, DNV GL has undertaken extensive research on UK & international projects to consider key lessons relevant to the SAVE project.

2.2 The 6Es Framework adapted

The Cabinet Office has produced the 6Es - MINDSPACE framework that provides a guideline for policies that aim to change behaviour[1]. DNV GL has adapted this framework to use it as a structure to analyse lessons learned from past reasearch. In addition, this framework will be used in the next stage of work to design the customer engagement approaches that SAVE will adopt in its trials.

The 6Es refer to the actions needed to be undertaken by the organisation that implements a strategy to drive behaviour change. These are: Explore, Enable, Encourage, Engage, Exemplify and Evaluate. A graphical representation of the framework is presented in Figure 1.
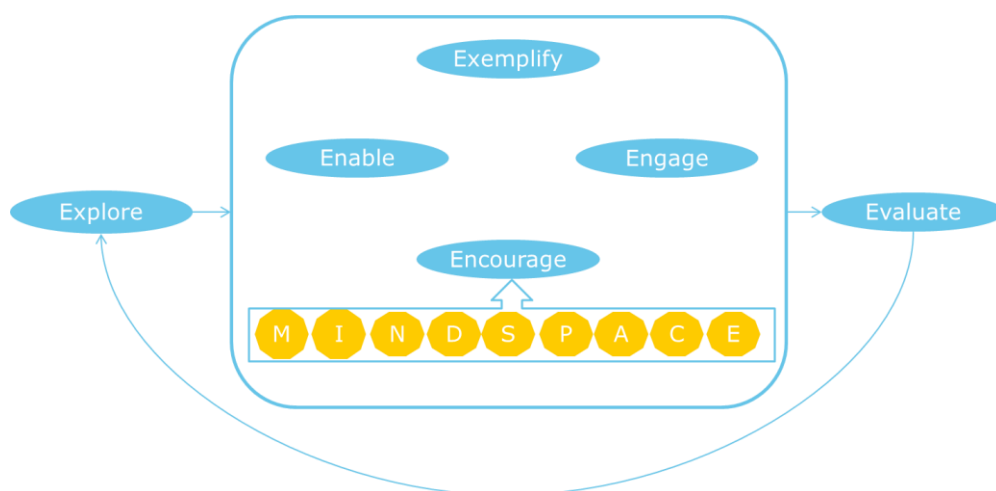
Figure 1: The 6Es framework adapted

2.2.1 Explore

In order to change behaviour, first one needs to understand the behaviour in question. Human behaviour is affected both by a conscious and considered understanding of our needs and desires as well as by contextual cues. Understanding peoples' experiences, beliefs, needs or desires can provide insights on how to better influence human behaviour by applying actions that could change behaviours. Humans have different attitudes towards different issues and can be differently influenced by the same actions. However, it is possible to group similar behaviours creating segments of people that can then be targeted, possibly in different ways, to change their behaviour. SAVE aims to identify the most appropriate customer segmentations in order to target customers more effectively.

2.2.2 Enable

People may face practical and structural barriers when encouraged to change their behaviour. The ability of people to change their behaviour is determined by the context in which they live. This should be recognised by the organisation that aims to achieve a behaviour change, and where possible actions taken to improve this ability. The available infrastructure, facilities, design and resources, as well as giving people different options, are critical in enabling people to behave differently. SAVE will aim to identify any technical and physical interventions that can be taken to change behaviour and at the same time recognise potential practical or structual barriers that people may face and try to alleviate them as far as possible.

2.2.3 Encourage

The willingness of customers to change their behaviour can be encouraged by tapping into two different types of human response. 'Reflective' responses are the reasoned, rational and considered reactions that humans exhibit and can be targetted through tangible incentives, commitments and promises. These responses are often simpler to understand and form the core of most approaches to changing behaviour. However, just as important is to understand our 'automatic' responses that reflect our instinctive, uncontrolled, emotional and subconscous reactions. Targetting these can involve utilising approaches such as peer pressure, novel presentation, subconscious cues, emotional associations and "pre-set options" that people have.

A framwork built around the main influences on human behaviour has also been developed and can be used as a checklist and a spur for ideas when developing and evaluating policies aimed at changing behaviour. This framework is named MINDSPACE after the initials of the different influences.

- "Messenger: Humans are heavily influenced by who communicates information.

- Incentives: Human responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses

- Norms: Humans are strongly influenced by what others do

- Defaults: Humans "go with the flow" or follow pre-set options

- Salience: Humans' attention is drawn to what is novel and seems relevant to us

- Priming: Human acts are often influenced by sub-conscious cues

- Affect: Human emotional associations can powerfully shape our actions

- Commitments: Humans seek to be consistent with our public promises, and reciprocate acts

- Ego: Humans act in ways that make us feel better about ourselves"[1]

SAVE will look to understand what individual and/or potentially personalised interactions with customers can be undertaken to stimulate behavioural change related to energy efficiency.

2.2.4 Engage

Activities that are undertaken focusing on group interaction (rather than on an individual basis) and feedback from customers are considered under the Engage element. SAVE aims to explore what the most effective ways are to interact with greater groups of people and for what purposes, as well as how to collect feedback from customers.

2.2.5 Exemplify

When implementing a strategy which has the aim of changing customer behaviour, it is fundamental that the organisation promoting this strategy is leading by example and certainly not contradicting its own advice. SAVE will identify good practice for organisations to set a positive example.

2.2.6 Evaluate

An important action which needs to take place after a strategy has been applied is the evaluation of all the impacts due to its implementation. It is crucial to have a robust methodology in place to prove causality of the intervention measures and other non-related effects. SAVE trials have been built around a statistically robust methodology that will be able to identify insights on how customers respond to different strategies. In this analysis interesting overall results that have been identified from past research will be included as they provide useful insights for the more detailed development of our own evaluation framework.

2.3 Methodology

DNV GL has extensively researched projects that have used behavioural change and customer engagement techniques in the energy sector in the UK (including the ongoing LCNF projects) and internationally as well as looking at relevant projects from outside the energy sector both in the UK and internationally to get further insights and inspiration.

An overview of the categories of projects reviewed and the methods used are presented in Figure 2.
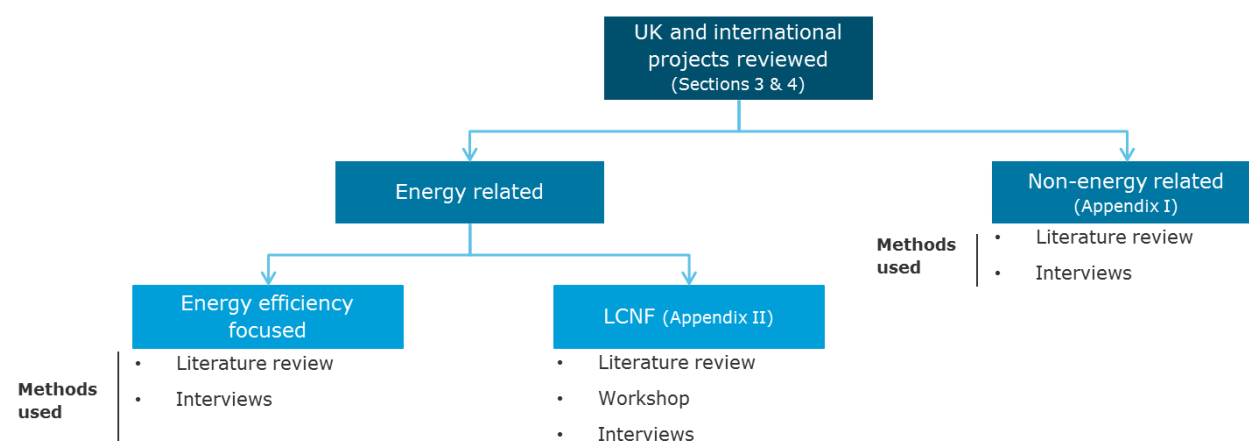
Figure 2: Overview of the categories of the projects reviewed and the methods used

A detailed literature review was carried out of key meta-reviews that have analysed projects in the energy efficiency and behavioural change domain. When more details for specific projects were needed, primary studies were also reviewed. As meta-reviews do not include some of the more recent projects,

further study of these projects was undertaken to ensure that the most recent experiences were also included. DNV GL used the following criteria for the selection of the projects reviewed:

- Projects that studied domestic, rather than industrial or commercial, energy consumers;

- Projects that focused on measures to reduce and/or shift energy demand using behavioural change approaches.

In many cases the research into the most recent projects was complimented by interviews. Detailed templates with information about these projects were produced and are included in Appendix III.

As customer engagement lessons from ongoing LCNF projects are not always fully documented, in order to ensure all learning was captured, the project ran a workshop in January that was well attended by participants from other LCNF projects, including both DNO and project partner staff. A staff member from Ofgem also attended the workshop as an observer. Following the workshop more detailed interviews were held with participants to cover detailed learning and ensure a thorough understanding of their approach was captured. An analysis dedicated to the LCNF projects that has explored aspects of customer engagement is provided in Appendix I. Again, detailed templates with information about the relevant LCNF projects are included in the Appendix III.

To explore further ideas and methods on behavioural change, a selection of non-energy related projects that provide insights relevant to SAVE were reviewed through conducting literature review and interviews. Appendix II includes the key findings from this analysis.

The key findings from this extensive research are presented in summary in Section 3 grouped by learning headings, while a detailed discussion of the findings takes place in Section 4, which are analysed through the adapted 6Es and MINDSPACE framework.

2.4 Limitations

The projects reviewed had limitations which inevitably will impact on how widely applicable their findings turn out to be when attempts are made to replicate the same approach over larger sample sizes. Most projects suffered from a built in self-selection bias as only interested people were prepared to participate meaning the projects were not necessarily representative of real energy customer demographics. Challenges with participant recruitment meant that projects have either not attempted to be representative or have lowered their expectations of representation in the face of the realities of securing participation. There is little evidence about how different socio-demographic groups respond to different interventions and limited learning about how to successfully target different socio-economic groups.

There were significant practical challenges in linking energy savings with specific behaviour changes due to limitations in data gathered and the granulatory of that data. Very few projects offered genuine insight into what can motivate customers to change behaviour and what that change involves. In many projects savings had to be estimated due to a lack of sufficiently accurate measurement data. Also, many energy efficiency projects focus on heating savings which makes them less relevant for SAVE's purposes. In the UK the vast majority of heating is through gas, while the SAVE project is focused only on impacts on the electricity network.

Ultimately, in order to make decisions about the value of engagement campaigns, their cost effectiveness must be evaluated. In the projects reviewed very little information was discovered about the cost effectiveness of interventions. The SAVE project seeks to fill a major gap in understanding by evaluating the costing of interventions and making comparisons between the cost of interventions and the cost of traditional network reinforcement. Collecting all the costs of setting up and running a

customer engagement campaign and evaluating these costs against the actual energy saving achieved is a key feature of the SAVE project and should add significantly to learning in this area.

2.5 How to read this report

There is a vast amount of information contained in this report with over 200 references covered. Therefore the report has been structured to try to assist the reader in getting the most from it.

Section 3 should act as a starting point for readers as it sets out the key learning that came from the research. In here references are made to Section 4 where trial findings are explored in more detail with detailed referencing of original sources. Therefore this section can be used selectively depending on the reader's specific area of interest.

Sections 5 & 6 (Appendices I & II) then provide a specific focus on insight delivered from non-energy customer behaviour initiatives and Low Carbon Network Fund projects respectively. These sections can be read happily in isolation, though they are also referenced in Section 4 and feed into the Section 3 messages.

Finally, Section 7 (Appendix III) contains completed templates for trials that were looked at in detail as part of the project. This should be used if the reader has a specific in interest in a particular project and would like to understand more about it.

3 KEY BEHAVIOURAL CHANGE LESSONS FOR THE SAVE PROJECT

1. Customer segmentations should actively assist in targeting campaigns effectively by focusing on differences in energy use, personal values and preferred methods of communication

Targeted marketing messages have proven effective when used by retail companies as a means to better engage with customers and customer segmentation is a prerequisite for this. The more data available on customers, the greater the level of sophistication can be, potentially even leading to tailored and personalised messages.

Customer segmentation can be based on different criteria including, for example, typical overall energy usage, personality/values type, readiness to participate in energy efficiency programmes, community type, and can also be used for different purposes. Depending on the customer group different reactions can be expected. Typically, in programmes that involve the provision of enhanced energy related information, savings can be greater with higher energy-users as well as younger and more educated households. Also the actions that customers may undertake to reduce their energy consumption can differ significantly. Investments in new equipment and appliances appear more likely within more affluent populations whereas overall, households appear to be more likely to reduce energy consumption through changes in habits and routines. Knowing the probable reactions of different customer groups will allow SAVE to provide more targeted advice that is likely to be adopted by the customers.

However, there is a risk that household segmentations may overlook the multiple and sometimes conflicting identities that people living in a house have. As residential energy use is typically measured on a household basis, rather than at the end-user level it is harder to understand the behaviour of individuals and group them appropriately. SAVE will need to consider how to strike the right balance between establishing groups of customers that can be used for more targeted messaging and at the same time be able to test the effectiveness of the segmentation adopted. It should look to identify an understandable set of key criteria for the development of customer groups based on information that is usefully applicable in the development of campaigns. This is likely to consider electricity use during network peak times (as benefits for the network will accrue by reducing/shifting electricity demand during network peaks), personal values (to effectively phrase messaging and incentivise people) and the best way to communicate (email, mail, social media etc.).

Data required for the development of the appropriate customer segmentations can be acquired through the collection of objective data that describes the customer demographics and energy use (e.g. relation between electricity consumption and price of electricity) or through surveys where customers provide direct information. With regards to the latter, although it can be a useful means of investigation, care will need to be taken as real life behaviours can diverge significantly from the behaviours people describe when completing a survey. Whilst some of the necessary data in SAVE will be based on measured data, there will be a need to rely on data gathered through surveys, bearing in mind the risk of misleading information from customers (see 4.1).

2. Customers need to understand how they can reduce their energy usage and be educated appropriately

To ensure the success of an energy efficiency programme that aims to change customers' behaviour, customers need to know what effective actions they can take. This is both a matter of customers being aware of where they use their energy, as well as what measures they can take to reduce that usage. In

addition, customers can be assisted to take measures if physical barriers that prevent them from taking action can be removed.

To enable customers to get insights about their electricity consumption SAVE will provide electricity consumption monitoring devices to participants, with some also receiving smart plugs that will monitor the electricity consumption of specific devices. The customer engagement approach will need to consider how best to communicate this information back to customers through a web portal and potentially other smart devices. Once customers have gained a better understanding of their electricity consumption they need to be educated on how to reduce it. There is scope for direct communications with customers to advise them on how they could be more efficient in their use (for example by running their washing machine at off-peak times). However, customers may sometimes face physical barriers to implementing energy efficiency advice. For example, if advice suggests that "using a 30 degree programme in your washing machine can save you £x" and the customer's washing machine doesn't have this functionality then the customer will not be able to implement the advice due to technical limitations. Therefore, SAVE will look to collect data that enables the identification of these sorts of barriers and will consider whether electricity efficiency advice offered is appropriate given the context.

When technologies are installed and/or demonstrated face to face, it is important to recognise that the personality of the people interacting with the customers will have an impact on their understanding and enthusiasm. Therefore, SAVE should ensure that any face-to-face interaction is carried out by trained professionals who themselves have a clear understanding of the project and what it is trying to achieve (see Section 4.2).

3. Parties delivering messages to customers need to be seen and recognised as both trustworthy and authorities in the subject matter

There is a delicate balance that needs to be struck in terms of who communicates with the customer in the project and what the customer's perception of them is. The complexity is created by the fact that the customer needs to trust this messenger in two ways: both as an expert in what they are communicating, in this case information about efficient energy use, and as someone who has the customer's best interests at heart. These two perceptions are often associated with different types of organisations and don't necessarily overlap in the customer's perception.

The balance between these two characteristics can be weighted and traded off in different ways. There are a number of different messengers that have been used in previous energy efficiency related projects that range from those that are perceived as experts in the field such as Utilities, Academics or Environmental Groups, to those that are perceived as working for, or being on the side of, the consumer, like Housing Associations, Consumer Associations, Local Authorities, Community Groups or Neighbours. Each of these has had some level of success in getting results. However, there is a suggestion that the most effective approaches have energy expertise as a foundation. Even though it is recognised that Utilities are not necessarily perceived positively by customers, they nevertheless still seem to be viewed as the experts and foremost authority on matters related to energy.

As a result, it may be that the most effective approach is to combine strengths of different organisations in delivering messages to the customer so that they trust both the accuracy of what they are being told as well as the intention. For example, a Utility looking to establish goodwill with customers may look to partner with a more trusted organisation such as a community or consumer group. In the SAVE project this could mean that SSEPD as the distribution network operator could present themselves in partnership

with a locally-based not-for-profit organisation such as Future Solent, who trial participants may be more inclined to trust.

Furthermore, messaging through different parties may also be effective in offering different reasons and perspectives to customers. However, this clearly creates a risk of mixed, confusing, or even contradictory messages. Therefore it is important that these different perspectives are clearly united under one overall goal and carefully coordinated to ensure consistency. In SAVE this coordination could be carried out by a central project 'Communications' function that would be responsible for setting the tone and nature of overall messaging, with partners responsible for direct customer interaction being trusted to interpret these guidelines. In this context it is also important to be careful with the use of company logos and to be aware that these can indicate a profit-motive to customers, while logos that customers do not recognise are also likely to create distrust.

Finally, as well as planned messaging through the project and its partners, interpersonal contacts and recommendations can also be as effective, if not more so. There are few more powerful forms of messaging than word-of-mouth where customers themselves can act as 'multipliers' of the project's message. Therefore, in community-based projects it can be particularly powerful to utilise local ambassadors and supporters, encouraging them to spread information and messages to others. There is still some need for care here to ensure that these local 'word-of-mouth' supporters are themselves seen as authoritative and are therefore trusted by others. For this reason children would not generally be seen as effective in this role. In the context of SAVE, the main trial groupings (other than the community coaching groups) will have participants who are dispersed across the Solent area rather than being based in discrete local community areas. This will make it difficult to utilise local ambassadors as described. However, there may be opportunities to create virtual communities of participants online using social media (see Section 4.3.1).

4. **Financial incentives can be effective but potentially need to be relatively large and impacts are often not sustainable over time; non-financial incentives should also be considered**

People tend to be motivated in different ways depending on a variety of personal factors and circumstances. Some individuals would appreciate a financial incentive that could be translated into savings in the electricity bill, cash payments, vouchers or rebates, but others might be motivated by environmental or altruistic concerns, or the prospect of better control. SAVE will explore the impact of both financial and non-financial incentives and their impact on different customer groups. To isolate and identify the impact of targeted time-of-use financial incentives (that go beyond simple savings on the bill from reduced usage) these will be applied on top of non-financial incentives in one of SAVE's trial groups.

Savings in the electricity bill can be achieved through behavioural change but some threshold effects are identified, meaning that a minimum level of savings is required before individuals would consider changing their behaviours. In particular, households that tend to waste electricity will have the opportunity to see significant savings in their bill that could motivate them. Also, people over the age of 65 tend to care more for savings and can be well incentivised by potential savings in their electricity bill. For some customers however, specific cash payments, vouchers and rebates would be required on top of bill savings to see a difference catalysed by financial motives. Small, frequent payments or vouchers can motivate customers to change their energy patterns but their effect generally only lasts as long as the reward is in place.

There are potentially creative ways that incentives could be offered in SAVE to maximise the impact of the budget available. Some of these approaches combine with other lessons/insights around how customers perceive savings and waste, the value of commitments, and competition and the setting of goals. A variety of approaches will be considered and potentially different ones may be tested on different customer groups. This may also include offering indirect financial incentives that enable people to feel good about themselves. For example, the incentive could be given to a green charity or paid to someone nominated by the customer. Alternatively, in order to maximise the impact of a small available pot, customers could be entered into a lottery draw if they achieve a certain level of energy reduction, where the funds available could be combined.

From a trial point of view, SAVE will also need to be careful to manage customer expectations of the value of incentives, as well as the perceptions of those customers who are not part of the group that receives financial incentives.

From a non-financial perspective, the provision of environment related information such as metrics related to climate change and CO_2 emissions can also motivate people to change their behaviour. This can tap into altruistic motives and engender a sense of shared responsibility, such as the desire to secure availability of resources for future generations. Moreover, control can act as a motivation in itself, with better control over one's own energy appealing to technology enthusiasts whereas better financial control regarding energy consumption can be attractive to the fuel-poor and tenants.

The impact of these different incentives will be dependent on the circumstances of different customers and their different personal values. Therefore the categorisation of customers becomes an important part of deciding on the best incentive approach, customers could even be given the opportunity to select their own incentives from a basket of offerings (see Section 4.3.2).

5. Normative comparisons between households have been shown to be very successful when based on intelligent like-for-like comparisons and combined with effective messaging

Normative comparisons of energy consumption between households are widely used and there is significant evidence of their success when used in combination with other information such as energy advice and historical comparisons. They can also lead to durable energy reductions over longer periods. SAVE will consider the best practice that specialist companies in the space have developed and adopt a combination of energy related information to be provided to the project participants.

Households appreciate normative comparisons but their effectiveness varies between nations and cultures as well as with the level of energy usage. For example Swedish and Swiss prefer historical comparison of their own usage, while the Finnish and Japanese react best when compared against their neighbours. Either way though, the messaging of these comparisons is essential in getting the desired response. Households always need to have a benchmark to aim for in order to avoid complacency and to ensure they feel that there is another target to acheive. For example, only comparing usage with the average consumption of their neighbours will incentivise users at the higher-end, but low usage households may feel they can increase their usage. However, comparing the latter with the most efficient household can alleviate this issue.

Furthermore, creating recommended behaviours by re-defining what is "normal" behaviour through the use of role models can also provide targets to aim for. The skill of effective messaging, and the avoidance of customer frustration, comes through ensuring these comparisons are presented as both accurate and meaningful like-for-like comparisons (e.g. similar households, in the local area, with the

same composition of inhabitants etc.). Therefore SAVE will consider using representative comparisons with both average and most efficient households. This will again require appopriate data to be collected and customers to be grouped intelligently. SAVE will also consider evaluating the impact of normative comparisons in a UK context as this has only been subject to limited exploration previously.

Finally, it will be critical that SAVE is careful in communicating performance with high energy using households. Negative messages that make people feel patronised or guilty can be just as off-putting as overly positive messages that leave customers feeling there is nothing left to achieve (see Section 4.3.3).

6. Opt-out designs should be applied where possible as they are typically more effective than opt-in approaches, for example if offering energy advice visits or competitions

Energy efficiency programmes that are designed on an opt-out basis tend to be more successful as people tend to follow pre-set options, and energy is not necessarily a foremost concern that drives pro-active behaviour on their part. However, care needs to be taken with opt-in approaches in order not to upset people by making them part of something they don't want to be involved in. The applicability of this to SAVE is limited by the fact that customers will have already opted in to participate in the project in the first place. However, there might be occasions through the project where specific campaign measures could be undertaken on an opt-out basis such as with the organisation of an energy advice visit or involvement in a competition (see Section 4.3.4).

7. Novel and creative techniques for sharing information can be used to effectively capture customer attention

Human behaviour dictates that attention is drawn to what is novel and seems relevant, therefore any customer engagement should aim to produce materials and take actions that fulfil these requirements. In the framework of an energy efficiency related programme the information provided to customers should be simply presented, involve new additional information over time and where possible be communicated through ambient (non-traditional or alternative) formats to help capture customers' attention.

The appliance specific breakdown of energy consumption information as well as energy audits can provide tailored information related to a customer's energy consumption trends that can trigger interest around their energy use. Due to the provision of smart plugs, certain SAVE trial group participants will receive tailored information about the electricity consumption of their specific appliances. The use of basic electricity related audits will also be considered by SAVE and can be combined with face to face interactions with customers that will take place during the project. Personnel who conduct any electricity related audits will need to be adequately trained.

Customers are also attracted by more frequent provision of information relevant to them as it potentially allows them to better monitor the results of their altered behaviours, and the longer the programme the more persistent the effects tend to be. Therefore, SAVE will explore providing information to customers about their electricity usage with relatively high frequency through an online application. SAVE will also take into account the specific times that enhanced and maybe more intense provision of further information is needed in order to serve network needs, for example during network peaks, while increasing awareness of what the DNO does.

A further way that an energy efficiency programme can make an impression on customers is through gamification, potentially involving animation, levels of progression and scores, to increase awareness

and motivate people to change behaviour. Such concepts may be worth further exploration depending on budget availability (see Sections 4.3.5 and 4.3.6).

8. There is a delicate balance to be struck between using negative concepts such as 'waste' or 'loss' while also making customers feel good about themselves

The use of concepts such as "waste" or "loss" are often more effective than "gain" or "save" when trying to motivate people to change their behaviours. Equating energy waste to other forms of waste e.g. water/food can be very powerful when visualised. Similarly, creating fear, e.g. "lights will go out" or "a new coal power station will be built nearby", can also make impacts very tangible. However, both techniques need to be used carefully to avoid disincentives from creating a feeling of guilt and fear and putting off customers. A way around this can be to present messages in a way that makes customers feel they are one of the people aware of what they are doing rather than someone who the message is really aimed at, e.g "energy wastage is dumb". In addition, issues related to the reputation of the companies that provide electricity may need to be considered before adopting such a narrative in communications.

On the other hand, focusing on positive rather than negative by making people feel good about themselves through rewarding good behaviour rather than criticising/punishing bad behaviour can be equally powerful. For example, asking people to tick off energy saving measures that they already take, or encouraging people to perceive themselves as good environmental citizens can trigger behavioural change as they feel the desire to live up to their billing. Another way to make customers feel good is to present and discuss their individual activities through media, for example blogs, social media, apps and local media, perhaps including interviews with participating customers (see Section 4.3.7).

9. Customer commitments through setting goals and targets can be very effective to achieve longer-term behaviour change, but often need strong incentives to give them meaning

Goals and targets can be very effective, especially for driving longer-term behaviour change by providing a structure and context for action, which has a deeper impact on behaviour. Best practice reveals that a programme should start with small commitments and step up to larger ones over time as customers buy into it and gain momentum. Otherwise customers could be put off if asked to achieve targets that look unachievable. However, as when normatively comparing customers, it is important that goals are updated or multiple targets are provided so that customers always have something to aim for and thus are motivated to change their behaviour.

In order to effectively do this there is a balance that needs to be struck between "planned" goals and those developed through "learning by doing" or by involving customers in the goal-setting process. SAVE will explore how the use of goals may be appropriate for different customer groups and ensure that customer performance is monitored to effectively update or redesign them if needed. Inevitably, beyond a certain level customers will not be able to further reduce their energy consumption without an impact on their lifestyle or significant investment in efficient appliances or the like. In this circumstance, other measures will have to be used to maintain a low level of energy consumption.

Whilst goals have to be clear and simple to be understood, ongoing interaction combined with good feedback to help customers achieve their goals is equally important for them to feel that someone cares and is there to help. However, in order for any goal to be effective it needs to be combined with strong

incentives (either financial or non-financial) and celebration of success in order to recognise customers' efforts. This is clearly likely to be more challenging in the context of non-financial incentives where competition and peer-comparison may be the main drivers for encouraging customers to want to achieve their goals. As a result, public commitments on achieving goals will be a further motivation to some people and can be used in combination with targets. SAVE will make sure that customers get the help they need and are in some way rewarded for their efforts as otherwise it will be difficult to justify setting targets. SAVE will also explore the use of the most effective means of maintaining public commitment, including social media, making sure to identify those customer groups that are most likely to use them.

Goals could be set either on a household or a community level and could also allow competition between households or communities. Shared group commitments tend to create a feeling of obligation to others and thus can enhance customers' commitment to the goals and produce durable behavioural changes. Similarly, setting goals in a competition framework between communities can act as an extra motivator (see Section 4.3.8).

10. Leading by example in promoting energy efficiency improves the perception of customers and increases the credibility of the project and its communications

The organisation that is leading the energy reduction initiative (in SAVE's case SSEPD) can play a role in exhibiting a positive example that encourages its customers to do the same. This could also be reflected by other partners in the trial such as Future Solent. This may include publicising their own energy saving measures and results, public energy displays that monitor the consumption in a specific area, installation of low carbon technologies or use of environmentally friendly vehicles. SAVE partners and suppliers, in particular those who will be visible to, or who directly interact with, participants, should look to build an environmentally friendly profile and lead by example (e.g. use EVs or bicycles for customer recruitment) in all interactions with customers. This should also include some Time-of-Use element (see Section 4.5).

11. Energy efficiency results need to be analysed within the context of wider factors such as the wider economic and regional context, the number of participants and the level of focus on peak demand

It is important to put results from energy efficiency programmes and trials into perspective in order to better understand and interpret them. As energy efficiency programmes and trials do not run in isolation from the wider economic and regional context the energy savings delivered are influenced by it. On a macro scale for example, the level of energy savings due to feedback programmes that involved provision of enhanced information about energy consumption was higher during the 'energy crisis era' (1974–1995) than during the 'climate change era' (1995–2010) regardless of the feedback strategy employed. Therefore, in SAVE structured monitoring of the economic and local context will be conducted throughout the duration of the project to allow better qualitative analysis of the overall results.

Another factor that has an effect on the results of a trial is the sample sizes. For example, feedback pilots of significant sample sizes (over 1,000 participants) tend to have lower results than those with relatively small sample sizes (less than 1,000) as it can be challenging to achieve successful communication with large groups of customers in order to engage their interest in a program. As SAVE aims to achieve meaningful results that can be used by the DNO with as much confidence as possible, the design of the trials involves a large sample size of 1,000 participants per trial to ensure that results are not overestimated in that regard. However, as all trial projects are inherently opt-in programmes because participation in these is voluntary, the energy savings are likely to be higher (up to three times)

compared to opt-out programmes that may represent a business as usual approach in the future. Taking this into account there will be potential opportunities and complications from opt-in and opt-out designs for the DNO.

Moreover, the effectiveness of feedback initiatives in generating overall household energy savings can be significantly influenced by the focus of the program on overall energy efficiency or peak demand reduction. Programs that are focused on peak load savings tend to achieve lower overall energy savings (more than 3 times) compared to regular energy efficiency programmes throughout the billing cycle. As DNOs primarily benefit from peak demand reduction, SAVE will focus on achieving this.

Lastly, there is a cost when attempting to change customers' behaviour to buy into energy efficiency. This cost, both direct and indirect, needs to be monitored and subsequently analysed to assess the overall cost effectiveness of the strategy used. Whilst in many energy efficiency projects in the past such a detailed analysis has not been conducted, SAVE project has been designed in a way to allow a robust cost analysis of the different strategies trialled in order to allow the development of a cost benefit analysis from a DNO's perspective (see Section 4.6).

4 REVIEW OF UK AND INTERNATIONAL LEARNING ON ENERGY EFFICIENCY AND BEHAVIOURAL CHANGE

4.1 Explore

A relative small number of projects has explored in detail the use of customer segmentation techniques. In this section an analysis of different approaches taken to customer segmentation, of the difficulties associated with it, the role of demographics in electricity consumption and the customer categorisation used for peer comparison purposes is provided.

Different approaches can be taken to customer segmentation

Customer segmentation allows for directed marketing messages and educational material, the identification of which customer groups give the most positive reaction and a further exploration of how programs could be improved[2]. Examples of how customer segmentation has been used to understand the motivation of customers and thereby have a significant impact on the uptake of energy efficiency programmes are shown here. Whilst the approaches of these studies have some similarities, there are differences in the criteria used to group customers.

Programme	Basis of Segmentation
SEAS – NVE (Denmark's largest energy company)	Personality types
Gentoo (Group of companies focusing on improve the lives of the people, communities and the environment) Energy Saving Bundles	Values modes
E-Source (Energy advisory services company) – Nielsen Claritas (Market research company)	Perceived receptiveness to energy efficiency interventions

Table 1: Basis of customers' segmentation for different programmes

The SEAS – NVE (Denmark's largest energy company) programme is achieving 17.6% reductions for 30,000 residential customers. Initial research and interviews were conducted with customers to group these into four distinct personality types: the Critical; the Dreamer; the Basic; and the Local. The specific characteristics of each of these groups influenced how they viewed and assimilated the information sent to them by the utility. This system of behavioural patterns and attitudes, which was observed by the utility in its customer base, allowed it to create precision messaging in its marketing campaigns[3]. The Values Modes segmentation approach was developed by Cultural Dynamics[4] and trialled by Gentoo as part of the Energy Saving Bundles project[5]. This approach categorises consumers into sustenance-driven 'Settlers', outer-directed 'Prospectors' and inner-directed 'Pioneers'. These categorisations are intended to help understand the motivations of the group members and therefore effectively influence the behaviour.

