SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Dundalk 2020

Advanced Metering Demand Side Management Behavioural Trial

Case Study

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Contents

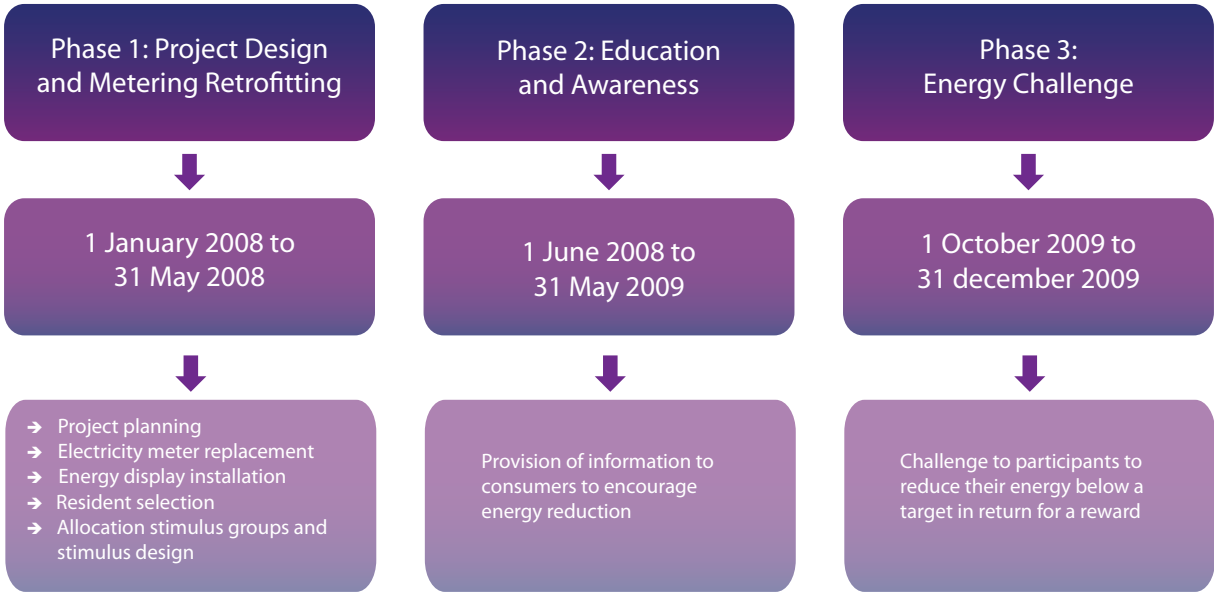
1.1 Introduction

The demand-side management (DSM) Behavioural Trial was one of a number of projects carried out under the Dundalk 2020 Project in the period 1 June 2008 to 31 December 2009. Based in Dundalk, it involved 200 residents from the Muirhevena Mór local authority estate. Partners on the project were the Sustainable Energy Authority of Ireland (SEAI), Dundalk Town Council, ESB Networks and ESB Electric Ireland (known as ESB Customer supply at the time of the project).

DSM activities are vital for Ireland to meet its sustainability targets and objectives. The DSM Behaviour Trial is intended as a practical case study involving a partnership approach to testing low-cost solutions for influencing behaviour and demand reduction. It explored the success of different interventions and communication at various stages with the particular social group involved.

While it is recognised that some of these interventions may not be economically possible on a larger scale, the case study highlights the correlation between support, engagement and reduction in electricity demand. It also identifies a consumer learning journey and engagement process, as well as how best to communicate with this specific demographic group. Each of these learnings has important implications for any future DSM Programme and, indeed, they have already been considered in the development of the National Smart Meter Trial.

The DSM Trial had three main phases:



1.2 Results of the DSM Behaviour Trial

The main findings may be summarised as follows:

1.2.1 DSM Impact

- The overall energy reduction achieved when adjusted for group bias was 11.2%, and of this 6.4% can be attributed solely to the Education/Awareness phase and a further 4.8% to a combination of the Education/Awareness phase and the Energy Challenge Phase.
- One-third of the residents achieved or exceeded both the overall and peak targets in the Energy Challenge.
- Overall, a 4.8% reduction in total energy and an increase of 2% in peak energy was achieved during the Energy Challenge Phase.
- Despite regular support and intervention, approximately 50% of participants in the DSM Trial did not fully engage. Reaching this group will present a challenge in a larger-scale implementation of DSM programmes where less intervention may be possible.

1.2.2 Meter Installation Programme

- The GSM[1] technology used in the Trial was shown to be 97% reliable. The meters were found to be 100% reliable.
- Installation of the meters highlighted a number of issues in relation to meter housing, wiring and labelling, and the use of the in-home display energy monitor. These findings are being managed by ESB Networks as the owner/meter operator.

1.2.3 Consumer Behaviour

- The DSM Trial succeeded in creating a perception of ownership, responsibility and control of household energy use, which is strikingly different to the perception of lack of control and responsibility prevalent among the larger community. This was evidenced in particular from the Focus Group survey feedback.
- The Energy Challenge participants followed a well-defined learning journey, which included a skills acquisition period (1 – 2 months); reinforcement and embedding of behaviour changes; and an indeterminate period of sustained behaviour changes.