Whilst the SEAS NVE and the Gentoo ESB programme grouped customers into segments based on personality, social or character types, the E-Source - Nielsen Claritas survey used segments which explicitly considered the receptiveness of customers to energy efficiency programmes. E-Source and Nielsen Claritas worked together to conduct a nationwide survey of 32,471 US consumers focusing on

products and services, including energy efficiency, rate options, and green energy. The results of the exercise allowed the survey companies to divide customers into the following segments based on their readiness to participate in energy-efficiency (EE) programs: EE Achievers were most engaged with DSM programs; EE Anticipators were inclined to participate in DSM programs but have not yet done so extensively; EE Uncommitteds were interested in saving money through saving energy but did not want to commit to a programme; EE Indifferents, the largest segment, were the least promising target audience for DSM program marketing[2,3].

The grouping of consumers into segments can also allow researchers to test different reactions to the same approach. Global Action Plan's EcoTeams approach established five different types of communities upon which interventions to promote energy efficiency were conducted:

1. Low income communities including housing associations;

2. Communities of employees (local authorities and companies);

3. Communities of interest (non-governmental organisations and faith groups);

4. Communities of influence (journalists);

5. Geographical communities (local authorities)

However this work was not conclusive and did not find significant differences in the success of the approach across these different groups[6].

Difficulties in customer segmentation

The examples shown in the previous section have been shown to be effective in promoting energy efficiency programmes. The methods used are however not without potential drawbacks. A meta-analysis of 27 case studies from the Changing Behaviour[7] program showed that the practice of grouping customers into neat categories had the potential to sacrifice an understanding of the subtle complications of an individual's identification with multiple groups and the conflicting influences on decision-making. The behaviour of customers may be influenced by a number of different factors which do not necessarily correlate with each other. Energy suppliers should also not allow themselves to lose sight of the fact that a 'household' is not usually an individual with a clear set of objectives or character type, but more frequently a collection of interdependent individuals who interact in a complex manner[8]. Any attempt to incentivise energy efficient behaviour or solutions should consider this complexity.

A further complication comes from the fact that the responses given by consumers in surveys do not always match their behaviour in real life[8]. It has been found in various studies that that the stated commitment of consumers to green energy is not necessarily matched by their willingness to pay for it[9,10].This means that attempts to categorise consumers based on their responses to surveys are often not accurate and that there is no substitute for real-life observation of behaviour.

It has also been found that rules which seem to govern the behaviours of groups in one area do not necessarily apply to a similar group in another area. It is necessary to adapt the intended message to meet all of the various factors which may be specific to the location[11]. A similar lesson was learnt during the Green Energy Train Leidsche Rijn project[12], which was conducted in the Netherlands between 2001 and 2003 and was intended to reduce the energy, heat and water use in apartment blocks by 5%. This project concluded that education and communication materials should be tailored to the particular geographical setting as well as the target group. The programme also highlighted the importance of testing the method and communication material in advance in order to ensure that they could be altered so as to properly match the needs of the target audience.

The role of demographics in electricity consumption

The Electric Power Research Institute (EPRI) has conducted several studies which investigated how age, income, education level and level of electricity consumption can have an influence on the effectiveness of feedback-based energy saving initiatives. These studies have tentatively demonstrated certain tendencies associated with various factors. However the relationship between each factor and the effectiveness of energy efficiency initiatives was tenuous and some reports seemed to contradict each other[13]. The EPRI findings have found some support in other reports[14]. However more work is needed for these relationships to be more thoroughly verified.

1. Age: At least two studies seemed to show that energy efficiency measures resulted in a greater savings in younger households; although other studies did not bear out this finding and demonstrated no particular relationship between age and energy savings[13].

2. Income: The studies seem to contradict each other with respect to the relationship between income and receptiveness to energy efficiency initiatives. Different studies respectively showed that lower income households were either more likely or less likely to react to energy efficiency initiatives, whilst others show that household income has no influence[13]. The study on behavioural change and energy efficiency by DECC in 2012 did not help to clarify this question as it showed limited and conflicting empirical evidence on the relationship between household income and a willingness to change energy use behaviour. This report did however highlight the danger of unintended consequences which need to be considered when formulating policies that target lower income groups. Namely such measures may have the potential to incentivise consumers to reduce energy consumption below acceptable standards of comfort[14].

3. Education: At least four studies found an association between the effectiveness of energy efficiency initiatives and education, whilst others did not find this relationship[13].

4. Level of electricity consumption: Three studies seemed to show that the initiatives had a greater effect on households with higher levels of consumptions, although at least one study did not show this relationship. However in addition to the EPRI study findings, there is evidence which shows that energy intensive households have a higher energy-saving potential[13]. The results of a series of programmes showed that high-energy households save more when appropriate incentives are applied. This relationship is further supported by a series of randomised controlled trial (RCT) evaluations conducted by Opower. This study found that high energy consumers reduced energy consumption more than other groups after receiving Home Energy Reports. The results of these studies suggest that targeting high energy consumption groups could make behaviour change programmes more cost effective[14].

Customer categorisation for peer comparison purposes

The examples shown above concentrate principally on the question of how customer segmentation can be used to identify consumer groups so that messages intended to encourage energy saving activities can be targeted most effectively. However another reason for grouping customers is also to allow peer comparisons. Experience in the USA has provided lessons on the best way to create comparison groups which allow households to benchmark their own consumption against similar consumers. A study conducted using a database of 114,000 customers in the USA[15] showed that best way to cluster customers into comparison groups was by house data (floor area, house type and type of heating/cooling), street name or meter books (houses from which one meter reader collects data from in one day). There are advantages for both the customer and the energy supplier to the geographical clustering of groups. It is relatively easy for energy suppliers to establish peer groups amongst direct

neighbours and to describe these groups to consumers. Clustering of neighbouring residences allows consumers to compare themselves directly with their neighbour's homes. These are likely to be quite familiar to them and to be similar in terms of housing type and social characteristics to their own[16].

4.2 Enable

There are a number of things customers can do to reduce energy consumption when they are prompted to do so and an analysis of behaviours of different customer groups to reduce energy consumption is provided in this section. The projects reviewed also revealed the importance of understanding the practical barriers that customers may face when they are asked to reduced their energy consumption as well as the importance of positive face-to-face engagement which are both discussed here.

Behaviours of different customer groups to reducing energy consumption

The apparent contradictions of the EPRI studies highlighted in the previous section seem to highlight an important factor which utilities must consider when trying to increase the effectiveness of energy efficiency programmes. Utilities should consider not only the receptiveness of different customer groups to change, but also the practicality of implementing the measures needed to realise these savings. Assuming that consumers have access to the information they need to understand their own energy use, there are a number of things they can do to reduce energy consumption. These fall into three main categories:

1.   Simple changes in routines and habits;

2.   Infrequent and low-cost energy stocktaking behaviours (i.e., replacing incandescent bulbs with CFLs, weather stripping, etc.);

3.   Consumer investments in new energy-efficient appliances, devices, and materials[13].

It is important to note here that it is difficult to gauge the impact of different energy efficiency measures when attempts are made to change routines, habits and behaviour at the same time as implementing energy saving equipment and measures. In such cases, it is not easy to determine which savings were the result of behaviour change and which were the result of new energy efficiency equipment. For example, as part of the Greater London Authority (GLA) RE:NEW scheme, 'Green Doctors' made house-visits to homes in London[17]. These Green Doctors gave advice on behavioural changes with easily implemented physical measures such as energy-saving lighting, radiator panels, stand-by switches and real-time monitors. In all cases, it was assumed that savings had been made, but no effort was made to track on-going energy use in the participating homes.

In a study of 105 district-heated households in Finland found that regular monthly feedback and focused energy saving advice encouraged the following proportions of households to take the following actions: 54% turned off lighting in empty rooms; 27% lowered room temperature; 27% dressed more warmly; and 23% paid attention to thermostat valves[16,18]. However consumers which invest in new equipment, rather than merely changing their habits, tend to save more energy than those who merely change their routines. It is the higher income households who are more likely to make investments in energy saving appliances and home improvements. Lower income households, on the other hand, are more likely to take the cheaper route of changing their energy consumption behaviours. This seems to suggest that any energy efficiency programme which aims to achieve savings only by encouraging investment in energy efficient technologies will only appeal to a relatively small proportion of the customer base.

In an attempt to allow lower income households to also take advantage of the benefits of energy saving technology, Gentoo, supported by DECC, introduced in 2012 the Energy Saving Bundle (ESB)[19]. These bundles of home improvements were specifically designed so as to ensure that they cost consumers no more than £1 a week. However Gentoo has stated that any efficiency improvements resulting from this scheme did not derive only from the newly installed technology, but was also dependent on changes to customer behaviour. It was found that customers needed considerable support in order to ensure that they were getting maximum possible use out of their new investments. The scheme resulted in

considerable energy savings. However there is evidence that such projects tend to appeal principally to those who are already committed to green living. It is possible, but much harder, to bring about behaviour change in those who are not already 'converted'.

Need to understand practical barriers

It is also important to understand practical barriers which may prevent a customer form implementing energy saving technology and to design any programme so as to ensure that a successful uptake. Such barriers needed to be considered and overcome in the My Electric Avenue project. This was a project in which customers connected to same low voltage feeder leased electric vehicles in order to allow SSPED to evaluate the impact of these vehicles on low voltage networks. A practical barrier to this initiative was participant uncertainty about the range of these vehicles. This needed to be addressed through extensive stakeholder engagement.

Importance of positive face-to-face engagement

The degree to which electricity customers understand and feel "happy" about energy efficiency technology is very dependent on the personalities of the professionals sent to fit energy saving equipment. This is illustrated by the On Demand project, which was conducted to test the impact of utility-led residential demand side management response in the service area of Cooproriz, Portugal. As a part of this trial, participating customers were fitted with a cut-off device which could be turned off or on by the utility. The personalities of each fitter seemed to directly influence how well consumers understood the technology and their feelings of "happiness" regarding the technology[20].

The importance of the positive engagement of installers was also demonstrated in a trial carried out as part of the New Thames Valley Vision project. As part of this trial, energy management units were installed in households which were already fitted with solar PV. These units were intended to allow consumers to use the electricity output of their own solar PV cells to produce hot water, which can subsequently be stored. These customers received instruction on the most effective use of this system by means of a brochure, followed by a face-to-face meeting with an SSEPD customer manager and finally by from the fitter who installed the system. This has been found to be an effective way of imparting this information to users and ensuring that this equipment is used in the most effective way possible.

4.3 Encourage

Recent studies suggest that whilst feedback is both necessary and valuable, it is not always enough to bring about the social and cultural changes which will ultimately have a significant impact on household energy use[8]. Hence, the use of behavioural change techniques is needed to maximise this impact. Such techniques are discussed in the following sections. These include the assessment of the effectiveness of using: different messengers; financial and non-financial incentives; normative comparisons; "opt in" and "opt out" designs of programmes; innovative use and presentation of energy related data; priming techniques, including gamification; the sense of loss or waste; commitment both at a personal or a community level; appeals to the Ego, including competition.

4.3.1 Messenger

Non-profit organisations more trusted that profit making companies

In general, utilities, energy providers, online service providers, home service providers, retailers and equipment manufacturers have been found to be the least trusted advisors[21]. However, it is interesting to note that national government is held in equally negative esteem. Non-profit organisations such as community groups, local authorities and academics are seen as more trustworthy.

Utilities not trusted as messengers

Trust levels amongst consumers in utilities are generally low, particularly in the UK. The 2009 UK Consumer Conditions survey showed that the UK electricity and gas markets were rated as least transparent and generated least confidence with consumers[22]. This lack of confidence has tended to restrict the suitability of utilities as messengers for energy efficiency programmes. It should be noted that this seems to stem from a perception that energy companies are responsible for high energy bills, rather than any lack of faith in their technical competence. There seems to be a wide-spread acceptance that electricity utilities have high levels of technical expertise and could in principle offer energy efficiency advice. A study by Pike Research showed that consumers trusted electricity utilities to offer energy management services more than other service providers, such as cable or mobile phone companies[23].

According to Opower, in both the US and UK, consumers seem to accept that energy utility companies (as opposed to local authorities) have the right technical expertise to present messages related to on changing energy consumption behaviour[11].

Utilities that work to establish customer goodwill up front have faced the fewest issues in implementation[8,10]. There are many examples of successful partnerships between utilities and organisations outside their industry. For example, there is a growing trend for water companies to form partnerships with charities and community groups to promote water conservation. Such partnerships can help to overcome the distrust and frustration which consumers may feel towards utilities and their motivations for conservation programmes.

Local government as trusted messengers

Local authorities have also played a crucial role in the promotion of energy efficiency projects. The Borough of Kirklees provided free home insulation as part of its project Warmzone Kirklees[24]. The Warmzone project was instigated by Kirklees Council together with a number of other public and private organisations. Kirklees Council has over the years developed a powerful image as a trusted promoter of low carbon technology and has been instrumental in implementing demand side management in local government and private buildings in the borough.

The tendency for consumers to trust local authorities more than energy suppliers was underscored by the findings of an insulation programme conducted by the US County government in 1984[25]. The County employed a private company to conduct insulation audits of consumers' homes and then subsequently enact insulation measures. It found that uptake was considerably higher when consumers were informed of the scheme by a letter with the County letterhead (31%) than with the private company's letterhead (6%) or a combination of the two (11%)[16].

The lesson of regional government support to environmental programmes was also not lost on the US National Governors Association, which has advised all State Governors to identify messengers which could appeal directly to market segments. An example of this is the Clean Energy Works Oregon (CEWO) programme which started in Portland in 2010 and has now spread across the state of Oregon[26].

Community groups as trusted messenger

The most effective advocates for efficiency programmes seem to be trusted groups such as housing associations, consumer associations, academics, community and environmental groups, neighbours and other people known to the consumer[16]. Trusted messengers with a targeted message which repeats and reinforces the value proposition of energy efficiency can improve the effectiveness of energy efficiency outreach. The Smart Grid Consumer Collaborative study highlighted the positive results achieved by

projects which partnered with community groups such as youth organisations, universities, local charities and individuals[10].

The Dutch EcoTeam Program (ETP) also makes use of small social groups which gather together on a regular basis to discuss and compare methods for improving environmental behaviour, including reducing energy consumption. Studies conducted into the EcoTeams have shown that the groups are effective in changing a whole range of environmentally friendly behaviours[27]. This included reductions of 20.5% in gas use and 4.6% in electricity use. Longer term studies into these groups have shown that they manage to sustain, and on occasions improve upon, these savings over a long period. However, it should also be noted that the groups tended to be self-selecting and therefore highly motivated; the results of this activity can therefore not necessarily be taken to be generally applicable[28].

A good British example of how a trusted messenger can help encourage participation is the work done by Sunderland based housing association Gentoo which managed to bring about very high take-up of rates for energy efficiency schemes, in some cases as much as 100%. This was achieved by a process of face-to-face engagement and support for consumers throughout the process. This was facilitated in one case by the recruitment of a respected figure within the community who managed to increase participations rates within their particular area from 26% to 96%. The My Electric Avenue LCNF project also recruited local partners to spread the message about the project. Each trial cluster was made up of at least 10 households. In each case, a single local champion was recruited, who in turn needed to bring in another 9 households. The theme of empowering individuals on the ground with a degree of independence to spread the word about the proposed measures can also be seen at the Perth Solar City project in Australia. Based on a central message supplied by a project office, individual partners were given considerable leeway to develop targeted language when presenting this project to the 40 consumer households which took part. The concept of local based messaging was taken very much to heart by the Totnes-based Transition Streets programme. In this case a local neighbours' group took responsibility upon itself to work through a series of energy saving actions with only minimal external support, thus bringing about energy savings of 14%[29].

Interpersonal contacts and recommendations are comparably far more effective vehicles for the promotion of energy efficiency programmes. These have been seen to be considerably more effective than leaflets or labels in promoting energy efficiency measures[30]. Studies have shown that US domestic energy efficiency programs are more successful when they are implemented through existing community groups with extensive personal contacts[16].

Similarly UK studies show that 24% of UK consumers regard word of mouth as their main source of information about energy-related issues[14,31]. The Changing Behaviour programme highlighted the importance of trust between customers and programme managers to the success of a programme. This trust can be gained by making use of 'multipliers'. These are people similar to the intended target who are prepared to transmit the message to consumers. These multipliers are better placed to speak to consumers in a manner to which they are accustomed and to fit the message to an appropriate context for the end-user. This means that the message can be transmitted more effectively to consumers with an applied understanding of the end-user's social networks. Such an understanding can be effectively used to understand shared values within this network and to conduct community meetings and workshops in a manner appropriate to intended end-users[32].

A similar effect was observed in the in the EcoTeams campaigns[33]. Levels of neighbourhood participation in the scheme varied depending on the skills and qualities of staff. It was found that staff members who engaged actively with households in a targeted manner were able to gain their trust and could therefore more effectively convince household members to take part in the scheme[34]. The Clean Energy Works

Oregon (CEWO) program has applied this lesson by using a network of trained building services professionals to act as consumer energy advisers. These advisors explain the benefits of the programme to consumers and generally provide support which helps them to participate in relevant schemes. These advisors have been trained in all of the relevant energy saving measures, including cooling, heating, insulation and high-efficiency windows[26].

Potential success from partnership between different messenger groups

The UK Groundwork Green Doctors project involves a combination of local authorities and ground staff from a community based charity. This scheme promotes energy efficiency on a house by house basis. A local councillor who received a visit from a Green Doctor in turn wrote a letter of recommendation for the scheme, which generated further interest in a way in which previous communications had not achieved. This scheme succeeded in encouraging 25% of households to book an appointment with a Green Doctor. The scheme has also been used by Southern Water to promote its Universal Metering Programme. Advisers explain to consumers why meters have been installed and offer advice on saving water and on how to install simple water saving measures.

There is a great deal of evidence which seems to indicate that energy efficiency measures are more successful when utilities form partnerships with messengers from outside the energy industry. The Thames Water's 'Save Water Swindon' and 'Care for the Kennet' campaigns made use of similar tactics to promote water conservation by forming a partnership with the environmental charity WWF to offer a free water-saving home makeover[35].

Leveraging existing recognised brands and trusted parties

Both the Low Carbon London (LCL) and Customer-Led Network Revolution (CLNR) LCNF projects commenced with the view that a project brand that was separate to both the DNO brand and the project partner brands was necessary. This view emanated largely from a lack of experience amongst project staff of the length of time involved in building a successful brand. Concerns about using LCNF funding to enhance partner brands was also voiced and it is clear that this mistake came about from project teams desire to appropriately represent the LCNF fund. Potential participants struggled to engage with these unknown project brands and it was discovered that while electricity supplier brands may be comparatively less trusted than popular consumer brands, they were more trusted than the unknown project brands. Academic partners also provided a trusted brand that could be utilised. On My Electric Avenue the messenger was EA Technology but for the recruitment of the clusters, EA Technology trained local community members to recruit their neighbours. This was a deliberate strategy to enable trust.

4.3.2 Incentives

Role of financial incentives

Monetary savings are an important source of incentive to consumers in the USA, although it is less clear if this is the case in Europe. The Smart Grid Consumer Collaborative report in the USA has shown that messages which highlight cost reductions from energy-related programmes have broad appeal and are more effective in increasing participation than messages which concentrate on environmental benefits[8,10]. This seems to agree with a study of 136 Canadian households which showed that awareness of prices proved a greater incentive to consumers to reduce energy consumption than appealing to a sense of environmental and social awareness[16].

The Groundwork Green Doctors scheme relies heavily on financial incentives to gain interest and promote take-up. The energy saving measures promoted by this scheme are marketed using the message that the programme can help to lower bills by up to £160 annually. This is compared with the £100 cost for implementing the proposed measures. It is not easy to quantify what proportion of take-up

can be attributed to the desire by consumers to reduce costs as this cost-saving message is an integral part of the scheme message in customer consultations. However, anecdotal evidence from project managers suggests that cost saving is a crucial success factor.

The Low Carbon London LCNF project tried to use a combination of customer incentives and time-of-use based disincentives. These disincentives took the form of a very high peak demand price of 67.4p/kWh. However, there is not enough evidence to conclude if incentives or disincentives have been more effective in changing consumer behaviour.

Various utilities have schemes which aim to appeal to the desire of consumers to save or earn money. BC Hydro in Canada implemented a "Hit the target and Get a Reward" initiative which pays consumers a $75 reward to consumers if they manage to reduce consumption by 10% in 12 months. As well as this BC Hydro offers rebates to customers who buy energy efficient appliances as well as fridge buy-backs, lighting specials and window rebates. These rewards are on top of any savings the consumer makes by reducing energy consumption[36].

Comparable schemes are used to encourage recycling. Recyclebank[37] is originally a US model which intends to increase recycling rates. Residents are able to receive credits for the volume of waste which they recycle, which can be redeemed at mainly local retailers. The scheme has been expanded in the USA to every state any now covers items other than recycling, such as water use. A variation on this idea is a scheme which where points are awarded to a neighbouring household rather than to the householders themselves. Similar schemes have been running since 2009 in the UK in Windsor & Maidenhead and Halton Borough areas. This has been shown to significantly increase recycling rates in these areas compared to the national average[38]. A utility in Graubunden, Switzerland instituted a similar programme with 1,055 participants. Consumers used a website or mobile app to input meter readings. Points redeemable in online shopping were awarded if they managed to reduce electricity consumption. Participants were however also allowed to nominate 'buddies' to receive these points instead of them. It was found that consumers who nominated buddies were more likely to reduce consumption than those who did not[39].

Factors to be considered with financial incentives and non-financial incentives

In the past, it has been found that financial incentives have very little effect[40]. Five separate EU-based projects found that the economic benefits of behavioural change were insufficient to motivate long term changes in behaviour. This effect was compounded by an uncertainty in these projects as to whether potential savings would actually be achieved[8]. The RSE and AEEG Time of Use project in Italy found that it was difficult to change long-established consumption habits and that cost reductions were not enough to bring this about[20]. Studies have shown that appeals made on an environmental basis were more likely to cause consumers to make sustainable changes to their behaviour than economic appeals[41,42]. The reasons that respondents give for changing behaviour are mostly altruistic and based on environmental or social concerns; financial motivations tend to be secondary[43,44,45]. Environmental and other social concerns represent a significant motivation for many participants. For example 7 out of 10 people in UK have expressed concerns about security of supply and the danger of future generations not having access to energy[31]. The Transition Streets in the UK programme offered incentives in the form of grants or low-interest loans to install solar-PV on homes. The scheme did not report that this financial support was a significant incentive for most participants. Successful participants reported that environmental attitudes and good relations with neighbours were more important factors in their decision making. However applicants who were rejected tended to express frustration based on their failure to receive financial assistance.

The decision to make energy efficiency investments can be initiated by different motivations, including home-moving or renovation, as well as feedback-induced self-interest (energy bill savings) or altruistic and civic motives[46]. Programs that limit their appeal to self-interest alone may miss the opportunity to take full advantage of all the various factors which lead customers to make energy saving improvements to their home[47].

This is not to say that financial incentives have no influence on the behaviours of EU consumers. It is clear that there is no universally applicable motivation for energy efficiency schemes and that it is important that the message must be tailored to meet the different motivations of different parts of society[1]. For example money seems to play a much large role in the UK for participants over the age of 65. Studies have shown that 88% of people over 65 in the UK regard control of money as important, which suggests that this factor should be considered when targeting this group[31]. Respondents in a Finnish study reported that 68% were motivated by economic factors and 20% by environmental considerations[16,18].

Financial literacy, control of energy consumption and an understanding of the potential benefits available can help the take up of energy efficiency actions. Rented accommodation tenants, who tend to have lower incomes and have fewer savings, are more likely to be attracted to the opportunity to control their financial outgoings[31]. It has been shown that this particular group can be helped by the use of online financial management tools which allow them to monitor energy expenditure and therefore identify and modify wasteful appliances and practices[48]. There also seems to be a minimum threshold of savings which must be achieved in order to motivate consumers to change behaviour. A study conducted in Sweden[49] looked at a change in the billing method for building tenants which were used to paying pooled costs for energy consumption. These consumers were metered individually and had to pay the real costs of their individual consumption. It was found that these users needed to see savings of €200-300 per year to be motivated to change their behaviour.

Finally, a reduction on income tax offered to households which agreed to install insulation was shown to be ineffective as subsequent surveys showed that the credit did not influence the decision to install insulation[50].

Limited persistence of financial incentives effects

Financial rewards may serve as an extrinsic motivator to conserve energy but their effect is likely to last only as long as the reward is in place. A study which examined the effects of varying levels of financial reward which were offered in conjunction with information and feedback was inconclusive. Households which received the highest rewards saved the most electricity over the duration of the trial. However, it is not clear if these reductions were sustained after the rewards were discontinued[51]. Various other studies seem to suggest that such rewards only brought about short-term changes in behaviour[52,53]. These studies were variations on a common theme. Namely housing blocks were provided with consumption information and feedback and various forms of intervention, including financial incentives, to reduce energy consumption. In most cases, this resulted in initial reductions in consumption, which became less pronounced as the trial period wore on[28]. In the case where reductions in consumption were sustained, this appears to have been the result of an additional bonus which was offered to a block which managed to achieve total reductions of more than 10%[28]. There is in fact other evidence to suggest that households react better to smaller, more frequent rewards, such as 'green credits' which can be used to buy more efficient appliances to move away from pre-pay meters[48].

Non-financial incentives: Feedback can act as a powerful motivator

There is evidence that providing consumers with access to data on their energy consumption can help to motivate them to save energy. This tendency was demonstrated by research conducted with UK students where participants were given access to an online tool which allowed them to view their energy consumption and CO2 generation. It was shown that participants felt motivated to reduce consumption[42].

Trials have been performed to allow researchers to see the relationship between reductions in consumption and the type of information provided. It was found that continuous feedback on electricity consumption caused the greatest reductions in consumption at an average of 3%, increasing to 8% at peak times. Energy consumption reductions in the other groups were either not noticeable or were not statistically significant[54].

A three year pilot study conducted by Opower in Sacramento, Cooney[55] indicated that high consumption households receiving monthly reports consistently reduced consumption for 10-12 months into the study, after which time the results levelled off. Low consumption households receiving a quarterly report were shown to consistently reduce energy consumption over 29 months. There is however uncertainty as to whether these programmes retain their durability beyond 29 months as the studies on which they are based do not extend beyond this time period[14].

A comparable study conducted in nine working class housing blocks in Copenhagen was less conclusive. This showed 20% reductions against baseline levels as a result of eco-information being provided in three blocks, but not the other six[56]. Another study showed that providing "environmental information" did not influence behaviour as compared to a control group[57].

Motivation through a sense of environmental stewardship has mixed results

Appealing to a sense of environmental stewardship has been found to be effective with only certain consumers. In untargeted campaigns in the USA, stressing the economic benefits of savings seems to be more effective[10], although this tendency does not necessarily seem to hold in Europe[8].

Cooperative local ownership of projects and requirements to facilitate participation in decision-making can promote engagement and thus contribute to success. The Changing Behaviour meta-analysis study program[7] suggested that, "the capacity of end-users to take an active role in changing their energy behaviour influences their ability to take responsibility for the achievement of the goals of the programme or project. Cooperative local ownership of projects and requirements to facilitate participation in decision-making can promote engagement and thus contribute to success. Tailoring the message, the information and communication material and the channel are also crucial". The Danish island municipality of Samsø[58] conducted a trial which was intended to make the island self-sufficient in renewable energy. This project was helped by the long-standing tradition in Denmark of decentralisation of the energy market and co-operative community ownership of renewable energy and CHP schemes. This has resulted in widespread acceptance of renewable energy projects.

A version of EcoTeams was also implemented in the UK. In this, and other similar programmes, such as Transition Streets, norms were presented in a 'natural' rather than 'technical' context. These programmes are characterised by small groups working over a protracted period. This has been helped in cases where the groups operated in a small town, as these allowed the groups to position the norms established as the norm within that community. In the case of Transition Streets, which operated in Totnes, information on the aggregated activities of all of the participants was broadcast on a TV publically shown in a shop window. This activity lead to a perception amongst a significant number of Totnes residents (30%) that closely monitoring ones carbon footprint was 'normal' behaviour. This compared to the control area of Paignton, where 7% of residents took this position[59].

The German nation-wide EcoTopTen project[60] was aimed largely at an audience which was already quite environmentally aware. Consequently this tended to concentrate less on the reasons for environmentally appropriate behaviour, but rather on the right methods and technologies to meet the desired effect.

The attraction of new technology can work with specific consumer segments

Some consumers are motivated by a greater sense of comfort and control over technological solutions. This motivation tends to appeal principally to technology enthusiasts who are owner-occupiers. Vulnerable groups, renters and local authority tenants are less likely to be enthused by new technology[31]. For this reason, attempting to motivate consumers by appealing to their enthusiasm for novel technology is only likely to work with quite specific consumer segments[8].

Limitations of non-financial incentives

Recent studies suggest that whilst feedback is both necessary and valuable, it is not always enough to bring about the social and cultural changes which will ultimately have a significant impact on household energy use[61,62]. Providing information alone is not enough to spur consumers into implementing energy conservation measures. Customers may display sympathy towards the messages being transmitted; however this does not always translate into action[63,64,65].

US evaluations of energy efficiency programmes have shown that that intended targets often ignore messages even when such information is freely available[66]. Part of the problem seems to be that the messages being put out by utilities do not always match the realities of the lives of consumers. The Smart Grid Consumer Survey[23] showed that ideas which were popular with utilities were not always popular with their consumers. For example, demand response was found to be unpopular with 68% of responders, with 60% of them concerned about the loss of control of their appliances. This was not necessarily helped by marketing campaigns which have emphasised shutting down air-conditioning in mid-summer as well as the benefits of purchasing new energy efficient appliances in the middle of a recession.

4.3.3 Norms

Relative success of normative comparisons

Normative comparisons that compare a household's energy use with that of others are popular with consumers, but their effectiveness can be uncertain. Surveys have shown that 70% of respondents claim that they would change their behaviour if it could be shown to them that their consumption was higher than 80% of their peer comparison group[67]. A study in the enhanced billing in the Netherlands[68] came to a similar conclusion. A survey conducted as part of this study showed that participants found that customers stated that normative feedback provided an incentive to reduce energy use, though the study did not quantify the actual savings achieved[47].

However, studies which look at the effects of comparative feedback show that, although householders enjoy the opportunity to compare themselves against their neighbour, this does not necessarily translate into behavioural changes[18,69]. An analysis of twelve studies dealing with normative comparisons could not find any evidence that energy savings had been achieved as result[70]. A study which tested the effectiveness of comparative feedback, individual feedback, monetary rewards and information showed only marginal difference between the various study groups[71]. The comparative feedback group were given information about their energy consumption compared to similar households. The study did not find that comparative feedback was more effective than individual feedback that did not provide a comparison with neighbours. Providing households only with information was not found to be effective at all[28]. However, reviews of the efficiency programmes which allow normative comparison have shown that large-scale schemes can result in small, but consistent savings of 1-3%[14].

The Dutch EcoTeam Program (ETP) also makes use of comparative feedback. These EcoTeams are small social groups which gather together on a regular basis to discuss and compare methods for improving environmental behaviour, including reducing energy consumption. They are provided with data which allows them to compare themselves against the performance of other EcoTeams. However, the groups were also subject to number of different interventions, so it is difficult to know which was the most effective[28].

A linear regression analysis conducted as part of the UK CHARM Energy study tended to show that households in Bristol reduced consumption levels by 3% as a result of receiving comparative feedback about their own historical performance or comparisons with peers. However the analysis did not show that customers who received comparative feedback reduced their consumption at a greater rate than those who received individual feedback. Also the sample size was not sufficiently large to demonstrate that the result was statistically significant.

Comments made by the participants did suggest that participants believed that feedback caused them to change their consumption behaviours, as the graphical information provided allowed them to benchmark themselves against a norm. Any increases in consumption became easily visible to consumers, which allowed them to identify high energy consumption habits, and could therefore correct these[20].

A study on 271 California households examined the effectiveness of four different types of message which were intended to motivate participants to reduce household energy consumption[72]:

1. Encouragement to protect the environment;

2. Encouragement to benefit society;

3. Encouragement to save money;

4. A normative statement that most of their neighbours conserved energy.

In addition to this, a final control group was provided with information only.

By measuring actual energy consumption, it was found that the normative message resulted in the largest reductions in energy consumption. The normative message was shown to reduce energy consumption by 10%[47].

There seem to be significant difference in reactions to normative comparisons between nations, and possibly cultures[70]. In the UK[73] and Sweden[74], consumers appear to be less interested in comparing themselves with their neighbours than they are in comparing their own consumption against their own previous levels. On the other hand, Finnish[18] and Japanese[75] consumers were much more interested in comparing themselves to their peers[70]. A study conducted done by the Bristol Centre for Sustainable Energy seems to agree that UK residents are more interested in comparing themselves against historical performance than in their position against their peers[76].

The meta-analysis of 27 case studies from the Changing behaviour program shows that social interaction can help to promote the aims of a programme[7]. This interaction can take the form of peer pressure which places a sense of social obligation on consumers to change their behaviour. This will work in situations where the subject interacts with others who they like or respect and whose opinion of them is important to them. Alternately consumers may benefit from the support and advice of peers which can help them understand the options available to reduce consumption. The initiators of the UK Warmzone Kirklees[77] project, which provided free cavity-wall and loft insulation in Kirklees Borough, believe that the project was largely successful due to word-of-mouth communication.

Impact of normative comparison on different energy users

There is evidence to suggest that, whilst comparative norms tend to reduce energy consumption amongst high-to-medium energy users, they may actually result in increases in low-energy consumers. A study that investigated various different forms of interventions found that the savings made by medium-to-high energy consumers (2.5% to 3.7%) were almost completely offset by the increases in consumption made by low energy households (10.7%)[57]. This echoes the findings of another a study on the effect of cumulative feedback on 353 households. This found that feedback caused the greatest reductions in households with the highest consumption[78].

Effectiveness of recommended behaviours

The tendency for low energy households to actually increase consumption when faced with comparative norms, could be counteracted by the use of injunctive norms, i.e. examples of recommended behaviour. In a trial of 290 households in California, consumers were given weekly feedback on energy consumption[79]. The households were divided into high-energy and low-energy consumers and were accordingly treated in a different way. The high energy users were provided with hand-written notes telling them how much energy they had used, how this compared to their peers and tips on how this could be reduced. The low-consumption households on the other hand, were provided with injunctive norms in the form of notes with smiley or frowning faces telling them if their consumption had improved or worsened. This approach was found to be successful in reducing the consumption high energy households whilst preventing increases in the low energy households[47].

Combinations of norms with other forms of motivators can work

Some studies have shown that financial considerations play a significant role, in combination with other factors[14]. For example the E.ON Experimentet project in Sweden suggested that cost savings were effective as an incentive if they could be seen in conjunction with the ability to make comparisons with neighbours. This tendency has been used by Efficiency 2.0 in Illinois in the USA, which provides data to households that allows them to make household comparisons. It also offers a reward points scheme with credits which can be redeemed at participating shops, showing that incentives do not have to be delivered through the electricity bill. This scheme, which is intended to provide participants with a tangible result from their actions, has reduced electric bills an average of 5.5 %[26]. A similar scheme was used by CLNR and My Electric Avenue, where participants were offered £50 vouchers for Marks & Spencer and discounted car leasing respectively. Incentives such as cash payments or vouchers to change behaviour during the trials have not yet been trialled in LCNF projects and this is an area where SAVE could add to the understanding and learning on customer behaviour.

Opower has shown that combining regular monthly feedback and the provision of normative data can be successful. This method was first demonstrated in 2008 when Opower worked together with the Sacramento Municipal Utility District (SMUD), which contains 85,000 households. Subsequently Opower has spread out to Minnesota and Washington. It has achieved this by ensuring that the information which is provided to consumers is presented in a targeted way an in its appropriate context. Consumers receive data on their own energy consumption in a historical context, comparison with peer groups and targeted tips intended to help them to reduce consumption. This allows them to understand not only if their consumption is increasing or decreasing, but if it is extraordinarily high compared to similar households. The reports provided by Opower are carefully worded to make the point that comparable low-energy consumption peers represent a model to which their consumers should aspire. This message is reinforced by language and signals, such as smiley faces, which encourage certain types of behaviour. Consumers react to these interventions in different ways. Some change their habits, whilst others invest

in efficient appliances. Opower has managed in this way to achieve savings of 1.2% to 2.5%. These savings tend to be sustained as long as the households remain within the programme[20,47,80,81].

4.3.4 Defaults

There is a tendency for people to revert to their default option when presented with more than one possible option. This tendency can be counteracted by use of 'opt-out' as opposed to 'opt-in' schemes. Requiring participants to opt out rather than opt in has been shown to significantly increase participation in energy conservation schemes[47]. This practice has been common for several years in many programmes outside the energy sector. For example, Germany, which operates an opt-in system for organ donations, has a 12% uptake in the scheme. Neighbouring Austria, where citizens must opt-out, has 99.8% participation. This principle is also being used in the UK where an opt-out principle was applied to workplace pensions in 2012[82].

The options for using opt-outs in the energy sector may be somewhat more limited, but there are examples of the principle being applied. The UK social housing provider Gentoo has implemented a successful model whereby all new tenants receive an energy advice visit by default. Seattle City Light set up its Customized Home Energy Reports program as an opt-out. This meant that consumers needed to actively contact their utility to opt out if they did not wish be enrolled in the scheme. As a result only 57 of the 20,000 person population (0.3%) opted not to be enrolled[47]. Similarly participation in the CLNR LCNF project was automatic if the consumer did not opt out. This led to very high rates of participation, but relatively low rates of engagement from those who did participate. Many customers evidently did not understand that by not opting out, they had agreed to take part in the trial.

4.3.5 Salience

Value in making messages more salient

Salience refers to the quality of certain types of information standing out from the background 'noise'. Salience is an important quality for consumers who may be interested in certain selected facts and do not wish to expend time analysing the information provided by their energy company. Smart meter monitors typically become 'backgrounded' and receive less attention from consumers. Surveys of consumers show that they do not feel incentivised to remain constantly engaged with their energy consumption over protracted periods of time, unless they are able to receive constantly updated 'new' information. However, it is not always clear what this 'new' information might be[61].

There is strong evidence that more than one salient event is necessary to bring about long term changes in behaviour. This can be seen from Transport for London's (TfL) efforts to change commuter travelling habits during the period of the 2012 London Olympics. These were very successful during the course of the games. However, despite a hope that these habits would continue after the games were over, commuters soon reverted back to their old habits[83].

The importance of the provision of clear information to customers was highlighted by a study of household energy consumption in Japan. Consumers were fitted with displays which showed the energy consumption of their home and of individual appliances. Participants reduced energy consumption by 12% and 60% of participants reported that their awareness of energy consumption had increased[75].

An example of how salience was important to the success of an energy scheme is the Transition Streets project which was conducted in Totnes. The project managed to achieve a high level of recognition with residents of Totnes, who had learnt about it from various different sources: such as the local newspaper (43%), friends and relatives (39%), and other environmentally-aware members of the community (16%). The long term impacts of this salience are hard to measure, but surveys of participants showed that 85% believed that their behavioural changes would persist over the long term.

Importance of appropriate presentation of data

It is self-evident that information should be presented to consumers in a manner which is intelligible and interesting to them. The record of the industry on this score has been variable[70]. There is a wide range of potential textual, tabular, graphical and symbolic methods for expressing information to consumers and consumer interest is very dependent on the appropriate display of such information. Good practice must be applied when designing such formats or consumer interest can be lost very quickly[68,69]. It is important to label graphical displays carefully. Pie charts seem to be a popular form of graphic for displaying any form of breakdown and horizontal bars or lines are best suited for making comparisons, such as different household consumptions[70].

There seem to be notable difference in the acceptance of presentation styles in different countries and regions, and according to different contexts[70]. A specific design has been used to compare household consumption in Delaware, USA and in Norway.The design was received badly in Norway, where it was regarded as both childish and overly complex. It was not clear if the houses in the graph were supposed to represent aggregated data or actual individual houses.

Pilots in different parts of Canada (Ontario, Newfoundland, and British Columbia) showed that an energy display produced different reactions in the various places where it was used. The same display was used with similar sampling protocols and population frames, but resulted in very different reductions in consumption: 7% in Ontario, 18% in Newfoundland, and 3% in British Columbia[13].

Presentation of end-use consumption

There is a great deal of evidence which seems to link the provision of appliance-specific end-use consumption information to energy efficient behaviour[70]. This seems to be particularly the case when information is given on the costs of running various forms of appliance, together with information on alternatives[48]. For example 100 households in Norway were provided with a pie chart which broke down energy consumption according to end-use. 81% of respondents said that they found this useful and 28% said that they had learnt something from it[65].

Non-data displays

Another method for effectively gaining the attention of the consumer is the 'ambient display'. This form of display does not show any figures or text, but sends an alert to the customer about changes in electricity consumption. For example, such a display can be programmed to warn a consumer that consumption has exceeded a given level. This could take the form of an 'energy-orb' which flashes and changes colour according to the energy tariff in use at that time[84]. The orb gave a two hour prior warning of a high-tariff period, which tended to cause consumers to reduce consumption early in preparation of the high-tariff period and to continue afterwards. This meant that the orb fulfilled the role of load shifting, as well as overall energy saving[65].

The Clockwise Project in Sweden came up with a design for aiding customer understanding of energy consumption in 20 households in the town of Ursvik. The study split the participants into two groups. One group got an electricity meter, whilst the other group was issued with the Energy Aware Clock. Although some consumers reported that the information provided by the Energy Aware Clock was confusing, participating households did reduce electricity consumption by 10%.

An alternative concept to measuring own energy use come s from the USA and takes the form of a device which informs householders that the external temperature has gone below 68°F. This allows them to regulate the temperature in their homes by opening windows rather than using air-conditioning. This was shown to be able to reduce energy consumption over a three week period[85].

Non-Electronic Displays

A more low-tech, but nonetheless effective method of concentrating the attention of the consumer is the use of fridge magnets and markers which give information about time-of-use tariffs[86]. These were shown to have achieved high rates of recall amongst consumers with 75% of users finding the magnet useful[8].

Method and frequency of feedback

A number of studies have been conducted to try and establish the best method and frequency for disseminating feedback. There is evidence to suggest that information which is provided via a computer is more effective than the use of leaflets. This was shown in a study where a group of households was given feedback on leaflets, whilst another was sent the information electronically. The results of the study seem to suggest that energy conservation was higher amongst the group which received the information by computer[57].

Effectiveness of feedback seems to be related to the frequency with which it is provided. There are strong indications that continuous feedback produces positive results[87]. Projects which provided information on a daily basis are more effective than those which provide it less than monthly[47,70]. Other studies have shown that high frequency is not necessarily the only route to a successful project. A single instance of feedback which evokes cognitive dissonance in the recipient has also been shown to cause reduced energy consumption[88].

Persistence of feedback

The longer the trial and the more information available, the more persistent the effects seem likely to be. This has been shown by the results of many different trials. Evidence from Nordic countries found that trials which lasted longer and made more information available to the customer resulted in more persistent effects[89]. A Dutch study on gas consumption in 285 households found that displays showing energy use data caused energy savings of up to 15%. After respondents stopped getting this information, they returned back to previous habits within a year of the study[90]. The findings of Opower also seem to strongly indicate that it is necessary to maintain a continuous and regular flow of information to the consumer in order to maintain continuous engagement. Projects which caused initial reductions in energy consumption found that improvements tended to fall off when contact with the customer ended[11]. Whilst some trials seem to have naturally achieved persistent improvements, there are many studies which indicate that it is necessary for the utility to maintain a continual of information to the client in order for them to remain engaged and for energy savings to persist[47]. Strong additional evidence has been provided by studies which involved enhanced billing and energy display devices[13].

Energy audits

The purpose of energy audits is to provide consumers with the information needed to implement energy efficiency measures in a specific environment. They are intended to change customer behaviour by increasing awareness of energy generation. They should be seen as part of a long term plan to improve energy management rather than a single event which identifies one-off activities. In this way they can be part of a programme to bring about sustained changes in the habits and practices of consumers[91].The National Energy Efficiency Action Plans[92] make reference to campaigns in Austria and Ireland and highlight the effectiveness of energy audits in promoting awareness in household energy efficiency opportunities[91].

It can be argued that an energy audit represents a salient event from the perspective of a consumer in that it is a novel event. This was shown by the Groundwork Green Doctor Scheme which revisited 102

households in West London after they had conducted a project which involved audits at these addresses. They found the following responses from participants at these revisits:

- Remember your Green Doctor visit: 100%

- Can remember the advice given: 92%

- Still have prescription: 80%

- Still fulfil all pledges: 83%

An energy audit normally covers a range of different factors which have an effect on energy consumption. This may include the physical building, its thermal characteristics of the building as well as the energy appliances in use. The audit considers each of these factors and makes proposals for investments in the building. The significance of any such proposals is that they should be tailored to the specific building. There is evidence to suggest that customers place a value on receiving an energy audit from a trained and independent expert[91]. For example, the €CO2-Management project in Austria provided consumers with advice from independent technical consultancies on how to make energy saving changes to their home and to their energy consumption habits[20].

There is a great deal of evidence to show that energy audits can make a positive contribution to reductions in energy consumption. One study show how energy audits concentrating on energy consumption for heating and air conditioning resulted in 21% lower electricity consumption compared to a control group[51]. In another study, tailored energy saving advice was provided to households at two US military installations, based on information gathered at focus group discussions. The advice given differed based on the specific energy use patterns of the two geographically diverse areas. Advice given in Washington State concentrated on reducing gas and electricity use for heating, whilst in Arizona the target of the advice was a reduction in energy consumed for air conditioning. The Washington group achieved 10% reductions, whilst electricity consumption in Arizona actually increased by 2% compared to baseline levels[44]. A separate study which looked at gas consumption shows that households which had received an energy audit managed to reduce consumption compared to those which had not. Progressive reductions in gas use were observed in the two years after the audit was completed. It should be noted that the conclusions of this particular study are however overshadowed by some doubts about data quality[93].

The Canadian ENERSAVE program used a survey which asked questions about behaviours related to energy use. One group of respondents was sent energy saving advice tailored to their responses whilst another was not. The two groups were followed up two years later to check energy saving actions and energy consumption levels. This found that there was no difference at this time between the two groups either in terms of energy saving activities or energy consumption levels[94].

A different study tried to evaluate whether energy auditors trained to use persuasion principles (e.g. use of vivid, personalized information) could more effectively convince householders to implement energy saving measures. The results of this study were quite positive in that they showed that the trained auditors were more successful in encouraging householders to make applications for energy saving measures. However the programme did not seem to result in a difference in energy consumption amongst those households which had been audited by the trained auditor[95].

4.3.6 Priming

The practice of priming participants has been shown to be effective. For example, experiments with insurance forms show that when respondents are asked to sign the form before completion, they are more likely to make honest entries[96].

A form of priming was used by the EcoTeams project in order to make participants consider all of the ways in which they take actions to help the environment. This took the form of a tick-list of the potential environmental measures which they could take. The way in which the EcoTeam project is evaluated does not show whether this priming results in any more changes in behaviour than any other part of the programme, but it is assumed that the practice has a positive effect.

The EON "Get Energy Fit" campaign has been set up to resemble a personal fitness scheme. The programme invites participants to conduct a 3-stage get fit programme intended to stimulate individual action and therefore to change behaviour. These steps are: a) "Take The Survey", b) "Start Your Dashboard", c) "Set 12-Month Goals"[97]. Unfortunately results from this quite interesting campaign was not available.

Gamification

There are opportunities to use gamification techniques to incentivise improved energy efficiency behaviour. A good example of this was a stunt implemented by Danish energy firm Vestforbrænding and advertising agency Anew in a Copenhagen suburb. The firm set up a pizzeria, the output of which was linked to actions by local residents to moderate their energy consumption behaviour. Before opening the pizzeria at the start of winter, Vestforbrænding had sent information to consumers giving advice on energy saving techniques. The company then measured heat consumption levels and gave away free pizzas proportional to these savings. This resulted in 163 free pizzas being given away on opening night[98].

The EU funded BeAware energy awareness project tries to turn energy conservation into a game. The project makes use of a system called Energy Life which uses wireless sensors and a smartphone app to try and make consumers aware of the consequences of energy consumption. The system provides both awareness tips and feedback on consumption, which are presented in terms of a scoring system. Players need to achieve consumption goals which result in unlocking higher game levels. Participants can answer quiz questions intended to enhance awareness[99]. The game also allows participants to communicate with other players, which is intended to establish social norms in energy conservation[100]. The programme does seem to have been successful in reducing energy consumption. These reductions seem to be most pronounced in the first two months, but then less so subsequently. However, BeAware intends to address this in future versions of the game[101].

Another educational computer game is British Gas's EnCon CITY©. This is a purely educational tool and is not linked in any way to the energy consumption of the player. The game teaches players how electricity is consumed and potential sources of waste[102].

4.3.7 Affect

Appealing to a sense of loss or waste

It has been found that consumers can be incentivised to buying into energy efficiency through an appeal to a sense of "waste" or "loss of money", as opposed to promoting the idea of positive environmental benefits. Research has shown that consumers are most likely to react to statements related to preventing waste, particularly of money[21].

Canadian energy provider BC Hydro produced a marketing campaign which capitalises on the tendency to avoid loss. The campaign was featured in bus shelters, television, print, billboards and online[103]. The main theme of the campaign was that wasting energy is the same as wasting other commodities such as water or food. The campaign used a humorous approach and has achieved successful results. Visits to the BC Hydro energy conservation website increased by 350% and 91% of consumers surveyed said that they should be doing more to save power[104].

The use of language was an important aspect of the Clean Energy Works Oregon (CEWO) program. This found that words "audit" or "retrofit" have a negative connotation and should be replaced. Consequently CEWO instead offers energy "assessments" and "remodels"[26].

The Portuguese project On Demand discovered the benefits of continually changing its motivating messages so as to allow better engagement with customers. The project started by concentrating on the control of individual appliances, which tied into the feedback interfaces which monitored these. Over time however this evolved into how consumers could work together with the utility to, "do the right thing". The messages also focused on how community benefits could be converted into individual benefits[20].

Affect can also play an important role in promoting community-based energy efficiency programmes. Participation in these programmes is not always rational but is often dependent on intangible emotional motivations such as a sense of community. Participants in Transition Streets report a sense of social contact, which flowed over into other forms of neighbourhood interaction. The Groundwork Green Doctors scheme also acknowledged the importance of understanding the emotional implications of the scheme with participants – its Green Doctors were well briefed on this aspect. Their report on their activities in Lewisham stated, "While being monitored by delivery numbers, the Green Doctors never lost sight of the need to help clients, to sympathise with their difficulties and to spend time with those who warranted some extra care and assistance".

A study of energy audits and rebates found that the word "loss" was more likely to provoke action than the words "gain" or "save" when used in relation to money[95]. A different study took the opposite position in that it found that behaviour change was more likely to be encouraged by positive than negative lessons[105]. This work concluded that rewarding environmentally beneficial behaviour is more effective than punishing environmentally damaging behaviour[16].

4.3.8 Commitment

Longer term behaviour change can be enhanced by the use of commitments/goals on energy consumption. The establishment of personal goals can be more effective than material incentives when trying to make rapid changes and can also help to modify long-term behaviour[91,106]. This method has been used with some success in areas other than energy such as encouraging job-seekers back into work more quickly[107] and encouraging smokers to quit[108].

An early attempt to investigate the use of personal goals to modify energy consumption behaviour was conducted in New Jersey in the 1970s. The trial applied energy saving goals of varying difficulty to different groups. Some consumers were provided with feedback on household energy consumption and others were not. It was found that the only group to reduce energy consumption significantly more than the control group, which received neither a target nor any feedback, was the group with difficult targets and which received feedback. The study also found that groups which received feedback saved more energy than those which did not[85]. Similar results were found in other studies[109]. In each case, a combination of goal setting and frequent feedback was found to be effective in reducing energy consumption, although feedback alone could also be seen to have an effect.

A commitment approach has been found to have relatively persistent impacts[110]. A 3-year longitudinal study of 150 households engaged in eco-team interventions looked at the effects of information, feedback and social interaction[27]. These eco-teams aimed to target behaviours related to energy conservation. The programme was a success, resulting in 5% reductions in consumptions, increasing to 8% two years later[47].

The effect of committing to energy consumption was measured in a series of trials by use of a so-called 'foot in the door technique'. The principle behind this technique is that respondents will be more inclined to agree to a significant request if they have already agreed to another, smaller request. Participants were split into groups and were asked to complete a questionnaire and/or to commit to conserve energy by 10%. Actual energy consumption reductions were tracked, showing that all participating groups had reduced energy consumption compared to a control group[111].

The tendency for participants to wish to continue down the path of energy efficiency when they have taken the first steps was used by German electricity retailer Yello Strom. Yello Strom found that when consumers have already made a financial outlay on equipment intended to improve energy efficiency, they feel incentivised to take actions to ensure that they are getting the full value of this investment. Yello Strom's customers are invited to purchase or rent energy saving or energy monitoring equipment, such as low-energy light bulbs and in-house-displays, from them. They are then able to monitor their electricity consumption on Yello Strom's website. These customers then feel highly motivated to ensure to reduce energy consumption to recoup their expenditure. This has been a successful business model for Yello Strom, which now has 13 million residential customers[112].

Public Commitment

An important aspect of commitment to energy saving behaviour can be public commitment to a particular goal. There have been a number of experiments which show that people will tend to follow through with a particular course of action if they have made a public commitment to do this[111]. This tendency seems to have been confirmed by a study where householders were asked to make a public commitment in the form of a signed form to conserve energy. This fact was published in a leaflet. The participants whose commitment had been made public showed lower energy consumption rates than those who had made a private commitment and a control group. This behaviour continued for 6 months after the intervention[113]. The action of signing a form to indicate commitment to a goal seems to be effective in encouraging energy conservation. This was demonstrated by a study on energy conservation conducted with 53 households in Virginia. Four treatment groups were asked to sign a form to demonstrate their commitment to a 15% reduction in energy consumption. This study did not specifically measure the effects of goal setting. It was however successful in achieving 15% energy saving targets[51].

This public commitment effect has been effectively used in energy conservation programmes in which participants sign a public commitment to energy saving goal[113]. This insight was put to use in the 2009 FortisBC's 20/20 Challenge program. FortisBC offered customers the opportunity to exchange six light-bulbs for low energy bulbs for free. At the exchange, they were asked to commit themselves to an energy saving activity, which could be a change in energy consumption patterns or investments in their home.

Community Commitment

The UK EcoTeams project has made use of community public commitments in a more informal social setting to secure changes in behaviour. Participants are required at each meeting to present their intended activities to reduce energy consumption, some of which may be actions intended to be performed on behalf of the members of the community. At the start of each meeting, participants also had to give a report on actions undertaken since the previous meeting. These meeting and the communal activities tended to engender a sense of community obligation, which resulted in households in reducing electricity consumption by 5% and gas/heating energy by 19%. A similar approach was used in the Transition Streets project. The Dutch equivalent of the EcoTeams programme was also successful in reducing energy consumption over the short and long term. Self-reported data on the programme has shown that this was the result of changed behaviours some of which were one off actions with a long

term effect (such as installing double-glazing) or habits which became persistent (such as setting the thermostat to a lower level)[27].

Community-based interventions are able to produce persistent change, with programmes achieving and improving upon reductions over a two year period. This can even result in long-term changes in habits[14]. This can be aided by the setting of community commitment goals. This was demonstrated by the Austrian Energy Neighbourhood programme which encouraged communities in 8 cities in the province of Styria to reduce energy consumption by 9%. The goal was promoted as a form of 'bet' between the local government and the community groups. Participants received training and advice from trained professionals during the course of the competition. Winning communities were awarded environmentally friendly packages, including energy saving light bulbs, fleece blankets and vouchers for organic stores. This resulted in average reductions of 8.94% in the first year of the scheme, followed by 9.28% in the second year.

Ashton Hayes in Cheshire has attempted to show the effectiveness of community goals by setting itself the target of becoming the first village in England to be completely carbon neutral. It has attempted to achieve this through a series of community-led activities intended to measure and reduce their carbon footprint. This has included a series of energy audits, renewable energy initiatives and tree planting. Since starting this project in 2006, the village has managed to reduce CO2 emissions by 23%[114].

It should be noted however that goal setting seems to be most effective when applied to individual households; there is little evidence that the application of an additional community goal adds any further effectiveness to the scheme. This was shown in a study of two groups of households, each of which received feedback and individual goals. However one of the groups was also asked to try and reach a group goal. Both test groups performed better than a third, control group, but there was little significant difference between the two groups[28,47].

Implications of personality type

For pro-self people, an assigned goal seems to result in lower energy savings than a self-set goal, while for pro-social people the reverse might be true. This was demonstrated in laboratory conditions by an experiment which simulated energy setting on a washing machine[115]. It was found that participants who had been set a target achieved lower levels of energy consumption than those who had not. Social value orientation (i.e. the extent to which one values outcomes for oneself or for others) had an impact on the effectiveness of the type of goal set. Pro-self respondents used less energy with an assigned goal than a self-set goal, while for pro-social respondents the reverse was true[28].

Implications of type of commitment

Studies have highlighted the importance of differentiating between specific planned commitments which are made in advance and more general goals to "learn by doing". The Changing Behaviour meta-analysis of 27 case studies found that most energy conservation programmes ask participants to commit to specific planned measures which could in theory be achieved. Some participants are put off by this approach, which they regard as forming a "barrier" for energy measures[7]. This report also highlights the importance of using clear, unmixed and unambiguous messages when trying to encourage changes in behaviour.

4.3.9 Ego

Appeals to the Ego

Ego in this context refers to the tendency of people to believe that they are responsible for their own success, but that their failures are due to the actions of others. It is a potentially powerful motivator, but is difficult to harness as tool for changing behaviours. An example of how this was done successfully was the striking "Dumb Ways to Die" campaign by Melbourne Metro in Australia. This used a humorous animated song which compared dangerous behaviour near railway tracks with ridiculous actions such as, "setting fire to your hair or poking a stick at a grizzly bear"[116]. A similar anti-speeding campaign suggested that driving too fast was a sign of male inadequacy[117].

Use of Competition

There is some evidence that participants can be motivated to engage in energy saving programmes by the introduction of competitive elements. This was demonstrated by a competition held at Oberlin University in Ohio, USA. Students in 18 dormitories were invited to take part in a two-week competition to reduce energy consumption. Real time feedback was provided during the competition. Participating students became very engaged in the programme, organising online discussion forums and actively seeking ways to beat rival dormitories. In the event, the scheme resulted in 32% energy savings[118].

This principle was subsequently applied by the San Diego Gas and Electric Company together with Simple Energy, which implemented a community energy saving competition in the summer months, when highest energy consumption is usually seen in that region. This made use of the Simple Energy online interface, which allowed the 200 participants in the competition to monitor their performance. The interface was set up with a social gaming element, allowing the participants to directly compete with each other in their energy saving activities. The final winner of the competition achieved savings of 46.5% and was rewarded with a laptop computer[119].

4.4 Engage

For many programmes, group customer engagement is a key integral component. Different group customer engagement methods such as interim interaction, workshops, public and mass-media campaigns have been trialled by projects to evaluate their effectiveness which are all discussed in this section. Moreover, the role of timing of engagement is explored here. .

Interim interaction

It has been suggested that interim interaction, such as interviews, meetings and questionnaires during the trials/programmes can improve customer engagement effectiveness, although the data is inconclusive. Pilot models of projects which utilise feedback and participant interaction seem to produce positive results. However there is not sufficient data to show which model is most effective[2].

Workshops

Other (admittedly inconclusive) trials have suggested that workshops have limited effectiveness. Workshops which provide information energy saving and free energy saving equipment have been shown to raise awareness of energy saving issues. However, this awareness has not been shown to translate into energy saving behaviour. Studies have shown that there was no difference in the behaviour on workshop attendees and non-attendees[120]. The Groundwork Green Doctors scheme also concluded that workshops were not efficient ways of promoting energy saving behaviour compared to direct approaches to participants. Community events were only found to be effective when organised in conjunction with other existing events.

Public and mass-media campaigns

There is evidence to suggest that Mass media campaigns are not very effective at promoting energy efficiency. An investigation of President Carter's plea for consumers to reduce thermostat settings so as to counteract threatened gas shortages was not found to be effective. Door to door and telephone surveys found that those who had heard this plea were no more likely to have reduced their thermostat settings or to even be aware that doing so could help to combat the then existing energy crisis[121].

A mass media campaign by the Dutch government to highlight the dangers of global warming and to promote ways of dealing with it appeared to have only limited success. Surveys before and after the programme showed that behaviours to protect the environment only increased amongst those respondents who were already environmentally aware and acting in an environmentally friendly manner[27]. On the other hand there is some evidence that the Low Cost/No Cost energy conservation programme managed to gain some traction with consumers. A mass-media campaign was accompanied by an energy saving tips booklet which was sent out to 4.5 million households, together with a low-flow shower device. A subsequent survey showed that those who had received the booklet and those who had installed the low-flow device reported that they were more likely to have implemented energy savings tips. It is however not clear if the programme actually achieved any savings in energy[122].

As has been shown earlier, public campaigns seem to be most effective when they are organised in conjunction with trusted local partners, such as a local government organisation or housing association. It is important that the message from any such campaign is carefully tailored to the particular community and is followed up by other additional measures[91]. This local knowledge was a key aspect of the success of the Transition Streets and Gentoo projects as well as the Austrian Energy Neighbourhoods 2 (EN2) project. EN2 found that it was easier to engage participants by recruiting local "Energy Masters", rather than through public communications and advertisements. These Energy Masters became early adopters and were instrumental in further recruiting their neighbours into the scheme. There was a role to play for advertisements on posters and local newspapers in providing public information on the scheme, though these were not shown to have a particularly strong impact[20].

Timing of engagement

Engagement in the earlier phases of a project can be useful. However, constant engagement can be seen as a form of "nagging", which may lead consumers to feel that they are being unreasonably singled out and may cause them to lose interest in the programme. The importance of understanding the target audience is key here, as some consumers may have different concepts of what is regarded as "normal" behaviour and what activities and appliances could be regarded as a necessity[61].

4.5 Exemplify

An important part of efforts to promote energy efficiency activities is the establishment of positive examples. Public displays showing environmentally friendly activity, such as reduced consumption or low-carbon installations can be used to improve the image of an energy efficiency scheme in a particular area.

This can take the form of the public sector taking a lead on energy saving activities[123]. The Australian government promoted its Perth Solar City programme by installing solar PV equipment at five famous Perth landmarks so as to set an example for the desired behaviour. This was intended as a strong signal to the community of the resolve and intention of the scheme. On a slightly smaller scale in the UK, Totnes council fitted a solar PV array to the Totnes Civic Hall to promote the Transition Streets programme. This device also has a public display board which shows the amount of energy produced.

This location also became a popular location for public events to promote environmentally friendly activities.

A similar use of positive examples could be drawn from the Japanese 'Cool Biz' programme[124], which was launched in 2005 but came very much to the fore after the Fukushima disaster of 2011. This was a programme, promoted by the government, to restrict the inefficient practice of combining wearing suits at work with extensive air conditioning. Government pressure was applied to prevent climate control actions being taken between 20 and 28 degrees in buildings and the establishment of business fashions suitable to this climate. Government ministers and ambassadors acted as 'fashion models' to re-assure office workers of the acceptability of such sartorial choices[125].