1 Global System for Mobile Communications

2.1 Dundalk 2020 Vision

Dundalk is Ireland's first sustainable energy community under SEAI's Sustainable Energy Communities (SEC) Programme. The vision of the Dundalk 2020 project is "***to stimulate a national move towards sustainable energy practice through demonstration in an exemplar community***". SEAI has created a SEC blueprint based on the success of Dundalk 2020 and plans to create an additional five SECs in Ireland over the next five years.

The Dundalk 2020 Sustainable Energy Community is a living laboratory which demonstrates how different energy technologies and techniques can be used in an intelligent and integrated way within the community to bring together what were individual projects and individual plans. It involves local authorities, agencies, professional organisations, businesses and local community groups, with the aim of reducing energy use, achieving energy-efficiency targets and installing renewable energy where feasible. These initiatives are integrated, monitored and analysed at a local level. SEAI acts as the catalyst in creating networks and action groups, and in working with the various parties to help achieve the stated goals.

2.2 HOLISTIC

Dundalk is a demonstration community under the EU CONCERTO initiative (part of the EU Sixth Framework Programme for Research and Technological Development). SEAI coordinates a consortium called HOLISTIC ***(Holistic Optimisation Leading to Integration of Sustainable Technologies in Communities)***, which aims to stimulate a paradigm shift in the use of energy within communities to more sustainable patterns.

The HOLISTIC communities are Dundalk, Mödling (Austria) and Neuchâtel (Switzerland). Three associated communities observe and learn from best practice; they are Newry (Northern Ireland), Aachen (Germany) and the Italian Ministry for the Environment. The EC has committed €10.7 million to the HOLISTIC consortium.

The DSM Behaviour Trial has been part-funded by the CONCERTO initiative.

3.1 Introduction

The DSM Behavioural Trial was one of a number of projects carried out under the Dundalk 2020 Project in the period 1 June 2008 to 31 December 2009. Based in Dundalk, it involved 200 residents from the Muirhevena Mór local-authority estate. Partners on the project were the Sustainable Energy Authority of Ireland (SEAI), Dundalk Town Council, ESB Networks and ESB Electric Ireland.

The trial objectives were to:

- Assess the behavioural response of a trial group of 200 residential consumers within the 4km2 energy zone in Dundalk to a range of DSM stimuli, using 15-minute interval usage data from electronic electricity meters.
- Provide input to the Electricity User Trial of the National Smart Meter Programme (which began on 1 July 2009)
- Provide exemplar information for DSM implementation from the perspective of a community

Design of the DSM Trial took place in the first six months of 2008. Implementation and engagement with the 200 participants took place from 1 June 2008 to 31 December 2009.

3.2 Participant Profile

Dundalk Town Council is one of the largest housing authorities in the country, with over 1,300 homes in its social housing stock. The Muirhevena Mór estate is one of the larger social housing developments in the area. Over the past decade some of the houses have been bought by the residents. The estate now has a mix of approximately 50% public and 50% private ownership. The householders are defined, for the purposes of this trial, as in the C2DE social grade.[2]

As part of the Dundalk 2020 Programme, interval meters were installed in 200 homes in Muirhevena Mór. These devices recorded energy usage every 15 minutes and fed the results back to ESB Network's remote data collection system by polling each meter every two days. This data was then transferred, on a monthly basis, to ESB Electric Ireland to analyse and produce the monthly energy usage statements.

The findings of the DSM Behavioural Trial can be used to understand the behaviour of the C2DE social grades as distinct from other groups in society. As the C2DE group represents approximately 50% of the total population, however, these learnings are a useful source of information for similar initiatives.

Figure 1: Location of the Dundalk Sustainable Energy Zone and homes participating in the DSM Trial

2 C2DE is defined in the National Readership Survey social grades system. While originally defined to classify readerships of newspapers and magazines, the grading is generally used in market research. C2DE includes:
C2:Skilled working class – eg, foreman, plumber, bricklayer;
D:Working class – eg, manual workers, shop workers, fisherman, apprentices; E: Unskilled working class – eg, casual labourers, state pensioners.

3.3 Project Management Structure

3.3.1 Partners in the DSM Behavioural Trial

SEAI, ESB Networks and ESB Electric Ireland collaborated closely on the DSM Behavioural Trial. Work was planned and reported on through the DSM Action Group which was established to oversee this project. SEAI and ESB Electric Ireland jointly developed the various initiatives and communications to customers. Since, initially, all participants were their customers, all communications, bills and monthly usage statements issued from ESB Electric Ireland. ESB Networks received funding from the EU and from SEAI to install and maintain the infrastructure.

3.3.2 DSM Action Group

Management of the DSM Trial was carried out through the DSM Action Group (DSM AG). It reported to the Dundalk 2020 Steering Group. Regular and structured monthly meetings were held and minutes/records of all meetings were accounted for and agreed by the meeting participants.