Private organisations can also have a role in setting an example to consumers. The New Thames Valley Vision customer manager typically used a bicycle to visit potential representatives to take part in energy saving trials. This was well received by members of the target audience who felt that TVV was setting an appropriate example of environmentally friendly behaviour.

4.6 Evaluate

When interpreting results from energy efficiency programmes there are aspects that need to be considered around the measurement of their effectiveness, the economic and regional context under which they are implemented, their economic effectiveness, the impacts of sample size for the trial projects and their focus on overall energy efficiency or peak demand reduction. An analysis of these factors and their impacts on the results is provided in this section.

Measurement of the effectiveness of efficiency measures

Measurement of the effectiveness of efficiency measures is itself complicated by the nature of energy use. Typically utilities measure residential energy use on a household basis, rather than by the type of consumption. Monthly bills indicate changes to total household consumption. They do not however usually indicate how changes in consumers' choices and behaviours have changed energy demands. This makes it difficult to evaluate how an energy feedback program affects customer energy use behaviour and to verify directly attributable energy savings or the persistence of these savings.

Economic and regional context

The overall economic and regional context seems to have an impact on the energy savings delivered by a programme. It has been observed that energy efficiency programme promoted greater reductions in energy consumption during the "energy crisis era" (1974-1995) than during the "climate change era" (1995-2010). Also Western European feedback programmes have been more successful in achieving energy savings in the climate change era than in the USA[2].

Economic effectiveness of energy efficiency programmes

A preliminary study by ACEEE of the effectiveness of utility run energy saving projects in the USA has shown that 104 utilities have spent $355,204,597 on 83 such programmes, which represents 30% of all such programmes. Of the 29 programmes also provided information on the energy saved in these programmes as well as the intended goal[126]. The results of this can be seen in Table 2.

Total cost of 20 programmes	Average cost per customer	Electric savings goal (MWh)	Electric savings achieved (MWh)	Gas savings goals (therms)	Gas savings achieved (therms)
$128,889,166	$3.52	924,950	1,311,125	7,650,938	378,364

Table 2: Total programme budgets, saving goals and achieved savings reported[128]

ACEEE was also able to derive a levelised Cost of Saved Energy (CSE)[1] from programme costs and energy savings for ten projects, which spanned a number of years. The results of this study can be seen in Table 3.

	Programme cost	Savings achieved (MWh)	CSE (per kWh)
Total	$30,129,489	1,321,988	
Average	$3,012,949	132,199	1.61 cents

Table 3: CSE for the Electricity Programmes

Of the ten programmes evaluated, four were found to have been particularly cost effective. These were the One Change Project Porchlight campaigns which were implemented by four different utilities. These campaigns cost on average $4.4m and saved 300,000 MWh, resulting in a CSE of 1 cent/kWh. The Puget Sound Energy Porchlight campaign achieved a saving of 0.9 cents per kWh. This compares to the 10.37 cent/kWh which Puget Sound normally charges its customers and an average of 12.47 cent/kWh average of 55 utilities for which the EIA has data. This seems to show that community-based social marketing (CBSM) programmes may require a not-insignificant initial investment, but that they have the potential to make high and quick returns.

Impacts of sample size

Savings have been achieved with pilot projects which make use of feedback and pricing to promote energy efficiency. Both methods have been shown to be capable of bringing about reductions of more than 10%. It must however be noted that these savings are dependent on the sizes of the sample groups.

For feedback projects, there seems to be an inverse relationship between their effectiveness and the size of the same group. Groups of more than 1,000 participants seem to achieve lower energy efficiency reductions than those with fewer than 1,000 members. This seems to be related to the challenges associated with successful communications with such large groups.

This tendency does not however seem to apply to projects which are based on price signals. Even very large projects of more than one million customers seem to be able to achieve energy savings. This seems to show that dynamic pricing may be a more effective method for communicating with large numbers of consumers[2,47].

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[1] Utilities use CSE to compare energy efficiency with other energy sources. In this report we are reporting the CSE in $/kWh (and $/therm). ACEEE is using a levelised cost to be able to compare programmes of different duration. The formula for establishing this levelised cost is common across ACEEE publications:
Cost of Saved Energy (in $/kWh) = (C × 10^6) × Capital Recovery Factor/ D×10^3 . Capital Recovery Factor= A×(1+A)^B / (1+A)^B−1, where A = Discount Rate; B = Estimate measure life in years; C = total program cost in millions of dollars; and D = Total MWh saved that year by the energy efficiency programme. For these calculations, ACEEE estimated an average measure life of 1.5 years based on their review of the limited available data. This estimate is subject to a high degree of uncertainty and is an important subject for further research[128].

Overall energy efficiency versus peak demand reduction

It is important to make a distinction between those projects intended to improve energy efficiency and those which aim at peak loading. Peak load reduction programmes have been shown to be effective when their aim is concentrated specifically on this area. They do not however necessarily have the effect of reducing total energy consumption. Energy saving programmes have been shown to be able to achieve 10% savings. However, peak load reduction programmes, such as the US Peak Shaving programme which aimed to reduce air conditioning use, typically only result in net savings of 3%[47]. Conversely some studies suggest that energy saving programmes can help achieve peak reductions in the range of 0–2% range[13].

5 APPENDIX I - FOCUS ON NON ENERGY RELATED PROJECTS/CAMPAIGNS

Many of the most compelling case studies showing MINDSPACE principles in action are of course from outside the energy sector. There a is growing body of examples of behavioural insight used for social and environmental goals and many of these contain lessons that can be applied more broadly.

The MINDSPACE framework is a useful tool for breaking these examples down and understanding the ways in which they might be more broadly applicable.

5.1 Messenger

The use of trusted messengers outside the energy sector is well established. There is, for example, a growing trend for water companies to partner with charities and community groups to engage their customers in water conservation.

This is particularly important given public scepticism about the commitment of these companies to saving water and frustration with hosepipe bans.

Groundwork's Green Doctors approach, more commonly used to promote energy efficiency on a house-to-house basis, has been deployed by Southern Water to support their Universal Metering Programme. The main project objectives are to help customers understand why meters are being installed and offer advice and support to help them reduce their water use.

Since 2010, 33,000 Green Doctor home visits have taken place and 162 million litres of water have been saved through the installation of simple water saving measures. A linked programme of free 'benefit entitlement checks', which have to date secured an extra £1.8m in income for customers, provides further evidence that this programme is designed with customer's best interests at heart[127].

Similar programmes include Thames Water's 'Save Water Swindon' and 'Care for the Kennet' campaigns, both of which partner with environmental charity WWF and offer a free water-saving home makeover[128].

Public transport is another area where incumbent providers may not always be the most trusted sources of information and advice. In 2012/13 the Greener Journeys Behaviour Change Lab experimented with a range of methods for encouraging drivers to switch journeys to the bus. In Manchester, they used community groups as messengers, giving away free journey vouchers via a coalition of community radio stations. Evaluation demonstrated that 48 per cent of those vouchers were used to replace journeys that would otherwise have been by car and that 65 per cent of infrequent bus users then went on to use the bus again within a few weeks[129].

Another category where much work has been done to identify the most compelling messengers is in anti-smoking campaigns. When government found itself struggling to reduce smoking rates, one solution was to involve various parties, all with an interest in people stopping smoking and all capable of coming at the problem from a different angle yet able to advertise in and around the same time. Those parties were the British Heart Foundation (BHF), the NHS and Cancer Research UK. Each came at the problem with a unique advertising message. In combination, they created an additive and complementary effect, reflecting the fact that research had shown that 76 per cent of smokers need more than one reason to stop smoking. Evaluation of these campaigns showed that this new approach quadrupled the effectiveness of anti-smoking advertising[130][131].

Further afield, the messenger approach has been put to particularly imaginative use in the fight against AIDS. The DfID funded 'Get Braids not Aids' campaign in Zimbabwe seeks to increase awareness and use of female condoms through a particularly relevant cohort of messengers. Working with hairdressers,

and training them to introduce the topic into conversations with clients, the scheme ensures that the information is shared in a friendly and supportive environment where women feel able to talk freely. Via a network of 1,000 hairdressers 450,000 female condoms were sold[132] and a study amongst 400 hair salon clients found that women who had seen a female condom demonstration by a hairdresser were 2.5 times more likely to use the product than those who had not[133]. Since 2005, the scheme has been sponsored on an international basis by L'Oreal in partnership with UNESCO[134].

5.2 Incentives

Incentives are a complex area of behavioural intervention as straight 'bribes' can often crowd out intrinsic motivations, becoming counterproductive in the long term.

In the waste and recycling category, Recyclebank[37] is a model that has attracted considerable attention. Originating in the US, Recyclebank is a rewards scheme designed to increase recycling rates. In areas where the scheme is available, residents can register and receive points which are redeemable at (primarily local) retailers depending on how much waste they recycle, which is weighed at kerbside. This is delivered at a very low cost through negotiation of mutually beneficial deals with retailers.

Active in the UK since 2009, schemes in the Royal Borough of Windsor and Maidenhead and Halton Borough Council in Cheshire increased recycling rates by 8.8% and 9.1% year on year respectively in the boroughs in 2012, against a national average of 3.3%.

The weight of recycling collected by households has increased by 119kg in Windsor and Maidenhead and by 70kg in Halton. This compares to a national average of just 18kg[38]. In the US, where the programme now exists in every state, the model has been expanded to include other behaviours including reducing water use, working with brand partners such as Unilever.

This bears some similarities to the approach taken by IrnBru in Scotland to encourage the recycling of their glass bottles. Their deposit policy means that returning a bottle for re-use earns the consumer 30p, a scheme that has achieved considerable success with 70% of bottles being returned[135]. The Scottish government is considering making a similar scheme compulsory[136].

Another trial that took place in the US sought to test the effect of incentives in encouraging patients to get on to the right medication regime. Working with the Oklahoma Health Care Authority, behavioural economics consultancy ideas42 set up a programme designed to ensure that patients at risk of cardiac disease call their doctor and discuss a statins prescription. Those receiving only a basic letter served as a control group. A second group also received a $5 gift card with their letter. For a third group, the letter included a suite of behavioural nudges. A final group received both the gift card and the nudges. While all the interventions outperformed the control, interestingly the nudge method was more effective than the incentive alone or the nudge plus incentive[137].

Another area of health where incentives have been tested is in the fight against obesity. Building on the insight that losses tend to loom larger than gains, a study on weight loss asked a group of slimmers to deposit money in an account, which would only be returned to them if they met certain targets. After seven months, compared to a control group, which saw no change in weight, they achieved a significant weight loss[138].

5.3 Norms

Norms is one of the best-evidenced areas of the MINDSPACE framework, with examples of successful use of this approach coming from many categories of behaviour.

One area that does relate directly to energy is the 'Cool Biz' programme[124], launched in Japan in 2005 and expanded after the Fukushima disaster in 2011. Judged by the Sustainable Practices Research Group to be the most effective behaviour change initiative of any they had evaluated, the scheme was led by the government, who mobilised their role as an employer by not allowing any heating or cooling in its own buildings between 20 and 28 degrees, enrolled other businesses to follow suit and employed role models such as Ministers and Ambassadors as 'Fashion Models' to create new norms of acceptable business dress. In so doing they succeeded in redefining normal practice "such that it no longer involves a distinctly inefficient combination of suits, ties, jackets and extensive air-conditioning" in the words of Professor Elizabeth Shove[125].

The classic example of norms at work is in experiments around encouraging the re-use of hotel towels. A 2008 paper found that a generic appeal to 'save the environment' was (at 35%) less effective than a message about what most people do (at 46%) and that the most effective message of all was about what most people who stay in that exact room tend to do (at 54%)[139]. This demonstrates the power of personalisation within norms.

Similar findings have been demonstrated by the UK Government's Behavioural Insights Team in their work on charitable giving[140], showing that people are more likely to sign up to a legacy (and a larger amount) if they are told that others do the same. The BIT's work on tax returns conveyed a similar message, with an increase in on-time payments from 68% to 83%[141].

Norms are clearly one of the most widely applicable behavioural tools, spanning as far as tackling gang violence, where a project called the Cincinnati Initiative to Reduce Violence has successfully managed to get gang members to face up to the fact their behaviour is not considered normal by the wider community[142].

Social norms must be handled with care, however. Research exploring non-attendance at doctors appointments shows that communicating the time/money wasted through the non-attendance of others can actually make it seem more acceptable not to turn up, while showing that the vast majority do attend can achieve major improvements.

5.4 Defaults

Defaults can be a very effective tool, although the challenge in this case is that you can only change the default position in a process that you already control. When seeking to affect consumer behaviours in the 'real world', it is often the case that changing the choice architecture around key decisions is not possible or indeed that the behaviour in question is so habitual that no choice is actively being made anyway.

One area where defaults have been much discussed is in organ donation. The difference between countries where there is 'presumed consent' on organ donation, and countries where you have to actively opt in can be enormous[143]. In Germany, with an opt-in system, only 12% of citizens are registered as donors, whereas in neighbouring Austria, where there is an opt-out system, the figure is 99%[144]. The infrastructure that sits behind such systems is of course complex, with an opt-out system not necessarily ensuring a higher donation rate, but studies show that it is a significant factor, which saves lives.

Perhaps the most prominent example of defaults in use today is the innovation of auto-enrolment for workplace pensions in the UK, which started being introduced in 2012[82]. This builds on work done in the USA looking at behavioural responses to the retirement savings crisis[145]. At this regulatory level, it is debatable whether such an approach can truly be seen as a nudge though and the applications for voluntary behaviour change initiatives are not really apparent.

5.5 Salience

Salience strategies can be hard to pin down. Some of the most effective advertising works on the basis of salience, but this does not mean that all attempts to be salient are successful.

In behavioural terms, salience tends to be boiled down to a combination of relevance and novelty. The success of the most recent 'Fire Kills' campaign for example, which made people three times more likely to test their smoke alarm than before[146], was based on the idea of testing your smoke alarm at the same time as you change your clocks. This was a novel message that could be communicated strongly at a very specific time, enabling a reduced budget to go much further.

An example of a salience-led campaign that is often quoted is the 'Stalking Litter' approach adopted by Southwark Council. Using actors dressed in giant litter costumes, the public were directly engaged in litter related antics which they could not fail to miss, while at the same time building awareness of a new system of fixed penalty notices. While the programme was not formally evaluated, there is evidence to suggest that it contributed to a wider improvement in public perceptions of the cleanliness of Southwark's streets[147].

Another challenge with a salience-led approach is that a big salient reason to change behaviour at one moment may not necessarily follow on to longer-term change. In the evaluation of TfL's very successful work in changing travel behaviour during the Olympics, which led to 54% of commuters making changes to their journeys, the fact that a major event was taking place was clearly the dominant reason for doing so. It was the temporary conditions created by the Games that drove change and people were quick to revert to their previous habits once the Games were over. Any hopes that this moment might have provided an opportunity to sow the seeds for some of longer-term changes to travel behaviour TfL was seeking had to be quite quickly dismissed[83].

5.6 Priming

As priming is all about the subconscious, its successful use is very hard to demonstrate outside laboratory conditions. The classic example is the smell of baking bread as you enter the supermarket, designed to entice shoppers towards the in store bakery, although the science behind this is by no means well established [148].

The authors of Nudge describe an experiment where moviegoers were given a free bucket of (stale) popcorn. Those who were given a big bucket ate 53% more than those who were given a medium sized one, despite denying that the size of the bucket had any impact on their consumption[145]. On a more positive note, in school-based healthy eating experiments led by the same scientist, decreasing the size of bowls at breakfast reduced the average cereal serving by 24%[149].

Perhaps more usefully, it is suggested that people can also be 'primed' to behave in a more socially responsible way. By asking people to sign at the start of a form rather than the end when reporting how many miles they had driven on their car for insurance purposes, there was an increase in the total miles reported, despite a financial incentive to report less miles driven since reporting more would mean you would pay more[96].

5.7 Affect

The fact that many decisions are emotional is axiomatic. As with priming, however, designing interventions that exploit this truth can be challenging.

One programme that attempts to capitalise on this is WRAP's Love Food Hate Waste campaign to reduce food waste. By focusing on people's love of food, providing tips and recipes, the campaign avoids any

sense of finger-pointing or telling people what to do. A recent local campaign in West London (developed using the 6 Es and MINDSPACE models) was found to have achieved an overall decrease in avoidable food waste of 14% and a payback of £8 for every £1 spent on the initiative.

A harder-edged example comes from a set of behavioural interventions at a railway station at Mumbai designed to reduce deaths on the tracks (something which was claiming around a dozen lives a month). At the station itself, Behavioural Architects Final Mile[150] set up a three-panel photo of a rather alarmed man being gradually run over by a locomotive. This morbid frieze is positioned exactly at the two points where the temptation to cross is powerful, designed to subtly counter the flight response.

According to its creator, Satish Krishnamurthy, "It's intended to elicit an appropriate emotional memory. We look to faces to figure out situations, so his face is central. We repeated the image, because it catches the eye. And it has to be life-size, not larger than life, because it shouldn't intrude into the conscious. It should work at an unconscious level." Together with other interventions, this is claimed to have brought about a 70% reduction in deaths[151].

Another example of a campaign based on affect was an initiative to promote soap use in Ghana. Rather than focusing on the benefits of using soap, campaigners instead created a highly emotional approach designed to create feelings of contamination and disgust around toilet use. This approach was credited with a 13% increase in the use of soap after going to the toilet and a 41% increase before eating[152].

5.8 Commitment

Commitment is one of the more straightforward elements of the MINDSPACE framework to implement and successful examples of its use are relatively plentiful.

In one of their more controversial trials, the UK Government's Behavioural Insights Team worked with a Job Centre in Essex to introduce new processes designed to get job seekers back into work more quickly. In particular, they created a stretching commitment device, which ensured that the job seeker signed up to actively pursuing opportunities rather than just carrying out a minimum number of actions. This led to a 15-20% increase in likelihood of being off benefits after 13 weeks compared to a control group[107].

Smoking cessation is another area where commitments have been used to good effect. In one US trial, people were asked to deposit the money they would have spent on cigarettes in a savings account. After 6 months, they took a nicotine test and if they failed, their money was forfeited. This drove a 30% increase in successful smoking cessation after 12 months[153]. Contracts of various types supporting physical exercise and even parenting have also proved effective when trialled. Softer examples of commitments at work include asking people making doctors appointments or even booking restaurants to verbally repeat the time back (or even write it down themselves).

5.9 Ego

While easy to understand (when things go well in our lives, we attribute it to ourselves; when they go badly, it's the fault of other people) Ego is far from easy to implement.

One of the more striking examples of Ego in action is Australia's 'Dumb Ways to Die' campaign; another intervention aimed reducing deaths on the railway, in this case created by Melbourne's Metro Trains. With the help of a catchy song and quirky animated characters[116] the campaign targets youth, positioning death on the tracks as a 'dumb' thing to do akin to setting fire to your hair or poking a stick at a grizzly bear. In so doing, it also fights against the tendency to over-rate your own skills. The campaign has claimed a 30% reduction in near miss accidents, although its effectiveness has been contested[154]. Again in Australia, another attempt to exploit the possibilities of Ego involved an anti-

speeding campaign[155], which implied that driving too fast was a sign of male inadequacy[156]. On a more positive note, it has been argued that recognising positive behaviour may be an effective way of promoting its continuation, an approach commonly used in schools.

6 APPENDIX II - FOCUS ON LOW CARBON NETWORK FUND PROJECTS

6.1 Introduction

In order to encourage the UK Distribution Network Operators (DNOs) to use the regulatory period between 1 April 2010 to 31 March 2015 to try out new technology, operating and commercial arrangements, Ofgem established the Low Carbon Networks Fund (LCNF). The purpose of this fund is to provide money to pay for trials and demonstration projects to help DNOs understand what role they can play in facilitating the low carbon and energy saving initiatives that are underway to tackle climate change.

A key feature of the LCNF is the requirement that learning gained from projects can be disseminated, in order that customers gain significant return on their funding through the roll-out of successful trials and the subsequent network savings and/or carbon benefits. It is hoped that new projects in different network areas will use previous DNO trials as a starting point and benefit from the lessons learned in previous trials. To this end the SAVE project organised a lessons learned workshop and invited key project team members from other DNOs. This workshop and follow up meetings, phone calls and research forms the basis of this part of the review of customer engagement projects. The SAVE project seeks to investigate the possibility of encouraging distribution network connected customers to implement energy efficient technologies and behaviours in their homes that will lead to reduced or avoided network reinforcement cost. The project also seeks to provide an evaluation framework to assist other DNOs in the future to determine network and load growth characteristics that could be more cost effectively reduced by engaging with customers to lower energy consumption than dealt with through traditional network reinforcement.

In the future the DNOs may need to radically change the way they charge for access to their networks if customers, including domestic customers, change their patterns of use in response to smart metering and become customers and producers of electricity at different times of the day. DNOs' charges will need to reflect the costs (or cost savings) associated with very different patterns of use and encourage customers who have control over their demand to use more at times of the day when there is spare network capacity to avoid the need for expensive network investment in new capacity. Under the current regulatory framework electricity suppliers have the relationship with customers and DNO charges flow through the supplier as an add-on to an electricity customer's bill, which could limit the impact of DNO price initiatives if suppliers choose not to pass these prices on to customers.

In the future there may be conflicts between customer behaviour desired by DNOs and those of suppliers and in improve understanding of this topic the SAVE project is trialing incentives paid directly to customers to change behaviour at times of network constraint in order to reduce the future need for network upgrades. Such charges have not been trialled in previous projects however incentives have been paid at the beginning of trials to secure participation and there are learnings from these approaches. Previous LCNF projects have encountered brand recognition problems both for their own brand and for the project brand and this may hamper the success of payments to customers by the DNO. Changing the nature of the relationship that DNOs have with their customers may be key to realising some of the cost savings in a future lower carbon electricity sector.

6.2 LCNF Projects with relevant learning for SAVE

Four main LCNF projects have provided extensive learning about how to engage with domestic customers. Other projects have also engaged with customers but these have been mainly industrial and commercial customers and the learning from these projects are less relevant for SAVE. Projects such as

Electricity Northwest's Capacity to Customers, SP Energy Networks' Accelerating Renewable Connections, and WPD's Falcon project have provided learning about engagement with these larger customers. Engagement with domestic customers requires different approaches and therefore this report has focused on the following four projects outlined briefly below:

6.2.1 Customer-Led Network Revolution

The Customer-Led Network Revolution (CLNR) is a major collaborative project undertaken by Northern Powergrid, British Gas, Durham Energy Institute (Durham University) and EA Technology. Over a three-year period, the project is trialling smart-grid solutions on the electricity distribution network. The trials are being conducted through 22 'test cells', each testing different variables based on the low carbon technology installed, type of tariff, degree of monitoring, external 'control' over electricity usage, and customer demographics. Customers were recruited onto the trials using a variety of methods, including direct marketing campaigns, both opt-in and opt-out, as well as through developing partnerships with local communities and social landlords

6.2.2 Low Carbon London

Low Carbon London is a multi partner project, investigating the impact of a wide range of low carbon technologies on London's electricity distribution network. The project is also looking at how customer demand profiles can be influenced to support effective delivery of electricity. This report has looked principally at the smart meter trial which is monitoring the impact on the electricity network of thousands of customers using in-home displays linked to their smart meter to manage their electricity use. Over 5,800 EDF Energy customers in London are participating and about 19 per cent of these customers are taking part in the first British trial of day-ahead electricity prices. This dynamic time-of-use trial is testing whether day-ahead electricity prices via text or the in-home display could influence the demand for electricity.

6.2.3 My Electric Vehicle

My Electric Avenue is working with domestic and commercial customers, trialling an EV charge control system to balance out the charging cycles of EVs at times of network stress and deliver a cost-effective solution to DNOs that reduces the need for costly and disruptive electricity network reinforcement. This project entails significant customer engagement, as customers must be persuaded to lease EVs and participate in the trial in clusters that entails persuading neighbours to join the trial.

6.2.4 New Thames Valley Vision

New Thames Valley Vision (NTVV) is a large scale project that focuses on the low voltage networks aiming to develop a complete solution that will allow DNOs to anticipate, understand and support behaviour change in individuals, small businesses and larger companies to help them manage their networks more effectively. It involves engagement activities both with domestic and commercial customers in order to attract participants in the different planned trials. Also, a wider customer engagement activity around low carbon technologies (for both domestic and non-domestic) takes place through the advisory centre "Your energy maters" that has been set up for the purposes of this project.

6.3 LCNF projects viewed through the 6Es and MINDSPACE framework

These three LCNF projects have been reviewed through the MINDSPACE framework in order to extract key learnings that will be utilised in designing the approach that the SAVE project will take for engaging with customers.

6.3.1 Explore

LCL and CLNR commenced in 2011 in an environment where DNOs had not previously considered either categorising customers or engaging with them beyond the connection process. Both projects gave initial thought to customer categorisation in an attempt to produce statistically significant results but both projects were challenged to maintain this in the face of poor initial uptake rates. Targets for uptake were set as part of the project's Successful Delivery Reward Criteria that forms the basis for DNOs to continue with the projects and obtain incentives for successful project delivery. The combination of the desire to meet objectives for reputational reasons and financial incentive meant that some compromises were made.

In the first year of the LCNF when DNO experience of running innovation projects was more limited, the timescales allowed for detailed 'post-bid' scoping and planning were limited. A key learning from this process is that large-scale trials may also benefit from a degree of 'development-stage' flexibility – while detailed plans are worked-up and finalised. Revisions between bid stage and trial commencement when they lead to more successful projects should be seen as an important part of the trial process and these changes do not denote failure. The customer journey chart below from the CLNR project demonstrates the number of points at which the customer may drop out or become ineligible to participate. This demonstrates that the projects not only needed to secure initial interest from customers to participate but also needed to find ways to sustain this interest during the full recruitment process.

Leaflets/information sent to customers

Customer agrees to participate over phone

Customer welcome pack sent

Relevant tariff and technology ordered

Customer contacted to arrange installation

Technology is installed (low carbon technology, monitoring equipment, smart meter etc) or any problems with installation identified

Further appointments arranged

Any further technology installed

Tariff activated

Incentive vouchers issued

Data collection starts

◆ = Customer may drop out or become ineligible at this point

Figure 3: Customer recruitment and installation journey[157]

Partner objectives in undertaking the trial drive customer segmentation and this is a major learning. For example during the CLNR project, British Gas was keen to trial customer approaches that were very commercially viable, this did not necessarily meet the objectives of statistically robust trial design that the academic partner was looking for and may lead the final project results not providing a complete exploration of the total distribution network connected customer base.

6.3.2 Enable

My Electric Avenue provides a great deal of learning about how to overcome practical barriers. The project requires clusters of customers to agree to lease electric vehicles in order for SSEPD to evaluate the impact of electric vehicles on the low voltage networks. Practical barriers such as customer uncertainty about electric vehicle driving range had to be overcome through extensive engagement from both the project partners and the projects community champions.

As part of one trial in the New Thames Valley Vision project, energy management units were installed in households which were already fitted with solar PV. These units were intended to allow consumers to use the electricity output of their own solar PV cells to produce hot water, which can subsequently be stored. The customers received instruction on the most effective use of this system by means of a brochure, followed by a face-to-face meeting with an SSEPD customer manager and finally from the fitter who installed the system. This has been found to be an effective way of imparting this information to users and ensuring that this equipment is used in the most effective way possible.

6.3.3 Encourage

Messenger

In both LCL and CNLR the projects commenced with the view that a project brand that was separate to both the DNO brand and the project partner brands was necessary. This view emanated largely from a lack of experience amongst project staff of the length of time involved in building a successful brand. Concerns about using LCNF funding to enhance partner brands was also voiced and it is clear that this mistake came about from project teams' desire to appropriately represent the LCNF fund. Potential participants struggled to engage with these unknown project brands and it was discovered that electricity supplier brands that may be comparatively less trusted than popular consumer brands, were more trusted than the unknown project brands. Academic partners also provided a trusted brand that could be utilised. On My Electric Avenue the messenger was EA Technology but for the recruitment of the clusters, EA Technology trained local community members to recruit their neighbours. This was a deliberate strategy to enable trust. NTVV has formed a partnership with the local authority (Bracknell forest council) and used their logo to co-brand the materials that are sent to the customers. Again the main reason for including the local authority was to enable trust.

DNO staff have not traditionally needed customer engagement and recruitment skills since customers who wish to connect to the distribution network will contact DNOs without requiring the DNO to solicit for business. Current projects have not yet resolved the question of what might be the benefits of DNOs acquiring these skills and whether this will result in a more cost effective solution compared to the business as usual approach of suppliers leading customer interaction. In both CLNR and LCL the suppliers played and continue to play a large part in the customer relationship.

Incentives

All three projects have offered customers incentives to participate in trials and the use of incentives is a key learning for DNOs in the LCNF. Prior to the commencement of these projects, DNOs did not get involved with any payments to customers. Most of the incentives can be categorised as upfront incentives to join the trial such as CLNR's £50 Marks and Spencer's voucher or My Electric Avenue's discounted car leasing. TOU tariffs have been trialled in both CLNR and LCL. These can perhaps be viewed as disincentives as the larger tariffs during periods of peak demand, in the case of LCL a tariff of 67.2p a kWh unit, attempt to act as a disincentive to using electricity in these periods.

Norms

My Electric Avenue has utilised the fact that humans are strongly influenced by what others do in attempting to encourage clusters of customers to lease electric vehicles. Using community champions to spread the message has been particularly successful and this is driven by customers observing their friends and neighbours willingness to lease an electric vehicle and therefore being more open to it themselves.

Defaults

There is no evidence that LCNF projects have attempted to use that fact that humans tend to go with the flow and therefore no learning in this area.

Salience

The novel nature of electric vehicles has been both a barrier and an opportunity in the My Electric Avenue project. The project has sought to make the trialling of electric vehicles relevant to the community in terms of understanding the impact novel technologies will have on customers' lives. Understanding the potential challenges in electric vehicle charging.

Priming

There is no evidence that LCNF projects have attempted to use sub conscious clues to change behaviour and there is therefore no learning in this area.

Affect

There is no evidence that LCNF projects have attempted to use emotional associations that can powerfully shape customer actions.

Commitment

Commitment has not been trialled extensively in consumer engagement trials in the LCNF. This is possibly as a result of early difficulties in recruiting customers leading to a view that it is better not to ask too much of the customer and risk no participation. In the ToU trial that EDF Energy are undertaking as part of LCL, customers received an undertaking that if they pay more for electricity as a result of using too much electricity during the expensive high tariff period they would be reimbursed the difference.

Ego

To date LCNF projects have not deeply explored the psychological reasons for changing electricity consumption behaviour and ways in which this can be utilised to motivate desirable behaviour.

6.3.4 Engage

Public engagement has featured successfully in all three projects, LCL started their customer recruitment by engaging very heavily with community centres across the trial areas. This engagement was carried out in timeframes that was suited to the community, often outside business hours. All projects have found engaging directly with communities connected to the distribution network has been important for project success.

NTVV has undertaken a trial to evaluate the impact of wider customer engagement on low carbon activities. It organised a "Low carbon day" where residents in the Bracknell area were asked to reduce their electricity consumption for one hour to take action against the climate change. Ten thousand

leaflets were distributed to households, posters places around the city and in stores, a live music session took place in the central square of Bracknell, and a BBC radio announcement just before the event was also made. Commercial participants in the automated demand response trial also were asked to reduce their demand. The outcome of this trial was very positive as electricity peak demand was reduced by up to 3% in the Bracknell primary substation (peak demand was 33.5MW during that day).

6.3.5 Exemplify

The regulated nature of DNOs and the need to produce viable and cost effective business plans that focus on using existing assets productively ensures that future investment is carried out on a needs basis. This leaves very limited resources for investment in technologies or behavioural change programmes within the DNO organisation that could provide exemplifying behaviour. Notwithstanding this, all projects have attempted to exemplify the behaviour or actions for example by utilising EVs or allowing their own commercial buildings to participate in demand reduction projects. Due to the brand recognition challenges discussed above, it is difficult to evaluate the extent to which exemplifying behaviour has impacted on trial participants' willingness to participate and behavioural change.

For example, in NTVV, the customer manager used a bicycle to visit potential participants in a trial for hot thermal storage. This was well received by members of the target audience who felt this set an appropriate example of environmentally friendly behaviour.

6.3.6 Evaluate

Current LCNF projects have focused on evaluating the trial results in terms of quantitative metrics but have not devoted extensive resources to evaluating the engagement approach and how successful the approach was compared to potential alternatives.

7 APPENDIX III - PROJECT TEMPLATES

7.1 UK

7.1.1 LCNF Projects

7.1.1.1 My Electric Avenue

Overview	
Programme:	My Electric Avenue[158,159]
Country/region:	UK, in SSEPD or Northern Powergrid licence areas
Period covered:	January 2013 / ongoing (to end of December 2015)
Stakeholders	EA Technology Ltd, Scottish and Southern Energy Power Distribution (Project leads). Partners: Nissan, Fleetdrive Electric, Zero Carbon Futures Participating DNO: Northern Powergrid
Background:	Electric vehicles (EVs) are starting to become more commonplace on our streets, and 'clusters' of EV owners are already forming, placing more demand on the local electricity network. Forecasts suggest that there will be 1.6 million EVs on UK roads by 2020. My Electric Avenue is trialling the Esprit technology, developed by EA Technology, in order to provide essential learning about managing the strain on the electricity distribution network from the anticipated increased uptake of electric vehicles.
Aim of customer engagement activities:	Customer engagement is geared towards recruitment to both the Technical and Social trials. This was to make sure seven clusters of 10 are successfully recruited, and 100 participants in the Technical trials and 100 Social trial participants are recruited.
Sample size:	100 Technical trial participants and100 Social trial participants.
Explore	
Is there any customer categorisation in advance?	Participation in the trials was subject to availability and eligibility and this message was embedded within the trial offers. Participants have to pass several checks to make sure that they are eligible for the Technical trials. Those participating in the Social trials only had to pass financial checks. All participants have been recruited under the agreement that they consent to take part in research over the period of the trial, and in the case of the Technical trials, they consent to have their EV charging monitored and controlled.
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Technical trial participants were offered an 18 month lease of an EV (a Nissan LEAF) at a specially negotiated rate, a free EV charging point, with technology installed within the charging point to allow charging, monitoring and control. Social trial participants were also offered an 18 month lease of an EV (a Nissan LEAF) at a special rate, although this was not at the same reduced rate as the technical trials. No additional equipment is offered as part of the Social trials.
What practical and structural barriers are identified?	Recruitment numbers - to get the required number of people necessary for the technical trial was challenging.
What is done to alleviate the barriers?	A unique approach to customer engagement through the use of cluster champions and strong project partnership, together with a great 'hook' (the Nissan LEAF at a heavily subsidised monthly payment) has resulted in over 2,000 registrations of interest for the technical trials, with the end result that the project will achieve its recruitment targets on schedule.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	**Information:** **Cluster Champions**: The project's central contact - they are the

	volunteer initiators of the project on the ground who assures the dissemination of information as well as the recruitment of the cluster. **Incentives:** **Negotiated lease deals on EV:** To encourage customer participation, the Technical trials offered a 'group' deal; a very low rental price for a new EV for 18 months. Participants in the Social trial could lease an electric Nissan LEAF at a negotiated rate, but not at the same reduced rate as the technical trials. **Savings and benefits** Participants could save up to 85% on their monthly fuel bill, no petrol and diesel costs, low recharging costs, no road tax cost
How is the MINDSPACE applied in these methods?	**M:** Community champions **I:** The project offers financial and technical incentives: great rental rate on new EV, savings on the fuel bills (up to 85% savings), road tax and the environment. Free maintenance of the car. **N:** Project sought to encourage a local cluster/electric avenue to participate – community influence. **S:** The concept "my electric avenue" reflects the future. **P +A:** The project arranged EV Test drive during the customer engagement (P) which enabled people to experience a positive smooth and quiet EV drive (A). **C:** Commitment of 18 months was a very big part of the trial. **E:** The ego is applied in many ways; driving a new EV (luxury), feels good to be able to reduce driving bills, good self-image to participate in a technical trial helping to determine EV's future usage and at the same reducing impacts on the environment. The rest of the community can see the installation of charging points – it's a visual reinforcement.

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	**Campaign Website**: My Electric Avenue website includes all information about the project and partners, how to engage, downloads for your neighbours, newsletter service and videos. **Other web based tools:** Facebook, Twitter and LinkedIn (to spread the message) **Engaging events** - promote the project at as many industrial and local events as possible - customer engagement EV test drive events **Working closely with partners:** PR through networking and partnership. EA Technology utilised own networks and partners' to maximise coverage. **Videos:** The project has created several videos about the different stages of the project and feedback from participants. **Survey feedback:** When signing up for the trials, participants are required to commit to providing feedback on the project and their driving and charging habits.
Are these methods successful	Recruitment methods were hugely successful; utilising local contacts to engender trust and buy in. The project empowers local individuals – Cluster Champions to recruit 10 people in their neighbourhood, on the same low voltage network feeder.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	N/A

Evaluate (Quantitative and qualitative evidence)	

What methods are used to assess the impact of different approaches?	The project is still in recruitment stage and therefore no analysis has yet been undertaken.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Not yet analysed
Do different customers behave differently?	Not yet analysed
How impact varies over the longer term?	Not yet analysed
Summary (Key learnings and evaluation of the robustness of the study – our view)	
The key learning at this stage is centred on recruitment and engagement. The approach adopted by this project has been very successful, as the message has been distributed by local trusted individuals. Flexibility has been very important and it has also been important to work closely with Project partners and to ensure that the relationship is a true partnership.	

7.1.1.2   The Customer-Led Network Revolution (CLNR)

Overview	
Programme:	The Customer-Led Network Revolution (CLNR) Project[160,161,162,163]
Country/region:	UK, located in Northen Powergrid's distribution area in the North East and Yorkshire (major cities involved Durham, Leeds, Newcastle and Sheffield as well as more rural town)
Period covered:	The start date was January 2011 until September 2013, however Ofgem have given permission for the programme to run until June 2014
Stakeholders	Northern Powergrid (over all project leader), British Gas (Project delivery and responsible for customer recruitment), EA Technology (Consultant), Durham University Energy institute (Test cell design, data analysis and detailed evaluation of learning outcomes), Sustainability First and National Energy Action
Background:	The Customer-Led Network Revolution (CLNR) Project is the UK's biggest smart grid project and at the forefront of the move towards a low-carbon economy. Over a three-year period, Northern Powergrid and its partners will be trialling innovative smart grid solutions on the distribution network within the electricity grid as well as creating thousands of smart-enabled homes to give customers more choice and flexibility over the way they use and generate electricity. The CLNR project seeks to develop cost-effective solutions that will ensure the UK electricity network is fit for the future and able to cope with mass uptake of electricity dependent, low-carbon technologies, such as solar panels, electric vehicles and heat pumps. In addition, the project will explore commercial solutions, such as different pricing structures. This will help the electricity industry find the best way to keep down the cost of connecting customers to the grid and minimising the cost of meeting their electricity needs.
Aim of customer engagement	The aim of the customer engagement is to recruit volunteer customers (domestic and commercial) into 22 separate 'test cells'. Each test cell has a

activities:	number of different variables based on low carbon technology installed, type of tariff, degree of monitoring, external 'control' over electricity usage and demographics.
Sample size:	Over 10,000 domestic, around 2250 SMEs and over 200 industrial/ commercials

Explore	
Is there any customer categorisation in advance?	The 22 different trials will enable better understanding of how much electricity people use, when they use it and for what purpose, and whether financial or other incentives can encourage them to shift their usage away from periods of peak demand. In order to do this, the project actively study thousands of residential, commercial and industrial electricity customers and includes the following categorisation: • A group of around 10,000 domestic customers – the majority of these will be regular customers who do not have low-carbon technologies in their homes. However, subsets of this group will have one of the following low-carbon technologies installed in their homes: heat pumps, micro–CHP systems, photovoltaic panels or electric-vehicle charging points. For these customers, enhanced monitoring will be undertaken, including voltage and power quality measurements, as well as in-line monitoring of each low-carbon technology device. The following pages will focus on the recruitment of residential customers to the CLNR trial.

Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Smart-meter installation: Smart meters where installed in participants households. Though, many of the customers were already British Gas' existing smart meter customers. Other Low carbon technology installations: For some trials installations of other low carbon technology was required such as heat-pump, charging points for Electrical vehicles, solar panels and some white-goods (e.g smart washing machines) Enabling tools: A special campaign website, dedicated Facebook, Twitter and LinkedIn pages and "guide to our trial" booklet. Managing customer system - telephone help-line.
What practical and structural barriers are identified?	1) Installations; 'Ideal' technical solutions were not always available at the market, some homes needed to install special equipment in prior to the monitoring equipment hence delayed the installation of the monitoring equipment. 2) Recruitment to twenty of the project test-cells encountered some significant challenges which required considerable flexibility and ingenuity from the team in order to achieve its trial recruitment goals.
What is done to alleviate the barriers?	1) The project team had to 'create future technologies' out of materials that exist currently. Trial recruits seemed relatively open to accepting trial equipment in their homes, despite some inconvenience. 2) To achieve trial recruitment, the project required looking beyond British Gas's own customer base to populate some of the low carbon technology trials The important thing is to remain adaptable and innovate to deliver successful outcomes.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	**Information** **Northen Powergrid and the project partners support:** For any queries or concerns relating to the different phases of the project, participants could get personalised support from the partners via email (website) or via a telephone **help-line**. **Personal customer approach:** Personalised letters from British Gas, followed by telephone calls and further tailored information from Durham university.

	Face to face visits: personal advice during or after interviews. **"Guide to our trial" booklet** with relevant useful information for the participants about the different trials. **Incentives** **£100 incentive** to all test cells (apart from basic monitoring) paid in Marks & Spencer vouchers **Heat pumps and micro-CHP technologies subsidy** to encourage uptake, as a result of funding received from DECC.
How is the MINDSPACE applied in these methods?	**M:** Even though the main messenger was BG, the recruitment phase was in association with Durham University. The involvement of a well-known research institute gave the project credibility and trust in the eyes of many customers and encouraged them to be part of the trial. **I:** The project offered financial reward of £100 to participants and technical incentives would include installation of low carbon technology associated with subsidies.

Engage (Group interaction/feedback from customers)

What engaging activities take place?	**Customer recruitment journey:** British Gas (BG)was responsible for the recruitment, monitoring and installation of equipment. However, Durham university was the messenger for the direct customer conversation. In a first phase BG sent out leaflets and letters to their customers and other schemes which who they had linked up. Durham University followed up by telephone calls and customers who agreed to participate was sent a welcome pack (Guide to our trials booklet). Participants were contacted for arranging installation time for relevant technology (phase when some participants became no longer eligible for the trial due to technical reasons). The participants would receive "half" their incentive vouchers and start to being monitored (data collection). **Campaign Website and other web based tools:** **Communications materials**: These materials varied depending on the test cell with over 72 separate customer facing documents produced. **Direct marketing;** letters, email, leaflets, online surveys. **Events and community engagement** Community engagement has been conducted at a local representative level with organisations such as the councils.
Are these methods successful?	**The customer trial recruitment** drive concluded with impressive results with recruitment targets achieved in the majority of the 22 different trials. The team initially recruited 11,654 customers, of which 10,794 are 'net recruited' customers (those that have not dropped out or become ineligible for some reason). The most popular recruitment drive was for the Smart meter monitor trial and the Off-Peak Saver 3 Rate time-of-use tariff trial, which were both oversubscribed. **The telephone approach** (getting customers to initially agree over the phone to be on the trial) was broadly successful and both residential and SME customers have been motivated to respond to a web survey. **Direct marketing** was particularly successful (8-11% success rate for TOU and PV test cells compared to an industry average of 1-1.5%). **Communications materials** worked well, although the sheer number of these (72 different documents) was an administrative challenge, with each requiring Ofgem sign-off. **Difficulties :** - How to not influence the control households - ("Hawthorn Effect"). E.g "Some people turned off lights in house just before the visit " Significant **community engagement** was not feasible with the detailed plan timeline. Some **recruited customers dropped-out** or became no longer eligible for the trial. Moreover, the number of demographic groups and test cells made the **project complex to manage and administer.** Review and sign-off procedures by both Ofgem and the project partners slowed processes

	down. **Branding CLNR proved problematic.**
Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	N/A
Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	The Durham University's social science team is looking into the project's anthropological findings based on the results, gained from hundreds of interviews with a diverse cross section of residential and business electricity users. Sustainability First has reviewed the recruitment methodologies.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Messenger – Durham University proved to be an appropriate messenger. Incentives - The prospect of obtaining a smart meter appears to have been a strong incentive for TOU test-cell recruitment.
Do different customers behave differently?	Those customers who already had low carbon technologies installed were keen to know about how they could use them further/make more use of them. The project has noticed a difference between people's engagement and flexibility depending on lifestyles.
How impact varies over the longer term?	Durham University will evaluate the full trial results and findings in the end of the trial.
Summary (Key learnings and evaluation of the robustness of the study – our view)	
Project team had the flexibility to alter plans when test cell design was not working and had to formulate and adapt to alternative solutions to respond to the technological and market constraints that became apparent once recruitment began. Also, working closely with all partners was crucial to be able to deliver such a big and cross cutting project. The project team felt the timescales from the bid underestimated complexity of the initiation phase. The time assigned for project initiation did not allow for detailed pre-trial planning activity.	

7.1.1.3   Low Carbon London (LCL)

Overview	
Programme:	The Low Carbon London (LCL) Project[164,165,166,167,168]
Country/region:	UK, London electricity distribution network
Period covered:	The start date was January 2011 until December 2014.
Stakeholders	UKPN (over all project leader), EDF (Supplier), CGI(Consultant), Imperial College (Academic partner, data analysis and network models), Flexitricity, Enernoc (Aggregators), Siemens, Smarter Grid Solutions (technology provider) , GLA, National Grid, Sustainability First
Background:	Low Carbon London is a multi partner project, investigating the impact of a wide range of low carbon technologies on London's electricity distribution network. LCL is investigating how 'smart grid' technologies can be used to

	help meet the increased demand for electricity. The trials are preparing for a future where electric vehicles, smart meters and local generation are common place and where businesses and individuals can play an increasing role in reducing carbon emissions. Initially EDF customers were recruited on to the smart meter trial, later British Gas customers who already had meters were included in the trial.
Aim of customer engagement activities:	The aim of the customer engagement was to recruit volunteer customers to participate in trials.
Sample size:	Over 5,800 domestic, commercial customer participating in demand response and active network management, 77 residential and 66 commercial EVs.

Explore	
Is there any customer categorisation in advance?	Project initially aimed to undertake customer categorisation but the pressure of recruitment made this very difficult.

Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Smart-meter installation: Smart meters where installed in participants households. A project website Day ahead tariffs sent via text and IHD EDF used their existing call centre to handle customer queries.
What practical and structural barriers are identified?	Initially recruitment was attempted through community engagement under the banner of the project brand but this proved very difficult.
What is done to alleviate the barriers?	Eventually EDF undertook recruitment under their own more recognised brand and this helped to overcome the lack of brand recognition for the project brand.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	Information Community engagement: The project team made up of UKPN and EDF staff engaged through community centres at existing events. Customer approach: Personalised letters from EDF, followed by telephone calls and information from EDF's existing call centre both for recruitment to smart meter trial and subsequent ToU trial. Incentives £150 incentive to trial participants plus benefits from bill reduction if consumption took place in low price periods.
How is the MINDSPACE applied in these methods?	**M:** Project initially thought about messenger and decided to make project brand the messenger. However potential trial participants struggled to engage with the unknown project brand and it was discovered that electricity supplier brands were more trusted than the unknown project brands. **I:** The project offers financial reward of £150 to participants. ToU tariffs also offer the customer an opportunity to pay a reduced rate of electricity at times of low demand, however this is offset by a very high tariff at peak demand periods.

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	Customer recruitment - EDF was responsible for the recruitment, monitoring and installation of smart meters. The initial engagement activities under the LCL brand was carried out by a joint effort from UKPN and EDF. This involved attending community meetings and attempting to interest customers in participating in smart meter trials. Direct marketing – EDF took over the customer recruitment and sent letters to customers inviting them to participate. This was followed up by calls from the EDF's customer call centre.

	Website and other web based tools Communications materials
Are these methods successful?	The customer trial recruitment – initially not successful. Direct marketing was particularly successful and the project recruited 5,800 Communications materials were branded jointly as EDF and LCL and explained the background for the trial. ToU information was clear and well received. More than 1,000 project participants elected to participate in the ToU trials. Difficulties : Initial recruitment was challenging and project partners not fully aligned. Decision to develop separate project branding proved unsuccessful.

Exemplify

Does the organisation leading the project adopt the same behaviour that it suggests?	N/A

Evaluate (Quantitative and qualitative evidence)

What methods are used to assess the impact of different approaches?	Trials have not yet been fully evaluated however project has demonstrated success in ToU tariff trial recruitment with more than 17% of smart meter trial participants volunteering to participate.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Messenger – Initially LCL brand proved to be an unsuccessful messenger. EDF as a recognised though not necessarily a respected brand proved more successful. Incentives - £150 to participate – this incentive was needed to secure participation. Opportunity to reduce bills if consumption could be shifted to low price period. Any bill increase from consumption in higher price periods refunded.
Do different customers behave differently?	The challenges around recruitment have resulted in unrepresentative samples so evaluating comparative customer behaviour is problematic. ToU tariff trial is examining behaviour change around sharp price differentials. Low rate is 3.99p per kWh compared to high rate of 67.20p per kWh however, customers will be refunded any bill increase making behaviour difficult to assess.
How impact varies over the longer term?	Not yet evaluated.

Summary (Key learnings and evaluation of the robustness of the study – our view)
The projects commenced with the view that a project brand that was separate to both the DNO brand and the project partner brands was necessary. This view emanated largely from a lack of experience amongst project staff of the length of time involved in building a successful brand. Concerns about using LCNF funding to enhance partner brands was also voiced and it is clear that this mistake came about from project teams desire to appropriately represent the LCNF fund. Potential participants struggled to engage with these unknown project brands and it was discovered that electricity supplier brands that may be comparatively less trusted than popular consumer brands, were more trusted than the unknown project brands.

7.1.1.4　New Thames Valley Vision

Overview	
Programme:	New Thames Valley Vision[169]
Country/region:	Thames Valley Area (Primarily focused on Bracknell)
Period covered:	2012 -2017
Stakeholders	SSEPD, DNV GL, GE, Honeywell, EA Technology, University of Reading, Bracknell Forest Council
Background:	New Thames Valley Vision (NTVV) attempts to revolutionise the way in which Distribution Network Operators (DNOs) utilise their existing networks. This project aims to be complete solution that will allow DNOs to anticipate, understand and support behaviour change in individuals, small businesses and larger companies to help us manage their networks more effectively as the UK moves towards a low carbon economy. Building on the techniques developed for supermarket loyalty schemes, NTVV will use data intelligently to identify and predict network stress points in the short, medium and long term in order that DNOs can make more informed decisions.
Aim of customer engagement activities:	1. Customer recruitment for the installation of more than 250 end point monitors to keep track of the electricity consumption households 2. Customer recruitment for the Installation of up to 100 energy management units to domestic properties with PVs 3. Promotion and development of low carbon technologies to raise awareness around these and dissemination of network challenges
Sample size:	1. Approximately 20,000 households for the recruitment for the end point monitors 2. Approximately 250 households for the rest recruitment activities 3. The wider population in the Bracknell area for the promotion of low carbon technologies.
Explore	
Is there any customer categorisation in advance?	1. No 2. Only customers with PVs are targeted for the installation of energy management units. 3. No
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	1. A smart meter that is fitted in customers household 2. An energy management unit is offered to the households that have a PV that allows them to store electricity produced by their PV rather during network peaks than exporting their electricity to the network. 3. N/A
What practical and structural barriers are identified?	1. Many different practical difficulties in installing the technologies. As a rule of thumb, any type of moderately complicated device can be installed to approximately 70% of the households 2. The initial findings suggest that people have are not aware of the technology and how to use it
What is done to alleviate the barriers?	1. An initial assessment of compatibility takes place through a telephone interview 2. A face to face to demonstration of equipment helped customers to understand how to operate the device.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	• **Information** is provided to the customers that participate in the trials though receiving a newsletter every 6 months about the progress and results from the project • The equipment and installation costs for the energy management

	units are covered by the project allowing customers to take advantage of the potential **energy saving costs** that these units offer
How is the MINDSPACE applied in these methods?	**M**: All messages are delivered by co-branded leaflets/letter of SEPD and Bracknell Forest Council **I**: The necessary equipment is provided for free to the customers **N**: N/A **D**: N/A **S+P+A+E**: N/A **C**: Customers participating in trials sign an participation form providing consent to participate in the trial

Engage (Group interaction/feedback from customers)

What engaging activities take place?	• Group sessions are organised with people who have the end point monitors installed to explain them more about their electricity usage. • School talks are organised to communicate the challenges that electricity network systems face • During "Low carbon day" residents in the Bracknell area were asked to reduce their electricity consumption for one hour to take action against the climate change. Ten thousand leaflets were distributed to households, posters places around the city and in stores, a live music session took place in the central square of Bracknell, and a BBC radio announcement just before the event was also made. Commercial participants in the automated demand response trial also were asked to reduce their demand.
Are these methods successful?	• The feedback to the customers about their electricity use was very well received. • School talks were very successful and attracted the interest of young students • The outcome of the "Low carbon day" was very positive as electricity peak demand was reduced by up to 3% in the Bracknell primary substation (peak demand was 33.5MW during that day).

Exemplify

Does the organisation leading the project adopt the same behaviour that it suggests?	• A bicycle has been used by the customer manager when visiting households to recruit people for the trial related to the energy management units. Customers' reactions were very positive to the view of a representative of an organisation that is about to talk to them about how to reduce their carbon emissions also takes the effort to behave in environmentally friendly way • SEPD has installed solar PVs in their offices in Reading and present in a board, in the reception area, the amount of energy produced and the amount of carbon emissions saved

Evaluate (Quantitative and qualitative evidence)

What methods are used to assess the impact of different approaches?	Statistical analysis is being conducted by university of Reading aiming to develop customer categorisation to forecast electricity consumption rather than evaluate the impact of specific energy efficiency measures.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	N/A
Do different customers behave differently?	N/A

How impact varies over the longer term?	N/A

Summary (Key learnings and evaluation of the robustness of the study – our view)
Taking actions to exemplify environmentally friendly behaviour throughout the customer recruitment process is very well perceived by customers. Also customers seem to be inclined to change their behaviour to support their community to send a message for climate change, as shown by the "Low carbon day" event.

7.1.2 EDPR

Overview	
Programme:	Energy Demand Research Project (EDRP)[170]
Country/region:	UK.
Period covered:	2007 – 2010
Stakeholders	EDF Energy Customers Plc, E.ON UK Plc, Scottish Power Energy Retail Ltd and SSE Energy Supply Ltd
Background:	The Energy Demand Research Project (EDRP) was a major project in Great Britain to test consumers' responses to different forms of information about their energy use. Four energy suppliers conducted trials of the impacts of various interventions (individually or in combination) for both electricity and gas consumption. The interventions used were primarily directed at reducing domestic energy consumption, with a minority focused on shifting energy use from periods of peak demand. The project involved over 60,000 households, including 18,000 with smart meters. Measures were generally applied at household level but one supplier also tested action at community level.
Aim of customer engagement activities:	To obtain information about customer's energy use.
Sample size:	Over 60,000 households

Explore	

Is there any customer categorisation in advance?	In the trials each of the four suppliers applied different customer categorization. As a result, across all the trials there was limited evidence of how different population segments were affected by the interventions.
	1. EDF found clearly defined effects:
	    a. Smaller households are more likely to save energy overall and to shift consumption from the evening peak period;
	    b. There were differences between electricity-only and dual fuel customers, even though the explanation for that was not of easy definition.
	2. E.ON results varied according to different customer segmentation:
	    a. The customers selected because of their initial high consumption reduced their consumption whatever the intervention was. However this results was as expected, since consumer with high consumption have the highest potential of reducing their consumption;
	    b. There was a generally more positive response to interventions from 'fuel poor' customers rather than the 'not fuel poor' ones, which showed the greater motivation of the first category to save money.
	3. Scottish Power: this supplier made a more extensive investigation on prepayment customers. These customers did not make savings relative to the control group under any interventions.
	4. SSE found significant differences between customers based on:

	a. Postcode, only for electricity; b. Demographics, both for electricity and gas; c. Credit/prepayment customers.
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	There are three main tools used in the trials to investigate consumer behaviour and interaction: 1. Smart Meters. Two of the four EDRP trials (E.ON and SSE) provide the first evidence on the impact of installing a smart meter without any other scheduled interventions, showing that some aspect of the experience of getting a smart meter can itself prompt a reduction in energy consumption, particularly gas consumption (savings of around 3%). The clearer effect for gas consumption makes sense in the context that simple one-off changes (e.g. reducing a thermostat setting) can have big effects on gas demand. Moreover, it was clear that explaining to the customer what the new tool installed can do had much more impact on consumption compared with the experiment of presenting the new installation as a routine meter replacement. 2. Real Time Displays (RTD) devices. The trials showed modest (but persistent) savings from RTD provided with smart meters, which were around 2%-3% for electricity. For gas the results were less clear and households tend to pay less attention to the display of gas information than the display of electricity information. Moreover, Displays of CO_2 emissions were generally not widely noticed or used or perceived as useful. 3. Heating Controller integrated with RTD. Only the EDF trial studied the impact of the installation of a RTD with integral heating controller. The results show that this did not have any effect on electricity consumption (the change in gas consumption could not be analysed). However, customer surveys showed a positive response to the intervention, as measured by awareness of the device, perceived usefulness and overall rating. This discrepancy between customer response and actual behaviour would need further analysis.
What practical and structural barriers are identified?	1. Using one size of smart meter technology does not fit all households. Different geographical locations experience different signal strengths which can affect the ability of the meter to send or receive information. 2. Delivering the trials has demanded a range of different skills from the suppliers (technical skills, as well as safety, legacy and softer skills which are essential to clearly explain to customers the new technology which is being installed). 3. Gaining access to properties proved challenging. 4. Customer interaction with the smart metering equipment.
What is done to alleviate the barriers?	Little information is available on this subject.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	The motivational factors used in the EDRP project were: (i) Energy efficiency information and advice: mainly on paper but also via the web, a dedicated TV-based web page and RTDs (EDF trials). The EDRP findings are that the effect of energy efficiency advice was not always seen and, when it was seen, the reduction in annual consumption was up to 5%. (ii) Additional information on past consumption, including graphs with bills. Like for the factor above, EDRP findings are that the effect of the additional information on past consumption was not always seen and, when it was seen, the reduction in annual consumption was up to 5%. (iii) Benchmarking (comparing customer's consumption against the consumption of comparable households). Only the SSE trial used

benchmarking (without smart meters or Real Time Displays). There was a small but significant effect on electricity consumption, comparing the trial group with advice, historic feedback and benchmarking information with the most similar group (which had the advice and historic feedback but not benchmarking information). The additional savings attributable to benchmarking were 1%.

(iv) Customer engagement using commitment to reduce consumption. There was no detectable effect of this factor on consumption.

(v) Time of Use Tariff/Incentive. EDPR trials EDRP did not provide convincing evidence of an overall reduction in demand coming from this measure. However, effect on load shifting was registered in EDF and SSE trials, both of which showed a stronger load-shifting effect at weekends than on weekdays. Estimates of the magnitude of shifting effect vary with trials but were up to 10%.

(vi) Incentives to reduce consumption. 3 out of the 4 suppliers used this measure (E.ON did not) but only Scottish Power registered reductions in consumption, but only for credit customers and only for short periods.

How is the MINDSPACE applied in these methods?	**M:** the four energy suppliers which conducted the trials (EDF, E.ON, SP and SSE) **I:** Incentives to reduce consumptions. 1.　　EDF: a.　　Reward for year-on-year reduction in consumption, provided as Nectar points (typical value of £1 per 200 points). The year-on-year reduction in energy use was rewarded with 1000 points per fuel. In addition, 250 points were offered per fuel per quarter for providing meter readings online (200 points for phoning in readings). b.　　Time of Use Tariff (TOU) was used to incentivise shift from peak period consumption.　The TOU tariff intervention was based on electricity tariffs varying with time of day. The peak period was 16:30-19:30, night period was 23:00-06:00 and off-peak period was 06:00-16:30 and 19:30-23:00 (the same times for both GMT and BST). The peak tariff was 161-169% of the off-peak tariff and the night tariff was 56-65%, depending on region. The off-peak tariff was between 8.41 and 9.03 pence per unit (excluding VAT). 2.　　E.ON: None. 3.　　SP: this supplier introduced a financial incentive scheme, called "Green Challenge", to reduce consumption in addition to the existing interventions in each of the trial group. This scheme was spread over four waves which combined three elements: a.　　Incentive to reduce consumption: reward for quarter-on-quarter reduction in electricity consumption. b.　　Time of use: incentive to shift from peak period electricity consumption c.　　Customer engagement: pledge to reduce gas consumption. Wave 1 (Nov 08 - Jan 09): £10 voucher for using less electricity than quarterly target, £5 for just missing. Wave 2 (Feb - May 09). Main challenge was a £10 voucher for using less electricity than predicted. £5 to reduce peak time (early evening) consumption. Wave 3 (Aug - Nov 09). Pre-challenge letter to non-smart meter trials to encourage use of RTD. Letter about customer's average monthly spend in Jan-Jun 09. Main challenge was a £10 voucher for using less electricity than target. Gas Savings Pledge introduced "to make customers take action on their gas use in advance of the winter months approaching". The pledge was to: make regular checks on hot water and heating timer, adjusting according to "seasonality"; switch off boiler if away (only if there was no risk of "adverse temperatures"); and take a Scottish Power energy efficiency survey. Those who made the pledge were entered into a prize draw for a £500

voucher (with five £100 prizes for runners up), to purchase "low energy rated goods". The response rate to the pledge was 20%, which was said to be high for a Scottish Power mailing programme. Wave 4 (Nov 09 - Jan 10). Main challenge was a £10 voucher for using less electricity than target, "noting that anyone with two or three challenges worth of sustained reduction in energy use would find the fourth challenge the toughest yet". Customers also sent a free thermometer and information on how to use it to save energy.

4. SSE:

a. Reward of 5% of the bill (equivalent to the amount of VAT paid) for a 10% year-on-year reduction in consumption (incentive applied to electricity consumption only).

b. Time of Use Tariff (TOU) was used to incentivise shift from peak period consumption. The incentive to shift intervention was based on electricity tariffs varying with time of day, season and day of the week (weekday vs weekend). The peak period was 16:00-19:00, night period was 00:30-07:30 and off-peak period was 07:30-16:00 and 19:00-00:30. Low Season was March-October and the off-peak tariff was between 10.29 and 10.88 pence per unit (excluding VAT), varying with region. The peak tariff was 180-190% of the off-peak tariff (for both weekdays and weekends) and the night tariff was 50-60%. High Season was November-February and the off-peak tariff was between 10.87 and 11.46 pence per unit. The peak tariff was 180% of the off-peak tariff at weekends and 210% on weekdays; the night tariff was 50-60%.

N: "Benchmarking". Only SSE included benchmarking in its trial. There was a small but significant effect on electricity consumption, comparing the trial group with advice, historic feedback and benchmarking information with the most similar group (which had the advice and historic feedback but not benchmarking information).

D: N/A

S+P+A+E: energy efficiency advices, historic energy consumption information (such as comparison of energy consumption with earlier periods) and other digital media for delivering information (web, TV) shaped actions and attention of the customers involved in the trials.

C: Customer engagement using targets which commit the customer to reduce consumption was introduced by the four suppliers as following:

a. EDF: customer reads meters and provides the readings to EDF.

b. E.ON: monthly request for customer to read meters and provide the reading to E.ON, so that E.ON could provide accurate bills

c. Scottish Power: included a three-month period in which customers were invited to make a pledge to reduce gas consumption. This applied to prepayment customers with non-smart meters and credit customers with smart meters, who simultaneously had other interventions (principally financial incentives to reduce electricity use and an RTD), so the impact of the pledge cannot independently be evaluated. There was no significant effect of the package of interventions on gas or electricity consumption.

d. SSE: Benchmarking (see above).

Engage (Group interaction/feedback from customers)

| What engaging activities take place? | The activities used by the four suppliers to get feedback from the customers was as follow:
1. EDF:
a. a dedicated TV-based web page
b. Surveys; EDF carried out two main customer surveys (both by telephone): during recruitment (therefore covering the whole sample) and at the end of the trial, where EDF collected data from the majority of participants. The scope of this last survey was restricted as a result of the priority of achieving a high response rate. Focus was put on understanding change in consumer behaviour and/or energy use. |

	2. E.ON: Surveys; E.ON collected a considerable amount of data through telephone surveys. Questions were chosen to be analysed where further investigations could usefully add to those analyses already undertaken by the energy supplier and reported on elsewhere. Moreover, focus was put on understanding change in consumer behaviour and/or energy use
	3. SP: this supplier carried out three main surveys referred to as survey Waves 1, 2 and 3. Each had a similar content except where questions were changed to reflect the different interventions that were in effect at each stage. All three main surveys were a mix of face-to-face and telephone interviews.
	4. SSE:
	    a. Dedicated web site;
	    b. Surveys; this supplier carried out two surveys at the start of the trial (self-completion questionnaires, posted to all households when they joined the trial). Initially, completion of the questionnaire was required but this was abandoned because it was a barrier to recruitment. The part-completed questionnaire was returned by around 4,000 households. In addition, the company conducted 420 face-to-face interviews. Early in the trial, SSE also carried out two surveys focusing on specific interventions (telephone surveys). Finally, during the latter stages of the trial, SSE commissioned 8 group discussions, 24 depth interviews and 1186 telephone interviews to gather data on how households had responded to the interventions.

Are these methods successful?	N/A

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<tr><td colspan="2">Exemplify</td></tr>
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Does the organisation leading the project adopt the same behaviour that it suggests?	N/A

<table>
<tr><td colspan="2">Evaluate (Quantitative and qualitative evidence)</td></tr>
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What methods are used to assess the impact of different approaches?	The methods used by AECOM to assess the impact of the measures introduced by the four suppliers on consumer consumption was as follow :
	1. EDF:
	    a. Rather than use arbitrary methods to exclude households from the analyses, AECOM overcame this by using the non-parametric Mann-Whitney U test to test differences between groups, and reporting median consumption and changes in consumption
	    b. To analyse impact of Time of Use Tariff, AECOM applied an econometric analysis to analyse the impact on consumption of key drivers like the electricity distribution area, type of heating, number of people in the household, etc.
	2. E.ON: similar for EDF, AECOM overcame used the non-parametric Mann-Whitney U test to test differences between groups, and reporting median consumption and changes in consumption for the data coming from this supplier.
	3. SP: the analysis by Scottish Power used the ratio of consumption in the trial period to consumption in the same months in the pre-trial period whereas other suppliers used the difference in consumption between periods. Outliers were excluded by AECOM using the same approach as Scottish Power, i.e. changes greater than 50% between pre-trial and in-trial period were excluded. Initial examination of the resulting distributions of the changes in corrected energy consumption showed that they were sufficiently close to a normal distribution

4.   SSE: this supplier used weather-adjusted and time-corrected electricity and gas consumption data to take account of weather variations, both between years and for different days within a given year. A factorial analysis was undertaken to investigate further the effects of the different components of the smart meter interventions. The dependent variable was the change in consumption (pre-trial to in-trial) for each household. A number of "regressors" variables were added to the model to account for variability in the response due to factors other than the four interventions, like region within England, Scotland or Wales, postcode, grid supply point, fuel type, awareness of the trial, ecc.

| What is the impact of particular behaviour change effects relating to elements of MINDSPACE? | The implementation of the MINDSPACE framework used in the EDRP project gave the following results, which also shows difference between smart meter and non-smart meter interventions:
M: Not applicable, since the trials conducted by the four suppliers were applied in different zones.
I: Incentives to reduce consumptions.
1.   EDF:
    a.   Reward for year-on-year reduction in consumption:
        i.   Non-Smart Meter interventions: no baseline data were available and other data issues were identified, meaning that no clear conclusion could be drawn as to its effectiveness.
        ii.   Smart Meter interventions: no incentives used
    b.   Time of Use Tariff (TOU): at weekends, there was a significant overall reduction in the percentage of consumption that occurred in the peak tariff period (relative peak time consumption in TOU was 92% of that in control Panel). On weekdays, the load-shifting effect was similar but weaker (relative peak time consumption in TOUT was 96% of that in control Panel).
2.   E.ON: None
3.   SP:
    a.   "Green Challenge":
        i.   Non-Smart Meter interventions: none of the trial groups made significant gas or electricity savings in response to the various financial incentives.
        ii.   Smart Meter interventions: there was a temporary effect of the three Waves that focused on electricity consumption (without an additional gas-related incentive).
    b.   Time of Use Tariff (TOU): this supplier was the only one applying such a measure to non-smart meter groups; however, the trial design did not allow analysis of any independent effect of the incentive to reduce peak time consumption because the modest (£5) incentive to reduce peak time consumption over a three-month period was applied at the same time as a £10 incentive to reduce overall consumption.
4.   SSE:
    a.   Reward of 5% of the bill for a 10% year-on-year reduction in consumption:
        i.   Non-Smart Meter interventions: no incentives used.
        ii.   Smart Meter interventions: there was no significant effect of the incentive to reduce on electricity consumption.
    b.   Time of Use Tariff (TOU): Electricity consumption was higher at night in high season for customers on the incentive. The percentage shift from peak to night electricity usage is estimated as 8.5-10.1%, based on high season consumption at night (overall shift from peak is not estimated). Even though the incentives applied only to electricity, gas consumption was also higher at night in high season for customers on both the incentive to shift and incentive to reduce. The percentage of electricity consumption that falls in the peak period is reduced by a smaller amount – from 19.8% to 19.5% on weekdays and from 19.4% to 18.9% at |

weekends.

N: "Benchmarking". As mentioned before, only SSE included benchmarking in its trial. The additional savings attributable to benchmarking were 1%. The same comparison for gas consumption did not show a significant effect.

D: N/A

S+P+A+E: N/A

C: SSE: Benchmarking (see above).

The interventions had the following impact over the long (i.e. two years) term:

a.   Energy efficiency advice (paper/TV web-based)

1.   EDF: In the Paper group, the reduction in electricity demand remained significant in the second in-trial year, for dual fuel customers (2.4% saving) and both customer types combined (4.0% saving), and became significant for electricity-only customers (5.0% saving).

2.   E.ON: reductions in gas consumption persisted to in-trial year 1 plus 1 quarter and, in some cases to in-trial year 1 plus 2 quarters. The only effect that persisted through to in-trial year 1 plus 3 quarters was in the "smart meter, monthly bills and energy advice" group for Fuel Poor customers.

3.   SP: not analysed.

4.   SSE: not analysed.

b.   Historic Feedback

1.   EDF: In the EDF Paper group, the reduction in electricity demand remained significant in the second in-trial year, for dual fuel customers (2.4% saving) and both customer types combined (4.0% saving), and became significant for electricity-only customers (5.0% saving)

2.   E.ON: not analysed.

3.   SP: not analysed.

4.   SSE: not analysed.

c.   Benchmarking

1.   EDF: N/A.

2.   E.ON: N/A.

3.   SP: N/A.

4.   SSE: The persistence of the benchmarking effect could not be investigated because the in-trial period did not extend to a second year.

d.   Customer engagement using commitment to reduce consumption

For all suppliers: The persistence of any commitment effect could not be investigated because the in-trial period did not extend to a second year.

e.   Smart meters

1.   EDF: not analysed.

2.   E.ON: Reductions in gas consumption in the E.ON trial persisted to the first quarter of the second in-trial year (i.e. for 15 months) and for one or two further quarters in some groups.

3.   SP: not analysed.

4.   SSE: not analysed.

f.   Real-time display devices

1.   EDF: The reduction in demand remained significant in the second year, for electricity-only customers (11.0% saving) and marginally significant for both customer types combined (5.8% saving). It remained non-significant for dual fuel customers.

2.   E.ON: The significant reductions in consumption persisted through to in-trial year 1 plus 3 quarters. In the Fuel Poor groups, savings if anything increased over time. Reductions in gas consumption were not as persistent and groups with Real Time Displays did not show any greater persistence than the others

3.   SP: not analysed.

	4. SSE: not analysed.
	g. Heating controller integrated with real-time display devices
	1. EDF: As already mentioned, only this supplier tested the heating controller (HEC) intervention; however, a second full year of in-trial data was not available for enough households to test for longer term effects in this group.
	2. E.ON: N/A
	3. SP: N/A
	4. SSE: N/A
	h. Time of use tariff/incentive
	1. EDF: observed trends over time show that any initial effect on overall consumption is eroded over the first few quarters.
	2. E.ON: N/A
	3. SP: not analysed.
	4. SSE: there were no initial effects and the time-course beyond the first year could not be tested.
	i. Incentive to reduce consumption
	1. EDF: No available data to test the persistence of the observed effects.
	2. E.ON: N/A
	3. SP: No available data to test the persistence of the observed effects.
	4. SSE: No available data to test the persistence of the observed effects.
	j. Web-based interventions
	1. EDF: The observed trends show little variation in electricity consumption but the general trend is upwards.
	2. E.ON: N/A
	3. SP: N/A.
	4. SSE: not analysed.
Do different customers behave differently?	N/A
How impact varies over the longer term?	N/A

Summary (Key learnings and evaluation of the robustness of the study – our view)
Across all the interventions, there was scope for more households to have become and remained aware of the information or technology provided, and to have engaged with it on a regular basis. Hence, there is potential for greater impact on consumption – with or without smart meters. Moreover, the trial group members showed big discrepancies in electricity consumption during the pre-trial period, which means that the creation of the control groups was not as 'robust ' as initially thought.
Nevertheless, it is in DNV GL view that the trials conducted by E.ON are informative because they show the impact of different measures on behavioural change in a comprehensive representation of customers groups in different meteorological conditions. Furthermore, the size of the households involved (around 29,000) is a statistically very robust sample.

7.1.3 EcoTeams

Overview	
Programme:	EcoTeams[171]
Country/region:	National (in partnership with 36 organisations across the UK, primarily in South East, South West and Nottingham[172]). Initially pioneered in Holland[173].
Period covered:	2005-2008
Stakeholders	Global Action Plan, Defra (Environmental Action Fund)
Background:	EcoTeams are small groups of households (6-8 people) who meet once a

	month for approximately five months. The aim is to encourage and enable them to adopt greener lifestyles through making small but significant improvements across a range of consumption activities including energy use, transport, water, waste and shopping. The scheme operates at a community level through education, training and support, and gives practical advice and ideas on how to improve household efficiency, reduce environmental impact and save resources. The programme collects before- and after- data that measures actual behaviour change rather than just increased awareness[174].
Aim of customer engagement activities:	The programme includes specific objectives around changing: • Energy use (e.g. cfls, switching off, buying efficient appliances) • Waste and recycling behaviour (e.g. recycling, composting) • Shopping behaviour (e.g. seasonal, local, packaging, plastic bags) • Transport behaviour (e.g. reducing short car trips, using public transport more) • Water use (e.g. installing water saving devices, water butts)
Sample size:	3600 households

Explore	
Is there any customer categorisation in advance?	The project set out to test EcoTeams in five diverse communities and to evaluate the effectiveness in delivering pro-environmental behaviour change through these different channels: • Low income communities including housing associations • Communities of employees (local authorities and companies) • Communities of interest (non-governmental organisations and faith groups) • Communities of influence (journalists) • Geographical communities (local authorities) There was no attempt to segment within these communities.

Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	No technical or physical interventions are offered to participants, although as part of the scheme they are required to weigh their household rubbish and recycling and record their energy and water consumption.
What practical and structural barriers are identified?	These measurements were collected on paper forms which were manually processed, very time consuming and prone to inconsistency.
What is done to alleviate the barriers?	An online system was introduced that allowed household measurement data to be input directly, with database algorithms enabling more sophisticated analysis, including seasonal adjustment for heating energy. The database automatically produces a tailored feedback report for each household, and can also be used for higher-level reporting on aggregate environmental savings.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	EcoTeams operates on a collective, rather than a personalised basis so there are no specific interactions aimed at the individual. However, the behaviours that are promoted do take place on a personal/household basis (and the 'Mindspace' methods have been assessed on this assumption).
How is the MINDSPACE applied in these methods?	Messenger: There are three aspects at play here. Information is provided by Global Action Plan, an independent charity, it is mediated by a volunteer who is 'someone like me' and the process is sponsored by a trusted local agency (often a community group, RSL etc.) Incentives: Collective achievements are celebrated in the final meeting Norms: This is the most significant Mindspace element in use with EcoTeams, with a team working together for a length of time, all towards a goal agreed by the team and often represented by a visible sign.

	Defaults: A suggested list of actions is presented to participants on the assumption that they will be adopted, starting with small steps and building up to greater changes.
	Salience: n/a
	Priming: Group dynamics, and the behaviour of others has the potential to be an important priming process, as is the step of participants ticking off actions they already do, thus priming them as 'people who do things that are good for the environment'.
	Affect: Group membership allows participants to invest emotionally in the process. Images/language used in materials are designed to be positive in tone.
	Commitment: Each meeting ends with participants stating what actions they will do during the month ahead. In some cases this includes group members agreeing to undertake tasks for other members, e.g. pumping up tyres, bulk-buying. The next meeting starts by reviewing actions.
	Ego: Group activity fulfils a social need. For some people this is through leading a team, for others it is sharing information, whilst for others it is by providing hospitality.

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	EcoTeams are groups formed of approximately six people who each represent their household. They meet once a month for five months, and are provided with a set of resources to enable them to carry out topic meetings where they address the issues of waste and shopping, energy, transport and water. With the help of these materials and their facilitators, participants discuss the issues and map out practical actions they can make to reduce their impact in each area. They are encouraged to share their experiences, local knowledge and ideas on the environmental action they could take, and to support each other in making further changes to their household's behaviours.
	EcoTeams participants complete a before and after survey of their attitudes and behaviours.
Are these methods successful?	The team support element is appears to be key to the success of EcoTeams. Mixing with like-minded people provides participants with a sense that others live in a similar way and they are not alone in making further changes towards a greener lifestyle. The element of social pressure provided by the team aspect is also significant. The withdrawal of support at the end of the project was mentioned by some as a problem.
	There is evidence to suggest that this method was only effective with middle-income participants who had a pre-existing interest in sustainable living. Trials with low-income households proved far more challenging and a different (more intensive and heavily facilitated) approach had to be developed for this group.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	A variety of different organisations (from housing associations to councils and employers and even the BBC) sponsored the project. Having opted in they were by definition supportive but there is no evidence available as to whether this had any impact on the views of the participants. Interestingly, evaluation shows that the group leaders/facilitators tended to have lower environmental footprints than participants based on their initial measurements so there may have been some exemplification taking place in this way.

Evaluate (Quantitative and qualitative evidence)	

What methods are used to assess the impact of different approaches?	Quantitative behavioural impacts (measurements of waste/water/energy consumption - GAP database) Quantitative survey (self reporting of behaviour and attitudes pre- and post-, developed by New Economics Foundation) Project evaluation (focus groups and depth interviews and further analysis conducted by the University of East Anglia as part of a Defra funded evaluation)
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Evaluation does not allow the attribution of individual impacts to different elements of Mindspace although it would be reasonable to assume that 'Norms' is the single biggest influencer given the group process used. Key quantitative impacts: • Households reduced their electricity consumption by an average of 5%. • Households reduced their gas/ heating energy consumption by an average of 18% (seasonally adjusted figures). • Households reduced their waste to landfill by an average of 19%. • Households increased their recycling by an average of 5%. • Households reduced their water use by an average of 11%. Key survey findings. Attitudes: • 94% reported that they were doing more to reduce environmental impact than before, and were 'likely' or 'very likely' to maintain the changes they implemented during EcoTeams. • 89% rated their understanding of their household's impact on the environment as 'high' or 'very high'. • 83% stated that they feel confident talking to other people about environmental issues and 84% would recommend EcoTeams to people they know. • 81% rated the EcoTeams meetings as 'effective' or 'very effective' in encouraging them to make small, but significant, changes in their lifestyle. Reported behaviours (energy specifically): • 30-50% of participants most commonly: switch to energy saving light bulbs, increase diligence in switching off appliances, generally make more of an effort to use less energy. Some make investments such as buying energy efficient appliances. Wider evaluation (UEA): • Evidence that a semi facilitated delivery model using volunteer team leaders who were recruited through a sponsoring organisation was the most effective (and cost effective) delivery method. • A major challenge is that the project tends to appeal only to the already 'converted'. While significant behaviour change is still possible among this group, it has proved harder to promote the scheme to those who are not already committed to green living.
Do different customers behave differently?	There was very little difference in impact across the different community types who were targeted for this activity. However, as mentioned above, where a local community of interest was more actively involved, this had benefits for the overall effectiveness of the process.
How impact varies over the longer term?	The only data available here is self reported in the survey but 100% of EcoTeams participants reported that they were still carrying out the pro-environmental actions started through EcoTeams, over 6 months to 2 years since finishing the programme. Some said they were doing more. Those respondents to the survey who finished the programme up to two years ago are now engaged in more pro-environmental actions than those who just finished in the last year.
Summary (Key learnings and evaluation of the robustness of the study – our view)	
Learning from EcoTeams suggests that a comprehensive approach, tackling a series of related	

'green behaviours' over a 5 month period can have a real long term benefit. The case is valuable as it includes actual measurement of consumption/use (albeit collected by the householder and hence not entirely reliable perhaps) as well as survey data.

The evidence for long-term change is also more compelling than in other cases. The challenge with applying learnings from this project on a broader basis is that the project only appeared to appeal to those who already intended to live more sustainably and problems were encountered when harder to reach groups were targeted. The mainstream applications of this group-based approach are therefore uncertain.

7.1.4 Gentoo Retrofit

Overview	
Programme:	Gentoo Retrofit: Retrofit Reality, PAYS, The Energy Saving Bundle
Country/region:	Sunderland
Period covered:	2008-2011
Stakeholders	Gentoo Group (lead), DECC, Energy Saving Trust
Background:	Gentoo is a social housing provider with 29,000 properties and 70,000 residents. Having met the Decent Homes Standard five years ahead of schedule, in 2007 they set their sights on improving the sustainability/energy efficiency of the properties they owned. They executed this via a series of retrofit pilot projects, which tied in with the evolving policy landscape, and the development of the Green Deal. These projects are viewed by Gentoo as part of a learning 'journey'. The projects covered a number of retrofit measures including boilers, glazing, insulation and PV. There was also major ongoing emphasis on engaging with residents and changing their behaviour.
Aim of customer engagement activities:	Retrofit Reality: exploring how to make retrofits 'people friendly' PAYS: investigating if customers are prepared to pay a contribution towards cost of energy efficient measures The Energy Saving Bundle: testing the Green Deal model across whole neighbourhoods.
Sample size:	Retrofit Reality: 139 homes[175] PAYS: 119 homes[176] The Energy Saving Bundle: 1200 homes[177]
Explore	
Is there any customer categorisation in advance?	All customers are in social housing and a number are fuel poor/on benefits. To begin with, categorisation was based solely on property type and retrofit measures required. More recently, some attitudinal targeting has been developed: - Attempts to categorise tenants as Pioneers, Prospectors, Settlers - Different types of collateral available for those who are very engaged and those who are less so although no results available on the effectiveness of these developments as yet
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Retrofit Reality: PV, boilers, double glazing, EWI, efficient showers PAYS: Boilers, TRVs, heating controls, lighting, double glazing, electric fires, PV, EWI, low flow water appliances, personalised energy reports to help customers with budgeting The Energy Saving Bundle: Boilers, double-glazing, PV (in various different combinations). N.B. included comms to encourage PV customers to use appliances when sun shining.
What practical and structural barriers are identified?	Numerous practical issues to do with resident engagement/installation e.g. liaison between technical staff and residents/lack of room for extra kit in houses/predicted vs. actual savings/challenges of people living in fuel poverty/people not understanding how to use new kit (e.g. not used to thermostat controlled heating)/challenges of co-ordinating visits.

	Majority of issues successfully dealt with via painstaking engagement and hand-holding with residents. Mainly face to face, via visits to homes, in most cases by the same individual every time (backed up by a dedicated team in the office – the total size of team is 26). Plus in depth surveying of all properties in advance and using tried and tested installers.
What is done to alleviate the barriers?	

Encourage (Individual and/or potentially personalised interactions with customers)

What methods are used?	Information: Most common process used is a letter followed up by a visit (in some cases organised in advance by the customer ringing the office). Literature also left and where necessary discussions with family and friends also took place. Emails and texts have been used, to date less successfully although they recognise they are still learning about these methods (63% of tenants do not have broadband but most have smartphones). A letter with a reminder text proved successful. Word of mouth is important as these pilots have taken place in a small area. Behavioural advice was key alongside actual installation. Incentives: Free Energy advice kits including low energy bulbs and a Radiator Fan worth £50 have been given away in one trial. In another, customers were given £1 each time they submitted a meter reading.
How is the MINDSPACE applied in these methods?	**M:** Key in all these activities as Gentoo are well known and trusted by their residents. In one particular location, people would only respond to a community representative from that exact area and were put off by the appearance of someone in a suit (even though they were from the next door town). **I:** See above. Not a major element of strategy and in most cases people were being asked to make a contribution to measures. **N:** Played a big role in the take up of solar PV. To begin with this was a hard sell but when it became more normal residents started to request it to be like their neighbours. **D:** When a new tenant moves in, an energy advice visit is automatically arranged and they have to opt out if they do not want it. **S:** N/A **P:** N/A **A:** N/A **C:** Customers participating in schemes sign up to take part in ongoing data collection, get a certificate and can make 4 pledges around future behaviours. Those who received the Energy advice kit had to agree to install the contents and to follow up visits to check progress. **E:** N/A

Engage (Group interaction/feedback from customers)

What engaging activities take place?	Community workshops/events (publicised by letters/posters). Discussions also took place in regular tenant meetings. Liaison with local newspaper to raise awareness. Tracking levels of engagement based on interaction/surveys.
Are these methods successful?	Dedicated events have been successful when they took place at a small scale in places where people were going anyway (e.g. the housing office). When larger events were organised in harder to access locations (e.g. a sports hall) turnout was very poor. This was partly due to logistics but also because a 'green' message was not appealing and conferred no personal benefit. In future, the plan is to piggyback on existing events.

Exemplify

Does the organisation leading the project adopt the same behaviour that it suggests?	Major focus on setting the right example. Gentoo has a fleet of electric vehicles, has PV on the rooves of their own buildings and are currently exploring activity around growing fruit and veg in community.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	Retrofit Reality: 5 different packages tested. Monitoring actual energy use (via meter readings) and energy costs, pre and post survey of attitudes and behaviour (by Northumbria University) although the sample size for this appears to be very small, much anecdotal feedback to staff. PAYS: 4 different packages of measures tested. Pre and post analysis of consumption and bills. Customer satisfaction survey and qualitative feedback. The Energy Saving Bundle: 'Green Debate', general survey of 600 customers prior to creation of project. Questionnaire covering the experience as well as wider attitudes. Quantitative data including meter readings and occupancy data in a sample of 38 properties for one year pre and one year post, in depth monitoring of property archetypes by BRE, data loggers to understand heating habits in relation to outdoor/indoor temperatures. Comparisons made with predicted EPC figures. Plus: health impact assessment, analysis of reasons why some households did not join the scheme.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Hard to ascribe different impacts to specific MINDSPACE interventions using quantitative data. However, Messenger (trusted nature of Gentoo, ability to deal face to face and willingness to use local ambassadors) was key. The need for relevant local messengers was demonstrated by the success achieved in one area where local person was introduced, increasing take up from 26%-96%. Norms was a powerful factor too, with most of the projects ending up with very high take up across small communities. For example in one location, 47 bungalow residents were offered EWI. Initially only 45 agreed, but on consideration the final 2 did as well. It should be noted that the particular nature of the relationship between a progressive social housing provider in a concentrated area where they are well known means that they have many advantages versus those going in 'cold'. Considerable energy savings were achieved by all 3 projects. It is not possible to separate out the effects of installing measures vs. behaviour changes although it is interesting to note that in all cases RdSAP predictions of savings proved unreliable. With Retrofit Reality, overall energy consumption was reduced by 25%. In the case of the Energy Saving Bundle, 3 out of 4 bundles demonstrated a significant reduction in electricity use between 28 and 31%.
Do different customers behave differently?	Fuel poor customers tended to take 'comfort' benefit rather than save energy/reduce bills Not all customers were budgeting for their energy use, although we do not have evidence on how they can be identified (PAYS) Some behaviours very ingrained and hard to change (e.g. customers who has electric fires) Main evaluation is across different packages rather than different customer types.
How impact varies over the longer term?	Longer term impact not measured. However across the projects, energy savings from measures tended to be lower than those predicted by RdSAP (partly because fuel poverty means many customers using less than predicted beforehand).
Summary (Key learnings and evaluation of the robustness of the study – our view)	

Gentoo report that customer behaviour was as central to achieving energy savings as the installation of measures themselves and in many cases a lot of help was needed by residents to get the best out of new kit. Customer feedback data is more anecdotal than the energy saving statistics and in many cases only a small sample of homes were properly monitored for either. However, there is a very good sense of learning from all projects and a dedication to addressing challenges and being open about successes and failures.

A striking aspect across all projects is the incredible level of success in recruiting residents to take part in the schemes (in some cases, groups of customers even approached Gentoo directly). Many of the projects therefore achieved 100% take up, which is virtually unheard of. This appears to be down to the personal hand-holding and significant resource devoted to these projects by Gentoo.

7.1.5 Groundwork Green Doctors

Overview	
Programme:	Groundwork Green Doctors; RE:NEW Lewisham, RE:NEW West London
Country/region:	RE:NEW Lewisham: London Borough of Lewisham RE:NEW West London: London Boroughs of Brent, Ealing, Harrow and Hillingdon[17]
Period covered:	2011-2012
Stakeholders	RE:NEW Lewisham: GLA, Groundwork, Osborne Energy, Lewisham Borough RE:NEW West London: GLA, Groundwork, Boroughs of Brent, Ealing, Harrow and Hillingdon, Energy Solutions (Schools Programme)
Background:	RE:NEW is a programme of home energy retrofit for London's homes delivered through a partnership between the Greater London Authority, London's boroughs, London Councils and the Energy Saving Trust. It was fully rolled out in 2011/12 across 32 boroughs[178]. As part of the project in a number of local schemes house to house engagement was delivered by Groundwork under the banner of their existing 'Green Doctors' scheme. Offering home visits and advice on energy, the Green Doctors are positioned as independent, impartial experts from a local charity, working in partnership with the local authority in this case.
Aim of customer engagement activities:	The aim was to visit homes and offer energy efficiency advice, energy and water saving devices, referred to as 'easy measures'. Households were then offered surveys for energy efficiency 'further measures' where appropriate.
Sample size:	RE:NEW Lewisham: Target 1,600 homes, actual 1,638 RE:NEW West London: Target 6,400 homes, actual 6,640
Explore	
Is there any customer categorisation in advance?	Specific wards within local authority areas were targeted. Within these wards, all homes were then eligible, with a penetration of 15-25% being necessary to hit targets. Specific wards were selected by local authorities on a range of criteria including deprivation, mix of tenures and property types, opportunities for loft and cavity wall insulation, population age and fit with previous energy related activities in the borough. In one case a thermal imaging scan also took place.
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	A 75 minute – 2 hour home visit including: 1. An assessment of the property 2. Fitting of a package of 'easy measures' from the following long list: cfls, radiator panels, stand-by switches, real-time monitors, hot water tank jackets, draught proofing and water saving devices 3. Behaviour change advice to the householder 4. Referrals for 'further measures'. These were CERT funded improvements, delivered by another contractor, consisting of cavity wall and loft insulation and boiler and heating upgrades
What practical and structural barriers are identified?	Some of the easy measures were time consuming to instal and of minimal energy saving value (e.g. radiator panels which save only 87p per year!). Tap inserts also proved problematic. Longer-term evidence of the impact of behavioural advice is not available.

What is done to alleviate the barriers?	None within the project but future recommendations made.

What methods are used?	Information: Every home in target wards received a leaflet and letter explaining the programme and were then door knocked. Many customers apparently discarded leaflets as junk mail as they were not personally addressed. As on average only 25% of doors were opened, 'missed you' cards were then left. Across the boroughs, 66-86% of appointments were generated by direct door knocking. An 0300 number was available for residents to contact directly, which was the next biggest source of contacts. Community events, customer recommendations and follow up letters from LAs also played a small part. Once a visit was arranged, the Green Doctor visited each room of the house, fitting easy measures where appropriate and giving advice on simple no-cost behaviours (such as using economy settings on your dishwasher). The householder was left with a 'home energy report' or 'prescription' that included a list of what had been installed, suggested future measures and detailed the advice that had been given. Incentives: The free Green Doctor visit, including free easy measures was 'sold' to customers as "Free energy saving devices for your home".
How is the MINDSPACE applied in these methods?	**M:** Groundwork emphasise the fact that they are an independent, trustworthy, local charity (in this case working with the local authority). In situations where they have worked with energy/water companies they take pains to reinforce this independence. In one case a letter featuring endorsement from a local councillor who had personally received a visit, was used to generate further interest, to considerable success. **I:** The visit itself, the advice and the free easy measures are positioned as a time limited free energy efficiency makeover that could help lower your bills by up to £160 annually. The devices themselves are valued at up to £100 and potential grants for further measures are also referenced. **N:** There is a community element to the scheme, both in terms of the high penetration achieved in small areas and the use of community events, stands, leaflet distribution and schools based work. It is hard to assess the specific impact of these activities. They appeared to add little to the achievement of targets (e.g. in Lewisham only 92 visits were booked via community events, while in West London 75 events generated only 172 visits) but may well have had wider effects in creating a sense of collective involvement **D:** Not a major focus but some attempts made to present the Green Doctor service as an 'entitlement' you need to opt out of rather than an option. Increasing emphasis on this kind of approach in current schemes suggest that this has been judged to have some effect. **S:** N/a **P:** N/a **A:** Groundwork are well aware of the emotional dimension to these issues and Green Doctors are briefed accordingly. In the Lewisham Report they state that "While being monitored by delivery numbers, the Green Doctors never lost sight of the need to help clients, to sympathise with their difficulties and to spend time with those who warranted some extra care and assistance". Commitment: In this incarnation of the scheme only verbal commitments were made (and recommendations recorded on the 'prescription'). However, more recent versions of Green Doctors (including the Southern Water Universal Metering Programme) have involved the householder signing up to pledges around future behaviour. **E:** N/A

What engaging activities take place?	Popular community events included presenting to existing groups such as faith based communities and mother and toddler groups. A feedback form was left after all visits, although only a minority of recipients returned them (e.g. 7% in Lewisham). In West London a total of 102 homes were also revisited at least 3 months after their Green Doctor visit to assess longer-term impact.
Are these methods successful?	As identified above, community events were not successful in generating appointments but may have had wider benefits. A key challenge with community events was that they tended to generate interest from outside the precise targeted area. While feedback forms had a relatively low response rate (depsite an incentive for completion in West London), satisfaction levels were high with only 1.3% or respondents saying they were dissatisfied with the visit. At least 90% across all boroughs said they would recommend to a friend.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	Perceptions of this will vary across local authorities but there is no evidence that this played a part in the project.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	Quantitative: Data on numbers of homes targeted and visited, effectiveness of different engagement methods, easy measures installed and carbon savings achieved, referrals and referral conversions, delivery costs, customer feedback Qualitative: Assessments of effectiveness from different stakeholders plus lessons learned. Overall evaluation of RE:NEW conducted by GLA.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	The nature of data available does not allow us to identify specific impacts of different elements of Mindspace, although from the earlier assessment it can be inferred that the combination of Messenger and Incentives was the most powerful element of the project. Key impact measures include: Number of easy measures installed: Lewisham 10.5 per household. West London 8.4 per household. Carbon savings achieved from easy measures: Lewisham 210kg pa per household, West London 137.8kg per household. Savings achieved from behaviour change were not accurately measured but previous Green Doctor evaluations suggest this to be up to 300kg pa per household from immediate actions such as resetting and understanding heating and hot water controls and longer term measures such as usage of appliances and use of real-time monitors. Referrals for further measures only took place in a minority of homes. In Lewisham a total of 316 were made while in West London, there were 1029. The evaluation does not capture the final outcome of all of these but a completion rate of follow up surveys of 25-35% was recorded.
Do different customers behave differently?	While breakdowns of different housing types were collected, there is no data available on the relationship between this and the success measures of the projects.
How impact varies over the longer term?	No actual in use monitoring was done. Longer term data was only captured via revisiting 102 households in West London, with the following headline results: Remember your Green Doctor visit: 100% Can remember the advice given: 92% Still have prescription: 80% Still fulfil all pledges: 83% Have noticed reduction in fuel bills: 26%

Summary (Key learnings and evaluation of the robustness of the study – our view)
Green Doctors demonstrate the value of: • Well trained, experienced staff delivering a face to face engagement programme • Tried and tested format encapsulated in the home visit • Strong back-end systems to support door knocking, making appointments and collecting data (easy to operate for the on the ground team, using i-pads) • The power of 'free' to generate interest and engagement • An evolving set of experiences that can be applied across sectors (e.g. water) There is perhaps an over-reliance on the installation of measures in generating impact from these projects, allied to an assumption that these measures will continue to generate reliable energy savings. While the overall results are undoubtedly impressive, and the value for money achieved is quite significant (in West London a total of £694k was spent on engaging 6,640 homes) there is an understandable need by Groundwork to maintain the momentum of the Green Doctors initiative and perhaps therefore some reluctance to report all the challenges involved in completing these projects. Ultimately, the missing link in these case studies is a detailed understanding of the effect of behavioural advice which, it is claimed, could exceed that of the 'easy measures'. This, sadly, is not captured in the evaluation.

7.1.6 Transition Streets

Overview	
Programme:	Transition Streets[29]
Country/region:	Totnes
Period covered:	2010-2011
Stakeholders	Transition Town Totnes, South Hams District Council, Beco (PV installation), Totnes Town Council, Energy Saving Trust, Dare/Energy Action Devon, DECC Low Carbon Communities Challenge (Funders)
Background:	Transition Streets brings together groups of neighbours who study a workbook over a period of months, and take action to reduce their use of energy, water and oil-powered transport, while also producing local food and installing solar PV to generate electricity.[179]
Aim of customer engagement activities:	• Adoption of a series of low or no cost behavioural actions from the work book (ranging from monitoring your energy usage to buying seasonal food) • Access to additional energy efficiency support via the Energy Saving Trust's Home Energy Check or through Street Energy Assessors • Installation of domestic solar PV, with the help of a grant (only available once the basic efficiency work has been done.
Sample size:	468 households via 56 separate groups
Explore	
Is there any customer categorisation in advance?	Aimed to reflect a cross section of local population and property types which was largely achieved although flats were under-represented (3% vs. 25% actual) as were rented properties. Some difficulties were encountered in engaging lower income households although 38% of total participants had low disposable income (less than £250 per month).
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	The key technical solution offered was solar PV installation, delivered by project partner Beco with the help of DECC funded grants. This was accompanied by handheld display units to help householders judge the best time to run electrical appliances. Free or heavily subsidised loft and cavity wall insulation was also made available in partnership with South Hams District Council.

What practical and structural barriers are identified?	PV was only available to those with appropriate rooves and once basic energy efficiency work had been done. The grant scheme was oversubscribed so not all those who wished to were able to access it. Despite additional tailored help for low income households, some were not able to qualify for financial reasons.
What is done to alleviate the barriers?	The main efforts in this area involved negotiations with project partners and other stakeholders (such as housing associations) to alleviate financial concerns.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	Information: A workbook containing 35 carbon-reducing actions is worked through by a group of on average 8 people over 7 sessions in a 3-4 month period. The group is self-managing but the first meeting is led by a facilitator. While this was of course a collective activity, the actual behaviours needed to be taken up by individuals. Incentives: The opportunity for solar PV grants was an incentive for some to participate.
How is the MINDSPACE applied in these methods?	**M:** As this is an entirely locally run and originated scheme there was a strong sense of credibility and trust. **I:** As detailed above, the potential for a solar PV grant of £2,500 for able to pay homes and £3,500 plus a low interest loan for the balance of the cost (which could be covered by the FiT) for low income homes. This was a motivator for some but not all participants as a number of groups were formed that were not eligible for the grants. **N:** The group dynamic, and the fact that this was taking place in a relatively small town (it reached 5% of all households in Totnes and the surrounding area) meant that there was a strong drive to position the activities in the workbook as the norm. The primary reason given for joining a group was 'to build good relations with my neighbours' again suggesting the crucial social angle to the project. Furthermore, a total of 141 PV systems were ultimately fitted, which undoubtedly had an impact in a small area. The total generation from these systems was shared on a TV monitor in a shop window that was linked via a web application to all the domestic systems. **D:** N/A **S:** The project was salient and indeed newsworthy in the area, and this was reinforced by the installation of community scale PV on the civic hall (see below) with a 'switch on event', launch and celebration. **P:** N/A **A:** In evaluation, all participants described social benefits to the project including better social contact with neighbours, practical help of many kinds and more communal action on issues that matter to the neighbourhood. Difficult issues came up at times in groups too. This was therefore an emotional journey for participants, not just a process of rational engagement, and it seems likely that this added element contributed to the success of the project. **C:** There were no formal commitment devices used but the group dynamic (studying a topic together and going away to take action) does appear to have this effect. As one participant stated: 'I felt an obligation to make changes after sitting through the meetings'. Also the fact that some actions were taken communally, or involved group members helping each other reinforced this. However, some participants felt that the lack of clearer ongoing commitments was a weakness of the programme and that it would be easy for people to slip back to old behaviours. **E:** N/A

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	The group element of the project was of course central to it, as described above. Other community-based activities included celebrations of achievements, a Totnes Energy Fair and an open Eco-Homes event.

	Participants completed an evaluation form at the first session and then again at the final session and these were used to record changes in behaviour and attitudes.
Are these methods successful?	The community activities appear to have been well received, with 100s of attendees to the Energy Fair and over 500 individual visits to the 13 local demonstration Eco-Homes. These are planned to become annual events.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	A 14Kwp 75 panel PV array was fitted to Totnes Civic Hall as part of the project. A public energy display board is located at the entrance (overlooking the central market square) which shows the amount of energy produced and carbon saved to date.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	Evaluation of carbon and financial savings from behaviour change via a pre and post questionnaire. Detailed data on PV generation Online survey on the social impacts of the project (completed by 10% of participants) followed up by interviews[180] DECC sponsored pre- and post- research among 300 Totnes residents (with comparisons available to Paignton and national samples). Conducted by GfK NOP.[181]
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	The biggest impact of this project is likely to be via norms, so the results should be viewed in this light. The most useful evidence on this is from DECC's survey, showing that over the period of the project there was an increase in people in Totnes agreeing strongly that reducing one's carbon foot print is the 'normal' thing to do in their area (18% up to 30%). This was not matched by Paignton, where it increased from 5 to 7% or nationally (8 to 9%). Around PV, there was significantly higher recognition of solar panels in Totnes than in 2010. The proportion unaware of any fell from 36% to 6%. The greatest difference is seen by a shift from 2% to 33% seeing 'a lot'. An increase in awareness of solar panels is also shown in Paignton but the Totnes increase in awareness is much higher. Again, this points to a normative effect. There is less compelling evidence of other behaviours becoming norms, although there was a significant increase in Totnes residents reporting that the majority of their lightbulbs were energy efficient (from 20 to 27%) There is also some interesting insight into the role of the incentive (i.e. grants for PV systems). The chance of a grant did not feature highly as a reason when evaluating the reasons for joining a group in the first place. Good relations with neighbours and doing something positive about climate change came higher. However, for the minority who did join in order to qualify for grants, their overall reaction to the project understandably varied significantly depending on whether they got one and disappointment around the allocation of grants was the main negative experienced by the project. As far as salience is concerned, Totnes residents who were aware of the project were more likely to have become aware of it from seeing it in the local paper (43% Totnes compared to 31% across all LCCC projects), heard of it through friends or relatives living locally (39% Totnes compared to 26% in the LCCC average) or heard of it through a member of the community who is knowledgeable about the environment (16% Totnes compared to 9% in the LCCC average), suggesting that it was salient in the community. Overall the average reduction in heating/power demand for participating households was 14% (excluding PV). Of the 35 actions in the workbook, on average each household took up 10 new ones. The most popular new actions were: 1. Know how much energy you are using (monitor)

	2. Always turn things off at the wall when not in use
	3. Buy local and seasonal foods
	4. Know how to control your heating system and thermostat
	5. Know how much water you are using
	In terms of overall feedback, 82% said the meetings and materials were good or very good and only 2% said their group would not keep meeting in some form at the end of the process.
	83% said they have made improvements to their home and 86% had made behavioural changes.
Do different customers behave differently?	No segmentation available. Interestingly, though, 44% of those receiving PV grants were low disposable income households vs. 38% of participants which is impressive given the difficulties explained earlier.
How impact varies over the longer term?	There is no hard evidence of long-term impact but in the online survey 90% said it would be very easy or somewhat easy to sustain the behavioural changes in future and 85% were confident that the benefits of the project would last for at least a year.

Summary (Key learnings and evaluation of the robustness of the study – our view)
Transition Streets provides a compelling case for a community-led approach in driving behaviour change on a local level (with only light touch facilitation).
In common with similar methods used elsewhere, it relies heavily on 'messengers' and 'norms' although in this case there was an additional element of 'incentives' involved via grants for solar PV. The main benefit of participation identified by those who took part was in the area of social life/getting to know your neighbours rather than hard environmental or energy saving measures. While attempts have been made to provide some robust evaluation, both by Transition themselves, who worked with the University of East Anglia to attach credible carbon saving figures to 25 of the 35 workbook actions and by DECC though a more general pre-post survey of attitudes and behaviours, there are limits to what this data can tell us.
In both cases, we are relying on claimed behaviour rather than actual energy savings and it is uncertain whether people always acted on and maintained these behaviours.
Another inevitable finding from a project of this nature is that it tends to 'preach to the converted'. In a location that was already more committed than average to 'green living' (13% in Totnes said they had joined a local green group vs. 1% nationally), this project appears to have been a way for already engaged households to team up with other like-minded people. As with similar projects, it therefore raises the question of whether this kind of approach would be applicable to a more apathetic mainstream audience.

7.1.7 40 household pilot

Overview	
Programme:	40 household pilot[182,183,184,185]
Country/region:	England, North Devon, in Braunton and Ilfracombe
Period covered:	2012-2013
Stakeholders	361 Energy Action (a community social enterprise which promotes energy savings and renewable energy) funded SEACS (Sustainable Energy Across the Common Space) EU project , two primary schools in Braunton and Ilfracombe (Caen Primary and Ilfracombe CoE Junior School)
Background:	40 Households took part in project run by 361 Energy Action to test engagement approaches to influence the uptake of energy efficiency and micro renewables to save energy, money and carbon. 361 Energy Action, in collaboration with local primary schools, invited households to engage in order to be supported to learn about reducing gas and electricity consumption through behavioural changes and technical solutions.
Aim of customer engagement activities:	Engage with 40 households to help them to reduce their energy cost and consumption through technical and behavioural changes.
Sample size:	40 households

Explore	
Is there any customer categorisation in advance?	No

Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Recruited households were given an **Energy Saving Starter Packs** to help them monitor, understand and reduce their electricity usage. - remote electricity meter consoles - Showertime monitors - Plug-in energy monitors - Remote controlled plugs (4 plugs with 1 remote control) • **Energy Champions:** four members of 361Energy acted as volunteer Energy champions and followed up to ten households each. The energy champions trained further 5 Energy Champions. This entailed giving them a 3hr training session offering an introduction to; how to measure and save energy and the Green Deal/ECO. • **361 Energy website**
What practical and structural barriers are identified?	1) Some households found it difficult to set up the monitors. 2) Most households did not engage much after the initial meeting and only a few provided monthly meter readings.
What is done to alleviate the barriers?	1) Energy champions visited each household to explain and set up monitoring equipment. Further 5 energy champions were trained to help 361 energy to better support the households. 2) Further engagement with households through the energy clinics in order to re-energise the group to be more interactive with their energy champion volunteers.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	361 provided all households with support, equipment and energy surveys. Different channels were used: putting up posters and sending out invitations by newsletter/email. Information: • Energy monitoring • Energy Champions • Energy related events • Primary school events • A monthly newsletter • 361 Energy's Website Incentives: • Free energy monitoring starter pack worth £70 • Free home survey • Group discounts on technology and/or installation • Competitions with Energy efficiency related prizes
How is the MINDSPACE applied in these methods?	M: 361 Energy's volunteer Energy Champions I: Free Energy-kit, free technical home surveys, free advice from energy champions focusing on reducing participants energy bills. Free local energy events and negotiated group discounts A: Partnership with the primary school in order to encourage children to affect/persuade their parents to participate C: Participants asked to commit to certain number of commitments (energy readings, attending group events...), also the reciprocity acts (offered energy measuring equipment and personal help from Energy Champion).

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	**Local energy events** 361 Energy engaged with the households through local events such as

energy clinics or attending local events in the. The Energy Clinic provided information about technologies ranging from energy efficient light bulbs and roof insulation to air source heat pumps and solar thermal panels for hot water heating, as well as behavioural change to reduce energy consumption.

Primary school engagement

A 1 day event in one school where every child saw a performance by Global Action Plan about energy. Kids were encouraged to bring their parents along at the end of the day to persuade them to join the scheme. At another school 361 Energy worked with the "Eco Club" that was led by a teacher. Children did an energy measuring exercise which was then developed as a school assembly run by the children themselves.

Competitions with Energy efficiency related prizes. Households were asked to submit monthly meter readings to encourage them to:
- reduce their energy consumption by the greatest percentage. Based how much electric and/or gas can be reduced month on month so compares one month to next over a year.
- Submit video on innovative initiatives to reduce energy consumption with some evidence to show its has been implemented.

Recruited participants commitment:

Households interested in becoming part of the 40 households project could download and fill in a questionnaire on the 361 website.

Participants were asked the following:
- Participation in the project for 12 month period
- Meter readings (every month) submitted by dated photo's to your energy champion via email
- If an EPC is wanted, a commitment to a house survey in which every room in the house and loft must be inspected
- Consideration of attending a group energy saving sharing session

Are these methods successful?	The initial engaging methods seems to been well perceived as the project was launched successfully, but the engagement dropped quickly and 361 Energy found it difficult to engage with households over a sustained period. Resistance to technical surveys led to low uptake.
Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	Yes, 361 Energy was set up by a group of like-minded sustainability and renewable energy consultants. The energy champion volunteers all monitor their energy usage and have adopted energy saving behaviour and technologies.
Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	361 Energy have not yet evaluated their approach to engagement or analysed its impact.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Attempting to use children as the messenger was unsuccessful highlighting that the messenger must have authority in addition to being trusted.
Do different customers behave	N/A

	differently?
How impact varies over the longer term?	**Schools leading example:** In one school, the Eco Club teacher set up an energy plan for the whole school. In the other school, the estate manager started to monitor the schools energy use closely in order to do energy savings. Both schools shift to LED lighting from a local supplier/ manufacturer. This could have a positive impact of behavioural change on the pupils. As a result of the "group discounts on technology and/or installation" incentive, a discount for households wanting to install Solar PV was negotiated, two households installed the solar panels. In addition, this led to a negotiated deal for LED bulbs and florescent tubes.

Summary (Key learnings and evaluation of the robustness of the study – our view)
Sustained engagement where households are required to provide data/information was very difficult and time consuming for volunteers and proved costly to sustain over a 12 month period. Children did not have sufficient authority to influence household energy consumption.

7.1.8 Challenge 100

Overview	
Programme:	Challenge 100[186,187,188] "Tackling fuel poverty for 100 families, in 100 homes, in 100 days"
Country/region:	UK; Challenge 100 took place in three urban areas (Birmingham, Luton and Manchester) and two rural areas (County Durham and South Staffordshire).
Period covered:	Started in November 2009 to early 2010
Stakeholders	E.ON UK, Loughborough University and local authority partnership which helped to identify households that might be fuel poor and to gain their trust to carry out the fuel poverty assessments and the whole house measures that were needed: Birmingham City Council, Durham County Council, Luton Borough Council, Manchester City Council, South Staffordshire Council. E.ON also partnered with charities and government bodies who shared their expertise from working with people living in fuel poverty : the Energy Saving Trust (EST), Age UK, Citizens Advice, Experian, Money Advice Trust and National Energy Action
Background:	In 2009, around 4 million households in the UK were living in fuel poverty. By 2011, E.ON were committed to helping their most vulnerable customers by investing £59 million in a social programme which gabe vulnerable customers access to a range of specialist products and services designed to reduce energy bills, improve energy efficiency and increase household income. E.ON set-up Challenge 100 to help understand how they could make a difference to fuel poverty levels and whether the current system allowed them to do this. In particular, E.ON wanted to find out: • where it was best able to tackle fuel poverty alone • where it needed to work with partners • what policy changes were needed E.ON wanted to see how effective the existing policy framework was for tackling fuel poverty, so they only offered measures that were currently available through the Government's energy efficiency programmes. These are the Carbon Emissions Reduction Target (CERT) and the Carbon

	Emissions Saving Programme (CESP).
Aim of customer engagement activities:	The aim of the customer engagement was to help the participants to eradicate fuel poverty in 100 days.
Sample size:	102 households
Explore	
Is there any customer categorisation in advance?	Anyone affected by fuel poverty living in the selected streets, regardless of their energy supplier, was eligible to take part. E.ON took a 'community' or 'whole street' approach to delivering Challenge 100 so they didn't only target E.ON customers (< 7% of participants were E.ON customers).
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	The project combined the energy efficiency installations with behavioural measures to advise families on how to best use energy as well as income maximisation. Technical equipment such as Energy monitor and temperature meters were also installed. **Community Energy Volunteers (CEVs):** were recruited to provide additional local support, including home visits, to householders in each area. These volunteers were recruited within the communities where Challenge 100 was taking place. **Energy monitors** were offered to each Challenge 100 family to display their electricity use. 64 energy monitors were installed by the CEVs in each area.
What practical and structural barriers are identified?	In practice, the recruitment process in rural areas was more difficult, although the take-up rates were similar to those in urban areas. Less dense housing meant that E.ON couldn't use the 'whole street' approach to encourage take-up. This also made the doorstep assessments difficult and they had to do most of the initial assessments by phone. It was harder to encourage take-up in rural areas where they didn't have dedicated CEVs. The social tariff landscape offered by the different energy suppliers is complex and the One Stop Shop advisers had limited information about other suppliers' tariffs. For non-EON customers (93%), it was therefore more difficult for the advisers to fully help householders reduce their energy costs by advising on tariff options and payment methods.
What is done to alleviate the barriers?	To get households involved, Eon had to truly engage with the community. The presence of assessors in the streets and in the local community centre during the recruitment process played a crucial role by bringing the project to life for householders and answering their questions and gaining trust.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	**Information:** One Stop Shop information: Energy efficiency advice and information on tariffs and payment methods and benefit entitlement checks was given over the phone by a One Stop Shop adviser. This was followed up by supporting brochures sent through the post. For E.ON customers advisers could give tailored personal advice as they could access existing customers' consumption data. Community Energy Volunteers (CEVs) Each visit of the CEVs covered a range of support areas, mainly around energy efficiency advice and improving thermal comfort. The CEVs also installed and gave general instructions about what the energy monitor was for and how to use it. They played an important role during the energy efficiency installations by offering ongoing support, education and advice. **Incentives:**

	One Stop Shop service provided the full package of measures that are needed to help a family living in fuel poverty: - free energy efficiency measures such as wall and loft insulation - high efficiency central heating or draught proofing - Income maximisation package: Each individual family was offered end to end support, from reviewing their benefit entitlement to helping them fill in the forms and send them to the relevant departments. Debt advice was also provided where needed and if a householder's debts were found to be unmanageable, they were referred to the National Debtline for further support.
How is the MINDSPACE applied in these methods?	**M**: E.ON knew that as a supplier they were not trusted and therefore used the One Shop Stop advisers, the local authorities as well as the Community Energy Volunteers (CEVs) approached the customers. **I**: The trial offered free energy efficiency installations, free telephone service for energy advice and benefit entitlement checks/budget reviews. **N**: The installation of the energy monitors as well as the readings of historic energy consumption bills, enabled visualisation and benchmarking of costumers own energy use over time. **S**: Energy monitors displayed participants' electricity use in order to reduce consumption. **C**: Participants had as a goal to get out of fuel poverty in 100days

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	N/A
Are these methods successful?	E.ON learned that engagement through trusted community groups was key to running a successful fuel poverty programme. Where they were able to work closely with the local authority, and householders could speak to a local point of contact, EON found that the project ran much more smoothly and often, neighbouring householders wanted to join the programme too.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	E.ON findings have provided greater clarity in determining its own responsibilities as an energy supplier. They used the findings from Challenge 100 to overhaul the way they provide a holistic approach to ensure the best possible support for fuel poor customers.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	**Participant experience** E.ON used the 'Net Promoter Score' (NPS) tool to measure participant satisfaction levels. NPS allowed the Challenge 100 householders to give EON feedback by telling them how likely they would be, on a scale of zero to ten, to recommend Challenge 100 or E.ON to a friend. The maximum score of 10 was given by 60% of respondents when asked if they would recommend either E.ON or the Challenge 100 project. These results show that the householders felt engaged with Challenge 100 and that the project was widely viewed as very positive. **Feedback-videos ;** EON created 5 short films capturing the feedback from some of the Challenge 100 families. **Impacts and results** Energy efficiency measures alone led to fuel poverty being eradicated in 45% of the Challenge 100 families.

What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	M: As an energy supplier, E.ON recognised that householders might not trust them initially, by working with local authorities, Challenge 100 was able to gain credibility which encouraged householders to be open to the initiative.
Do different customers behave differently?	More than 25% of EON's participants had prepayment meters, which limited their access to other types of tariff. No analysis has been done on the different success rates between prepayment and non-prepayment customers on the basis that they were all in the fuel poor category.
How impact varies over the longer term?	Almost half of the 64 participants who received the energy monitor had a follow-up visit from a CEV who asked questions about behavioural changes. Out of the 29, 12 said they had changed their behaviours after the monitor was installed. However, due to the project's short duration, it's hard to say if these behavioural changes will be sustained over time.

Summary (Key learnings and evaluation of the robustness of the study – our view)
Challenge 100 has shown the true value of a coordinated and holistic approach to addressing all causes of fuel poverty. EON recognised that they couldn't solve fuel poverty on their own and partners played a key role throughout the project by enabling them to build on their expertise and enable trust. The project found that to be successful it must be simple for householders to access and if possible provide a full package of support at a single local point of contact for communities.

7.1.9 Lockleaze 'Streets of Solar' scheme

Overview	
Programme:	Lockleaze 'Streets of Solar' scheme[189,190,191,192]
Country/region:	Bristol UK – in Lockleaze, a front runner pilot scheme area for Localism and 'Big Society'
Period covered:	July 2012 to 2013 and ongoing. Project (domestic rooftop PV installations) was completed in two stages (Lockleaze I & II). Streets of Solar will be replicated in 2014 in South Bristol and Lockleaze phase III is planned for summer 2014.
Stakeholders	Bristol Power Co-op, Bristol Power Community Interest Company, Bristol Area Solar Installers Co-operative (BASIC). Lockleaze Neighbourhood Trust
Background:	Bristol aims to be a Solar City. Bristol's Solar map shows enough roof space for 700 megawatts of solar power on city. Bristol Power Co-op is an electricity company owned and run by it's members, aims to arrange free solar power from rooftops throughout Bristol, Bristol Power works in partnership with BASIC, Bristol Area Solar Installer Co-op, created to make more local jobs and help make Bristol the UK's first solar city. It's also working with Bristol Energy network, which has created Bristol's Community Strategy for Energy.
Aim of customer engagement activities:	To secure participation in the project, ensuring residents join an energy co-operative and consent to have free solar panels installed on their roof.
Sample size:	23 roofs (households), made in two times; Lockleaze I (13 households) and Lockleaze II (10 households). Phase III is planned to be 50-100 homes.
Explore	
Is there any customer categorisation in advance?	Lockleaze was chosen partly because it is classed as a fuel poverty area and most of the houses are a similar design, which makes the installation process easier and cuts down installation costs.
Enable (technical and physical interventions taken to change behaviour)	

What different technical or physical measures are offered?	• Technical measures of the Installation of solar panels - Solar panels- typically between 8 and 14 self-cleaning panels on a standard roof. • Webpages: All information about the scheme could be found at Bristol Powers Coop webpage
What practical and structural barriers are identified?	Sometimes the scheme would create scepticism, the offer sounds "too good to be true". Existing mortgage arrangements – the lease agreement had to be accepted by the mortgage provider.
What is done to alleviate the barriers?	Bristol Power helped participants to inform their insurance company and to negotiate with mortgage holder to enable roof lease agreement. Since this agreement also states that the solar installation stays with the house and transfers to the new owner if the house is sold any assistance to overcome this barrier was important.

Encourage (Individual and/or potentially personalised interactions with customers)

What methods are used?	**Information:** Analysis of Smart meter monitoring allowed the project to show savings made by each household and compare with other households without solar panels. Some households reported that they use their meter to make sure they only using their own electricity. **Financial Incentives:** - Free electricity: electricity produced can be used by the household free of charge and reduce their bill by up to 40%.
How is the MINDSPACE applied in these methods?	**M:** Bristol Power Coop and Lockleaze neighbourhood is based on a local community co-op offering membership and ownership – witch enables trust. The messenger plays a big part in the engagement appeal. **I:** The scheme offers many financial incentives : free PV installation, free use of generated electricity, a lower energy bill (up to 40% savings) **N:** Project sought to encourage whole streets to participate – community influence. Analysis of Smart meter monitoring allows the project to show savings made and compare with other households without solar panels. **S:** The concept of being part of the future and a collective change was used as a means of encouraging participation. **P:** Solar panels on roofs are visible for the community and prime others to do the same. **C:** People are asked to commit their roofs to the scheme for a period of 20 years.

Engage (Group interaction/feedback from customers)

What engaging activities take place?	**Community engagement** Initial community engagement was through the Big Society front-runner engagement group, Lockleaze Voice, who put the project team in touch with Lockleaze Neighbourhood Trust, a neighbourhood partnership group. **Home visit:** interest to join the project could be registered via Bristol Power Coops website, or by signing up at the engagement events. **Community Events:** Bristol Power Coop also attends a wide range of community events in areas where they were engaging, and plans and runs its own events in local community centres and at community fairs. **Newspaper, newsletter and leaflets:** The engagement campaign also hit the front page article in Bristol's main newspaper, The Post with the headline 'People Power'. **Short films:** Bristol Power Coop created 6 short films about their work – all available on Youtube, covering planning, engagement and follow-up.
Are these methods successful?	From the engagement invitation via, 'Lockleaze Unlocked' newsletter, around 100 people came to three events, and over 80% signed up as interested in the project.

Exemplify

Does the organisation leading the project adopt the same behaviour that it suggests?	Bristol Power was nominated for a Sustainable Energy Europe Award in 2013 and shortlisted in the top 25 for 5 awards out of over 240 entries. It was also highly commended for a South West Energy award in 2013.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	Bristol power have not yet evaluated their approach to engagement or analysed its impact.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	**M:** The messenger in this project made a difference to the success of the project as the co-operative values encouraged people to participate. **I:** The financial incentives were key : free PV installation, free use of generated electricity, a lower energy bill (up to 40% savings) drove the participation. **N:** Community influence and following neighbours was important in encouraging whole streets to adopt solar panel. **S:** The concept of being part of the future and a collective change was successfully used as a means of encouraging participation. **P:** The sight of solar panels on roofs in community would have a priming impact. **C:** People were asked to commit their roofs to the scheme for a period of 20 years and this needed a legal change to their mortgage. The commitment made seems to have helped to drive participants to encourage others to participate. **E:** In this deprived neighbourhood the status symbol of solar panels was important. Their egos were utilised to as they were doing better financially, were smarter than those not installing solar panels – an aspect of beating the power companies is strong in this project.
Do different customers behave differently?	No analysis has been done.
How impact varies over the longer term?	The Street of Solar pilot in Lockleaze was a success, and will be repeated in South Bristol 2014.

Summary (Key learnings and evaluation of the robustness of the study – our view)
The key learnings from this project are around the community aspects of engagement. This project has sought to encourage participants to come together as part of a project, it's focus is both on community and individual benefit. The title, Streets of Solar, was chosen to encourage a feeling of community and participation.

7.2 US

7.2.1 NorthWestern Energy Smart Grid Pilot Project

Overview	
Programme:	NorthWestern Energy Smart Grid Pilot Project
Country/region:	Montana, USA
Period covered:	2011-2013
Stakeholders	NorthWestern Energy, DNV GL, Tendril, Pacific Northwest Smart Grid Demonstration Project
Background:	DNV GL task was to install Home Area Networks (HAN) equipment in customer home, configure customer interface, and educate customers about the equipment and customer interface
Aim of customer engagement	Determine customer willingness to change behaviour based on real time energy pricing and usage.

activities:	
Sample size:	Number of households participating in the project: ~200

Explore	
Is there any customer categorisation in advance?	Targeted customers with electric water heaters, with a permanent high speed internet connection, and within a small geographic area in range of communications equipment. Removed customers with previous DSM program participation.

Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Installation of load controllers on water heaters, plug load appliances, and thermostats. Installation of customer web interface and in-home display that provides real time energy pricing.
What practical and structural barriers are identified?	After installation, there was a period of time before the system went "live" which is believed to have reduced customer interest. Technical issues with equipment and interface updates. Portal used would not work on smart phones, only on computers.
What is done to alleviate the barriers?	Regular newsletter communications and technical troubleshooting.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	Information: Real time pricing updates and periodic newsletters. Incentives:_ In the pilot, the customer received credit on their bills based on their time of use, if the charges were less than those calculated by the standard rate. If energy use was higher than normal constant electric rate, then customer was not penalized, but was charge the standard rate.
How is the MINDSPACE applied in these methods?	Implementation of the MINDSPACE framework to analyse the methods used to change customer behaviour (e.g. **M**: Trained energy auditors were used for installation and customer education, rather than using HVAC, electrical, or IT technicians. **I**: If bills calculated by time of use rates were less than those calculated by standard rates, customer received a credit. **N**: Newsletters referred examples of customers that had saved energy and money in the program. Graphs on portal showed comparison to other customers in the program. **D**: Defaults on load controller were set to "opt in" for demand response events. **S+P+A+E**: Graphs on portal showed comparison to others, daily and weekly usage, etc. **C**: Customers were not asked to make commitments.

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	Newsletters
Are these methods acceptable?	Yes

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	Another part aspect of the project did install conservation voltage reduction equipment on substation feeders.

Evaluate (Quantitative and qualitative evidence)	

What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Results of this pilot program have not yet been determined or quantified. DNV GL does not have a role in this part of the project.
Do different customers behave differently?	Customers appear to participate at varying levels depending on interest. Results not yet quantified.
How impact varies over the longer term?	Results not yet quantified.
Summary (Key learnings and evaluation of the robustness of the study – our view)	
Overall project approach is described above. Because the approach was not varied during the project, no study of relative effectiveness of different approaches will exist. The project is still underway, and energy savings and other results have not been quantified by our client.	

7.2.2   One Change Project Porchlight

Overview	
Programme:	One Change Project Porchlight
Country/region:	Since 2005, over 900 communities in USA and Canada
Period covered:	2005-today
Stakeholders	One Change has been engaging with 'sponsors' - which include local distribution companies, regulators, utilities, state authorities - to develop Energy Efficiency campaigns for residential customers.
Background:	One Change is the organization behind Project Porchlight, a residential lighting program that provides funding partners ('sponsors') with a turn-key energy-efficiency campaign, gaining this way direct access to customers. The Project Porchlight approach identifies and mobilises supporters of energy efficiency from existing local community networks. These volunteers are equipped with high-quality information materials; colourful hats and jackets; and bags filled with CFLs in distinctive program packaging. Volunteers are trained to invite people to install one free CFL, and use the acceptance of that invitation as an opportunity to convey additional energy efficiency messages. All Project Porchlight campaigns are managed by local staff and engage directly with existing community organisations. Early stages of each campaign focus on community outreach, local promotion and volunteer training. A campaign launch event that includes local VIPs and musicians provides a focus for the grassroots engagement to generate earned media and momentum at the community level. Each campaign continues to recruit and train volunteers until targets are reached. A volunteer recognition event closes each campaign.
Aim of customer engagement activities:	Participant groups exposed to the Project Porchlight campaign are expected to present consistent behaviour changes including an increased likelihood to purchase CFL bulbs, an increased likelihood to discuss energy conservation with friends and family, and an increased likelihood of participation in other energy efficiency programmes.
Sample size:	A typical Project Porchlight campaign reaches at least 200,000 households through distribution of ENERGY STAR® qualified CFL bulbs. The savings associated with the replacement of these bulbs totals 92 million kilowatt-hours in energy savings over their lifetime. The scope of

	the program is scalable to meet local needs and help partner organisations achieve their goals on time and within budget. Since 2005, over 12,000 registered volunteers from 2,000 groups in 900 communities across North America have been engaged to deliver campaign messages directly to over 3 million households in neighbourhoods throughout the United States and Canada.
Explore	
Is there any customer categorisation in advance?	In order to determine whether changes in public attitude and behaviour could be attributed to the Project Porchlight campaign or whether change is a broader phenomena, prior to implementing Project Porchlight, a pre-campaign survey is designed to establish benchmarks on attitudes and conservation behaviour. The surveys are conducted by telephone among households in both treatment and control groups. Respondents are selected using a random digit dial methodology from communities within the target areas.
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Volunteers from existing community groups deliver a CFL bulb or other low cost efficiency gift (other efforts use a tire gauge or water savings device) door to door and at community events.
What practical and structural barriers are identified?	Each campaign has built upon the results of the previous campaigns. Experience gained during each campaign adds to a campaign toolkit that is shared with new staff and local program leaders. A constant challenge has been how to impose consistency in delivery while allowing local factors such as differences in community demographics to be considered.
What is done to alleviate the barriers?	A tactical plan is written for each campaign to accommodate for specific geographic, budget, sponsor, human resource, and communications needs.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	Volunteers from existing community groups deliver a CFL bulb or other low cost efficiency gift (other efforts use a tire gauge or water savings device) door to door and at community events. The gift attracts attention and enables a conversation, neighbour to neighbour, to empower people to make smart choices about how they use energy. The bulb is bundled with other utility or state energy efficiency program info. Because the contact is made by someone the person at the door recognizes as a credible source (a friend or neighbour or community leader), the message sticks.
How is the MINDSPACE applied in these methods?	**M**: Volunteers from existing community groups **I**: A CFL bulb or other low cost efficiency gift (other efforts use a tire gauge or water savings device) is delivered door to door and at community events. **N**: N/A **D**: N/A **S+P+A+E**: Early on in the campaigns it became clear that participants were often holding CFLs they received through Project Porchlight and waiting to install them until an incandescent burned out. In year two, One Change stopped referring to CFLs as a "new" light bulb, but just as "a light bulb", and started referring to incandescent bulbs as "old fashioned." Customers were encouraged to remove "old fashioned bulbs" even if they were still working. **C**: N/A
Engage (Group interaction/feedback from customers)	
What engaging activities take place?	One Change has developed a set of sophisticated web-based program planning, reporting, and evaluation tools to manage their campaigns and volunteer resources. This helps consistency and provides verification for sponsors. They use a Google Maps-enabled GIS tool that can incorporate

	multiple sources of data, including customer energy use and demographic data increase the effectiveness of street-by-street outreach. An iPhone app and other GIS tools make lead generation for other energy efficiency programmes possible, and facilitate quick follow-up opportunities specific to the local host utility programmes and household.
	The ENERGY STAR brand is consistently promoted through each campaign, and evaluations showed significant positive participant responses, including: • increased belief that ENERGY STAR products have a positive impact on the environment (Puget Sound) and, • increases in the number of people "very familiar with the ENERGY STAR logo, and can explain what it means to others" (Alberta, Saskatchewan, and British Columbia).
Are these methods acceptable?	No formal complaints have been recorded.

Exemplify

Does the organisation leading the project adopt the same behaviour that it suggests?	No information available

Evaluate (Quantitative and qualitative evidence)

What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	One Change works with third-party polling and research firms for every campaign to verify the installation rate, impact on brand favourables of sponsors, and to identify shifts in attitudes toward energy efficiency, compared to control communities where programme activities did not take place.
	When contacted by evaluators, Project Porchlight participants reporting installing the CFLs that they had received at the following rates: • 74% in Saskatchewan • 70% in Ottawa • 63% in Alberta • 57% in Vermont • 44% in New Jersey • 39% in Puget Sound Increased Participation in Future EE Programmes: In New Jersey, Project Porchlight was used to specifically market a refrigerator early-retirement programme. A review of participant data showed a significantly higher level of participation in the refrigerator programme in areas that had also received Project Porchlight. Project Porchlight staff and volunteers provided flyers and relayed messaging about Jaco's Refrigerator and Freezer Recycling programme to residents of Bergen County. Refrigeration recycling partner Jaco reported that of the 2,000 fridges that they have picked up, 500 were from Bergen County. On average, a Project Porchlight campaign cost approximately $4.4 million and saved 300,000 MWh, for a CSE (Cost of Saved Energy) of a penny per kWh ($0.01). One utility that ran a Project Porchlight campaign, Puget Sound Energy, normally charges 10.37 cents per kWh, but with the campaign they are achieving CSE of less than a penny ($0.009) per kWh. The cost of the Project Porchlight campaign in New Jersey, where 1.3 million doors were reached, was approximately $5.60 per customer, including the bulb.

Do different customers behave differently?	Explore whether different types of customers respond differently to customer engagement methods (e.g. Customers with prepayment have reduced their energy by 0.5% more compared to customers with no prepayment)
How impact varies over the longer term?	No data available for longer term results

Summary (Key learnings and evaluation of the robustness of the study – our view)
Behaviour change initiatives work best if appropriately targeted and delivered by trustworthy and inspiring messengers. Project Porchlight volunteers have proven to be a very effective marketing channel, by enabling peer-to-peer communication and motivating customers to participate in energy efficiency programmes. Community-based social marketing (CBSM) programmes, like Project Porchlight, may not be inexpensive in terms of upfront investment, but their return appears to be high and the payback period is short.

7.2.3 Sacramento Municipal Utility District Home Energy Report Program

Overview	
Programme:	Sacramento Municipal Utility District (SMUD) Home Energy Report Program[193]
Country/region:	Sacramento, United States of America
Period covered:	2008-2011
Stakeholders	SMUD (structured a rigorous experimental design and evaluation protocols for the pilot), Opower (Created and mailed the comparative feedback energy reports), Integral Analytics, INC (Impact and Persistence Evaluation report)
Background:	The objective of the pilot was to test whether, and to what extent, the OPOWER program reduces residential electricity consumption. The reports give customers three types of information: a) how their recent electricity use compares to their energy use in the past; b) tips on how to reduce electricity consumption, some of which are tailored to the customer's circumstances (e.g. customers with electric heat receive information on how to reduce electricity consumption by electric heating systems); and c) most strikingly information on how their electricity use compares to that of neighbours with similar homes.
Aim of customer engagement activities:	SMUD's Home Energy Report Reports are designed to provide motivation, information and education to residential customers about their electricity usage so that they can effectively lower their consumption and their monthly SMUD bill. The Home Electricity Reports are distributed to targeted customers free of charge, monthly or quarterly
Sample size:	Households were randomly assigned between those that receive the Home Electricity Reports (treatment group) and those that do not receive them (control group), by census block. In particular, sets of 5 contiguous census blocks were randomly assigned in turn to the treatment and then the control group until the threshold 35,000 households in the treatment group was reached, at which point the remaining census blocks were assigned to the control group, generating about 50,000 control Households.

Explore	
Is there any customer categorisation in advance?	Most treatment households (24,761) received reports on a monthly basis, and the remainder (9,903) received the reports on a quarterly basis. Assignment to monthly vs. quarterly reports was not random; households receiving monthly reports were generally higher energy consumers than households receiving quarterly reports. For instance,

	among the treatment households examined in the evaluation analysis, 98.8% of those receiving monthly reports consumed more than 20 kWh per day in 2008, whereas only 16.6% of those receiving quarterly reports consumed more than 20 kWh per day.
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	No technical or physical interventions were applied during this project apart from the energy reports that the participants received either by mail or email.
What practical and structural barriers are identified?	No data available on barriers
What is done to alleviate the barriers?	N/A
Encourage (Individual and/or potentially personalised interactions with customers	
What methods are used?	Information: Home Electricity Reports were distributed to targeted customers free of charge, monthly or quarterly, and included: • Last Month Neighbour Comparison • Twelve Month Neighbour Comparison • Personal Comparison • Personalized Action Steps Program participants also had access to the following interactive online tools associated with the program: • A list of energy saving tips customized based on data SMUD has about the household • More detailed information on energy savings tips than what is available in paper reports • Electronically reproduced graphs of neighbour energy use comparisons customizable by time period • The ability to add more information about the household • The ability to set an energy savings goal and track their progress towards reaching the goal • The ability to commit to making specific energy saving improvements as part of a plan for saving energy. Two different report templates and two different envelope sizes were used for the treatment group. The two report template groups were graphical and narrative. Both templates included the same core elements, including graphs with feedback information, but the narrative version included a blurb of text explaining the charts, reinforcing the normative messages, and highlighting tips on how to save energy (including both mentioning tips in the blurbs and pointing the reader toward the personalized tips section on the back of the report). The two envelope types tested included a standard business #10 envelope (similar to the envelope used to deliver SMUD customer bills) and a larger 6" x 9" envelope. An opt-out strategy was followed that resulted in very high participation rates (less than 3% of customers have opted out)
How is the MINDSPACE applied in these methods?	Implementation of the MINDSPACE framework to analyse the methods used to change customer behaviour (e.g. **M**: Opower **I**: No financial incentives offered. It wasn't part of the programme strategy. **N**: See above. Monthly and Quarterly Comparative feedback reports **D**: N/A **S+P+A+E:** the graphic template sent in a #10 business envelope reduced energy usage significantly more (nearly 3% relative to the control group) than the other three combinations (each less

	than 2%). More exploration is needed to determine why this combination of envelope size and template type had a stronger effect. One possible factor is that the #10 business envelopes resemble the envelopes in which SMUD sends its monthly bills, which may have inspired more individuals to open and read the communication. **C**: N/A

Engage (Group interaction/feedback from customers)

What engaging activities take place?	Three energy surveys (online, mailer and phone) were carried out during the evaluation process.
Are these methods acceptable?	No data available.

Exemplify

Does the organisation leading the project adopt the same behaviour that it suggests?	SMUD's own buildings are designed to be energy efficient and reduce their impact on the environment. SMUD's Customer Service Center, at 65th and S streets in East Sacramento, won the highest award given for energy efficiency and environmental design. The Platinum Award from the Leadership in Energy Efficiency and Environmental Design (LEED) was awarded by the U.S. Green Building Council in April 2007. A new corporate yard is under way at Kiefer Boulevard and Bradshaw Road. The East Campus Operations Center will be a LEED platinum certified/zero-energy facility. All new SMUD buildings will be LEED certified at least at the silver level.

Evaluate (Quantitative and qualitative evidence)

What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Three energy surveys (online, mailer and phone) were designed to identify the energy use changes reported by Home Electricity Report recipients that were responsible for producing the energy savings observed in the billing analysis. The most common kinds of behavioural changes cited by survey respondents included the following: • Set your thermostat wisely for comfort and savings • Get the lint out of dryers • Clean or replace air filters • Light only needed areas • Only run washer with full loads • Let the sun in for warmth • Turn off your computer at night Nearly one quarter of survey respondents reported taking behavioural action as opposed to roughly 15% of respondents who reported undertaking structural changes. From an energy savings perspective those structural changes accounted for approximately 40% of the savings while behaviour (including behaviours that interact with equipment) account for 60% of the savings based on engineering analysis. The strategy of sending targeted Seasonal Burst notifications yielded 178 kWh saving annually which is equivalent to 1.2% mean annual savings. The monthly average of about 15 kWh masks the seasonal impacts associated with this approach, which are closer to 25 kWh per month at the height of summer. The strategy also yielded 0.06 kW reductions on summer peak days. Given that this strategy only involved 4 mailers it appeared to be an effective strategy in terms of overall cost effectiveness
Do different customers behave differently?	The impact evaluation process showed that the group selected based on highest annual kWh consumption was saving the most. Year 2 savings = 2.89% for high consumption households (HCH) receiving monthly reports (22% increase over year 1) and 1.70% for low consumption households (LCH) receiving quarterly reports (a 36% increase)

How impact varies over the longer term?	No data available for longer term impact

Summary (Key learnings and evaluation of the robustness of the study)
The evaluation analysis of the programme has shown that Home Electricity Reports had a considerable impact of 2.2 % savings per month per household in Wave 1 and 1.6 % in Wave 2. Another important outcome of the impact and persistence evaluation analysis of the programme (analysis carried out by Integral Analytics, Inc.) lies in the synergistic effect between the Home Electricity report and other SMUD rebate and financing programmes that is observed. It has been observed that participation rate in other SMUD programmes is higher for customers who have been receiving Home Electricity reports (3.1 % versus 2.9% for the control group) even though participation rates generally declined during the years of the pilot programme (years of economic recession).   Home Energy reports can be used to create a relationship between the utility and the customer, which can then facilitate to stronger and more regular interactions such as participation in other programmes offered by the utility.

7.3 Rest of the world

7.3.1 Experimentet

Overview	
Programme:	"Sweden's largest energy saving experiment - Experimentet" - E.ON[194, 195,196,197]
Country/region:	SWEDEN – Nationwide
Period covered:	Between the 1st of February 2012 and the 31st of January 2013
Stakeholders	E.ON Sweden, Department of Energy Sciences at Lund's University (evaluation of the trial), Maingate (developed a measurement tool - display)
Background:	The aim of the "Experimentet" was through various media to visualise the electricity use for the participants and through feedback persuade them to reduce their electricity consumption. The participants saw their electricity use in real time via a display called 100koll (100control) which was connected to a smart meter. In addition, the participants could see and monitor their electricity consumption in real time via an online mobile app. The app visualised electricity in five different periods: economy, challenge, reward, reminder and empathy where visualisation and incentives for reduced energy use varied. The Experimentet was the third part of a larger trial that started in 2010.
Aim of customer engagement activities:	The aim for the customer engagement was to study if the participants could reduce their electricity consumption due to visualisation and feedback of their energy use. E.ON also wanted to trial which of the visualisations worked best. A cute Tamagochi or a game where participants compete against neighbours?
Sample size:	10,000 households
Explore	
Is there any customer categorisation in advance?	To be eligible for the trial, the participants had to be EON customers, have a yearly consumption of over 10 000 kWh of electricity and should not have moved during the project period. Participants had to be under the age of 75. Two groups were created depending on the information access of different participants: - Participants who met all criteria "active participants" were analysed using the two different models. - Participants who partly met the criteria were analysed using only one model in which heating method was not given.
Enable (technical and physical interventions taken to change behaviour)	

What different technical or physical measures are offered?	1. Visualisation display for each participant, 2. Smartphone Apps, 3. Campaign website, 4. Facebook page
What practical and structural barriers are identified?	There was an over-reliance on the hardware being perfect and therefore no real investment in 1st line customer support. This initially provided a poor experience for participants. Some participants never installed the equipment or answered the surveys. Lack of household information (only 50% of participants filled in the details of the heating method and family composition) given during the gathering surveys reduced the accuracy of the results. Participant's engagement reduced over time.
What is done to alleviate the barriers?	E.ON did house visits and assisted people on the phone. Up to two email reminders were sent out to the participants who didn't reply to the internet survey questionnaires. E.ON increased efforts and improved questions to be better structured to avoid being misinterpreted. E.ON tried to constantly evolve and adapt different messages to keep customers engaged.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	Information / Incentives: **A campaign website with data visualisation** - enabled people to monitor and follow their progress, identify who had saved the most energy, compare different parts of the country, share their energy saving tips, compare your own energy consumption and compete against others with similar homes etc. The content of the website also existed on a smartphones app. **Smartphone App** - connected to participant homes showing real time power usage. The data collected was then visualised in five different ways, each one during a specified period to motivate the participants and increase their understanding and knowledge. **Facebook page** dedicated to the "Experimentet". The Facebook-page then became more and more a self-help forum for its subscribers. **Traditional media** – E.ON took the best tips from the public and turned them into outdoor display units, TV-spots and even a book **Internet surveys** (questionnaires) via email to the participants.
How is the MINDSPACE applied in these methods?	**M**: even though EON knew that trust by participants remained an issue, they decided to be the messenger. **I**: applied through offering free smart applications to participants and especially through the Economy app ("real money"). **N**: the campaign website displayed all participants progress which could be followed/compared (influenced by others). The "challenge" application used peer-pressure **S**: participants were attracted by new innovative ways off energy use visualisation. **A**: Emotion was applied through the a cute Tamagotchi app whose health depended on each user's energy consumption habits. **C**: Commitment was applied by setting up energy saving targets and by the "reminder-app". **E:** The ego was applied through the reward application (best tips turned into social-media "seen by everyone") and The"battle" application- (winners and losers). Participants energy consumption was also displayed on website and other participants would see how others were doing.
Engage (Group interaction/feedback from customers)	
What engaging activities take place?	**Surveys** The "Experimentet" was divided into 3 stages including different surveys. - Stage 1: Focused on summarising the current knowledge regarding feedback and behavioural change within the field of energy consumption

	to create a theoretical foundation for the evaluation of the "Experimentet". - Stage 2: Studied if the participants had reduced their electricity consumption and by what means, both behavioural and technical, they have done so. - Stage 3: Studied the participants experience of the "Experimentet" and their feelings about participating. It determined the final electricity savings among the participants, and conducted interviews for deeper analysis. **Facebook engagement:** People left critical comments as well as positive comments about EON and the project on the facebook page. **Traditional media:** As a follow up on the reward app "Moroten" (the carrot) where participants contribute their own energy-saving tips and the best and most innovative was rewarded. This method also included a form of competition.
Are these methods successful?	The response rates of the internet email surveys varied depending on which group of participants it was addressed. The response rates were always high in the "active group" but lower in the "overall group" The engagement rate both for the survey response and utilisation of the smart apps decreased with time (confidential data). Participants changed their habits and **lowered their energy consumption by an average of 12%.** In the end of the experience : - 40% of the participants saved an average of 8.14% - 22% of the participants reached the goals they had set up the year before saving an average of 14.88%

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	Many of E.ON's employees participated in the trial. Moreover, E.ON have adapted high energy efficient measures in their offices in Sweden

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	The participant's electricity consumption data between 1st of February 2012 to the 31st of October 2012 was compared with the same time period during 2011, with the objective to study a possible decrease in electricity use.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	Even thought EON was the messenger, the over all reduction of energy use was 12%.
Do different customers behave differently?	It turned out that the most common reason to participate in "experiment" was interest in technology followed by reduced electricity costs and reduced environmental impact. Men were more interested in the technology and women in the environmental impact More participants performed behavioural changes, 74%, than technical measures, 66 %. Participants who set high energy targets tended to reach their goals better than other participants.
How impact varies over the longer	Some of these impacts results are confidential, however ss a result of this trial, Eon will soon be launching new innovative energy management

term?	services (control of home devices, Automation and remote steering of home devices etc) aimed at enabling a cheaper lifestyle for consumers.

Summary (Key learnings and evaluation of the robustness of the study – our view)
The Experience showed that participants needed to know why and how technology could reduce their energy consumption in order to participate. Another learning was that to constantly renew and stimulate the communication have a positive impact on the loss of interest by the participants. Finally, one size does not fit all and messages had to be varied so that participants did not get bored with messaging.

7.3.2 "Målerjagten" ("The Meter Hunt")

Overview	
Programme:	"Målerjagten" ("The Meter Hunt") - competition[198,199,200]
Country/region:	Denmark - nationwide
Period covered:	The "Målerjagten" competition went live on 1st January 2009 and is still ongoing.
Stakeholders	SEAS-NVE which is Denmark's largest consumer-owned energy company (delivery of energy and communication services to customers in Denmark).
Background:	The "Målerjagten" or "Smart meter Hunt" project was a combined smart meter rollout and demand reduction project. Målerjagten was designed using data from the campaign called "Use the energy better" in 2006 enabling SEAS-NVE to pinpoint certain needs and interests. Consequently, Målerjagten was designed around the consumer's own home and participants being able to win a large sum every month. The aim of the project was to both familiarise customers with smart meters and to take advantage of initial interest to get immediate and sustained electricity demand reduction both in overall demand and in peak demand. The back drop of this project is that Denmark is pursuing aggressive renewable energy target and expects to have 50% wind power in the grid mix by 2020.
Aim of customer engagement activities:	The purpose of the competition "Målerjagten" or "The Meter Hunt" was to convince customers to read their smart meters frequently and to submit the readings via web or text messages in the aim of reducing energy consumption by raising involvement and awareness among the contestants.
Sample size:	When Målerjagten went live in 2009 there were more than 25,000 sign ups to the competition. Today there are more than 44,000 subscribers, and this number is growing by the day.

Explore	
Is there any customer categorisation in advance?	No.

Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	**Website:** All information about the project could be found at this webpage. **My Meter webpage:** was and remains the personal page in Målerjagten where participants log in and enter smartmeter readings and follow their electricity consumption etc.
What practical and structural barriers are identified?	The participants were already used to metering equipment, no structural or practical barrier were identified. Practically, SEAS-NVE recognised customers had busy lives and financial rewards were designed to encourage participants to prioritise the project.

What is done to alleviate the barriers?	The competition was designed to be quick and easy for contestants and they could submit meter readings via the web page or via sms.

Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	Information: Website: The Målerjagten website serves as an important customer communications platform. My meter page: gives participants an effective overview of their electricity consumption. Different communication messages: SEAS-NVE believed that a mix of messages around energy use created more interest than only communicating the chance to win the monthly prize. Incentives: Reward: In addition to being a practical tool, Målerjagten is also a contest where participants stand a chance of winning cash every month. Fame: Each month's winner is announced on the front page of the Målerjagten website (www.maalerjagten.dk) and through PR initiatives, which has led to considerable coverage.
How is the MINDSPACE applied in these methods?	**M:** SEAS-NVE is based on a consumner owned energy company offering membership and ownership – which enabled trust. **I:** The competition offers financial incentives: to win a large sum of money every month, but also to reduce energy bills by becoming aware of energy use (up to 17% savings). **N:** The website offers benchmarking of contestant's energy consumption and relevant statistical figures to estimate household with energy consumption compared to average (also EGO). **S:** the competition designed the "my meter page" to be as easy and accessible as possible. **A:** The communication of the competition was made through different kind of social media with varied messages to stimulate people to take part in the project. **C:** People were asked to commit their meter readings in order to have a chance to win the reward and to get personalised feedback on their energy consumption. **E:** The ego is applied through the announced of the winner of the monthly award on the front page of website and through PR initiatives, this was appealing even if even if the chance of winning the reward was small.

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	SEAS-NVE use a wide range of social media to engage with the wider public. The campaign website was and is the heart of the project.
Are these methods successful?	After almost a year of running the competition, the average contestant has lowered his or her energy consumption by no less than 17% compared with the year before.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	Responsibility and a pioneering spirit are two fundamental elements of SEAS-NVE. The responsible pioneer today embraces innovation but also a responsibility that makes this company act in a well thought out and careful manner.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	The project analysed participants' smart meters readings and made historical comparisons of consumption data. No control group was used as this project was designed to maximise participation.

What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	**M:** The messenger in this project made a difference to the success of the project as the co-operative values encouraged people to participate. **I:** The financial incentives were key : to win a large sum of money monthly reward and reduce energy bills **N:** Participants were influenced by benchmarking on the website **S:** The concept of creating a user friendly website tool **A + P:** The communication of the competition through different kind of social media with varied messages was key to for engagement. **C:** People are asked to commit their meter readings in order to have a chance to win the reward and to get personalised feedback on their energy consumption – (reciprocity) **E:** The ego is applied through the announced of the winner of the monthly award on the front page of website and through PR initiatives.
Do different customers behave differently?	It has not been possible to obtain this information.
How impact varies over the longer term?	The financial reward ensured sustained savings.

Summary (Key learnings and evaluation of the robustness of the study – our view)
Målerjagten proved that with big incentives it is possible to create energy awareness leading to energy savings.

7.3.3 Perth Solar City

Overview	
Programme:	Perth Solar City[201,202]
Country/region:	Western Australia within Perth's Eastern Region.
Period covered:	November 2009 - September 2012 (end of the community participation phase)
Stakeholders	Western Power (Western Australia's largest electricity distributor -lead consortium), other members : Botanic Gardens and Parks Authority, Eastern Metropolitan Regional Council, Mojarra, Prospero Productions, Solahart, SunPower and Synergy
Background:	Perth Solar City is the most comprehensive residential energy efficiency initiative in Western Australia. The program was managed by Western Power utility on behalf of the Department of Climate Change and Energy Efficiency, as part of the Australian Government's Solar Cities initiative. The broad-reaching Program developed and implemented more than 30 energy efficiency and renewable energy projects designed to help residents reduce their energy use, save money and help the environment. To deliver a program of this scale, a consortia approach was used to bring together innovation, diversity and industry-leading expertise for the community. This consortia worked together to deliver a quality program to households.
Aim of customer engagement activities:	The aim of customer engagement was to help residents reduce their energy consumption, especially at times of peak demand, by providing customers with greater visibility and control over their energy use as well as generating some of their own energy. Western Power also wanted to test Smart Grid technology to identify the benefits to consumers and the network and wanted to understand the best approach to reach customers by focussing on the different means of customer communication. The trial wanted to identify and understand barriers to the successful uptake of energy efficiency and renewables in the residential sector.
Sample size:	16,283 households participated in the Perth Solar City program .

Explore	
Is there any customer categorisation in advance?	All residents within the Perth metropolitan region were eligible to participate in the Program. However, as Perth Solar City included a wide range of initiatives, a special categorisations of participants / or targeted households could be relevant depending on the different trials requirements. The program also included 17,082 households used as a control dataset.
Enable (technical and physical interventions taken to change behaviour)	
What different technical or physical measures are offered?	Many different technical and physical interventions were offered by Western Power and other members of the consortium to enable programs ranging from solar energy, new network technologies and behaviour change programs. **Technical interventions** Installations of smart meters (over 9000), In Home Display (IHD) and different Smart Grid communications infrastructure specific to each trial with communication technology. **Enablers for the Engagement Trials** (marketing, Behaviour change, home Eco-consultations, Iconic Projects, Demonstration Projects, Schools Engagement) : 　　-**'Collective Impact' campaign :** an accompanying broad reach marketing strategy 　　- **Eco coaches:** personal advice from coaches forming part of the 'The Living Smart' program (behaviour change program) 　　- **The Home eco-consultations trial :** enabled participants to better understand their energy consumption. 　　- **Demonstration projects:** The installations were designed to educate the local community about the benefits of energy efficiency and renewable energy. **The Perth Solar City Program Office:** A programme office run by Western Power that was responsible for overall program management, including customer service, project reporting, marketing, communications, media, community engagement, quality assurance, qualitative evaluation and data management. This helped to ensure that although multiple parties communicated with customers, a consistent approach was applied.
What practical and structural barriers are identified?	**Practical barriers** The main barrier was that participants didn't understand the equipment installed. There were also a range of commercial issues with the specific equipment, for example households that installed solar PV received greater incentive to feed electricity into the grid, rather than using it directly to offset their own consumption as the trial had envisaged. **Engagement barriers** Broad reach marketing alone was not enough to generate significant referrals for products and services. In attempting a wide and comprehensive trial approach, not enough thought went in to the alignment of technical and engagement trials and this created a barrier to participation.
What is done to alleviate the barriers?	When it became obvious that a broad education-based engagement strategy was not sufficient to ensure participation in the trials, this strategy was revised and more specific engagement designed to ensure participation. This engagement was rolled out by multiple parties under the management of the Perth Solar City Program Office.
Encourage (Individual and/or potentially personalised interactions with customers)	
What methods are used?	**Information** "Collective Impact": Positioned Perth Solar City as the educator and enabler for households on their energy efficiency journey. Eco coaching: phone-based eco-coaching to support participants to reduce their energy, water and transport use and set simple and measureable targets for the household through the establishment of 'social contracts'.

	The Home eco-consultations trial : a 90 minute Home Eco- Consultation (HEC) to understand what was contributing to participant's energy consumption and enable participants to make better informed decisions about energy efficiency and renewable energy. **Incentives** An attractive rebate was offered on particular solar PV systems and on solar thermal systems to encourage households to install these systems.
How is the MINDSPACE applied in these methods?	**M:** Western Power recognised they needed to leverage trust from other programme partner organisations and not control the engagement themselves. A multiple messenger approach was used to maximise the messages under the auspices of the "Perth Solar City-program". **I:** The program offered financial incentives such as reduction on solar systems. Other incentives were to install energy efficiency measures enabling a lower energy bill. **N:** Project was a large scale programme part of the Australian Government's Solar Cities initiative. Even non participants would be influenced by the broad reach marketing (social media) **P:** Five solar PV installations at iconic Perth locations and demonstration projects designed to educate the local community **S/A**: broad range of different social-media and communication was used to reach different kind of people. The concept of being part of the future and a new technology project as well as a collective change was used as a means of encouraging participation. **C:** The programme tried to secure participant commitment, for example by setting up energy reduction targets for the household (eco-coaching trial). **E:** The programme presented participation as a positive action and attempted to get participants to identify themselves with this positive self image.

Engage (Group interaction/feedback from customers)	
What engaging activities take place?	The Government and Utility worked together to communicate the programme to customer prior to the start of the trials. This was the broad based information campaign given credibility by the combined government and utility message.
Are these methods successful?	This campaign encountered very little opposition and engagement activities were well received.

Exemplify	
Does the organisation leading the project adopt the same behaviour that it suggests?	The demonstration projects played a part in building support for the programme by exemplifying the desired participant behaviour. While not all organisations in the programme could be said to exemplify the required actions, this was a strong signal to the community.

Evaluate (Quantitative and qualitative evidence)	
What methods are used to assess the impact of different approaches?	The analysis focused on evaluating the results of the trials, not evaluating the results of the engagement.
What is the impact of particular behaviour change effects relating to elements of MINDSPACE?	**M:** The most important aspect of the MINDSPACE utilised in this trial and a key determinant of success was the understanding of the importance of the messenger. Western Power recognised they needed to leverage trust from other programme partner organisations and not control the engagement themselves. **I:** financial incentives were also important **N:** By placing programme in the broader strategy of solar power uptake, the programme used norms to influence participation. **P:** Visual priming was successfully used at iconic Perth locations.

	S/A: broad range of different social-media and communication was successful in encouraging participation. **C:** energy reduction targets for the household were successful in ensuring commitment. **E:** was used to a limited extent but was not key to success.
Do different customers behave differently?	It has not been possible to obtain this information
How impact varies over the longer term?	The programme is no longer being monitored and longer term impacts are difficult to evaluate. This programme was implemented during a mining boom in Western Australia that had seen rapid growth in peak demand ahead of build out of necessary generation and delivery infrastructure which was a key motivator for the programme.

Summary (Key learnings and evaluation of the robustness of the study – our view)
The key lesson from the Perth Solar City program is that without fostering customer participation through education based community engagement, the successful deployment of new technologies and energy efficiency programs will be compromised. More than anything else, this project demonstrated the power of the messenger in engagement activities. Western Power did not seek to control all the messages about the programme and gave project partner flexibility in message delivery within a broadly established framework. Enabling key messages to be delivered by multiple trusted parties drove the success of this multifaceted programme. Without the tremendous contribution of programme partners, the success and benefits of the Perth Solar City program would not have been realised.

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