3.3.3 Residential Stakeholders

Success of the DSM Trial involved two key components – the successful retrofitting of meters and data exchange, combined with behavioural change by participants. To support these two objectives, a partnership approach was adopted with the residents of Muirhevena Mór. This involved regular interaction with representatives of the residents association, to ensure they were fully briefed on new initiatives and that their feedback on planned and existing interventions was gained. It is recognised that such close interaction may not be economically achievable on a larger scale. However, the advantage of the approach was that it provides in-depth and measurable feedback on the best way to communicate and engage in future DSM trials of this type.

3.4 Structure of the DSM Behavioural Trial

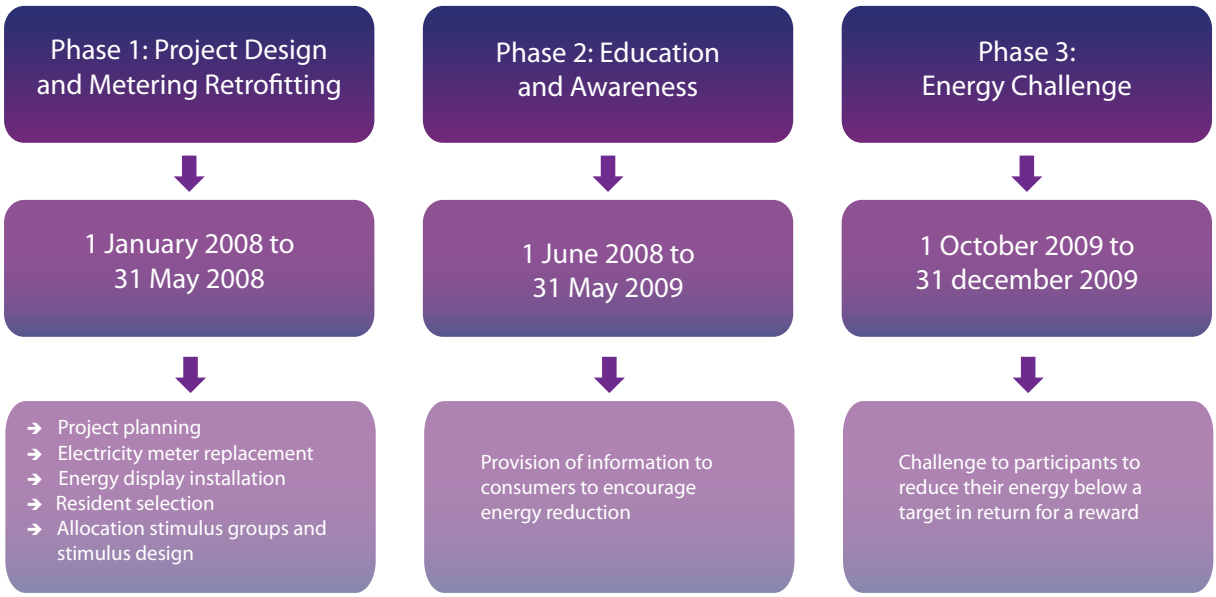
The DSM Trial was structured into four groups of 50 households. Group 1 acted as the reference or control group; Groups 2, 3 and 4 were provided with different stimuli in order to assess their impact on behavioural change, as shown in Table 1.

Table 1: Allocation of Stimuli by Group

Group 1	Stimulus Group 2	Stimulus Group 3	Stimulus Group 4
Reference or Control Group	Education & Awareness Advice	Education & Awareness Advice	Education & Awareness Advice
	In-Home Energy Display Monitor	Monthly Energy Usage Statement	Monthly Energy Ussage Statement
			In-Home Display Monitor

In creating the groups, every effort was made to ensure that overall consumption and group profiles were similar (for example, similar number of free electricity customers, token-meter customers, etc). However, due to data communication issues it was necessary to move some participants from the group to which they were initially allocated, which led to some imbalance in group profiles. This has been taken into account when analysing the results (see Section 4 below).

The DSM Trial comprised three distinct phases:



Assessment and review took place throughout Phases 2 and 3 by means of analysis of actual energy consumption patterns and surveys. Details of the four groups and the test stimuli are outlined below.

3.4.1 Participant Groups

3.4.1 Description of the Stimuli

Three different stimuli were developed for the DSM Behavioural Trial:

Education & Awareness Advice

Each Stimulus Group received information and advice on how to reduce their electricity use. This was developed and provided to participants by ESB Electric Ireland in collaboration with SEAI.

In-Home Display Energy Monitor

Groups 2 and 4 received an in-home display energy monitor, hereafter referred to as IHD. This allowed consumers to track how much electricity they were using and helped them to identify how to save money by using appliances less or turning them off.

Participants particularly valued the 'real time' screen, as opposed to the cumulative screen, even if it was shown in kWh. This was because it provided an instantaneous indication of change in energy use and, by inference, an indication of increase or decrease in the cost of their electricity use.

Monthly Energy Usage Statement

Groups 3 and 4 received a monthly energy-usage statement providing more detailed information on their electricity use. This showed how much electricity they used at night, during the day and in the peak period, and provided advice on how to reduce it. The tips included on the statement also helped them to avoid 'rush hour' peak time and provided advice on reducing overall usage by comparing highest and lowest-usage days (see Appendix A for an outline of a typical statement).

3.4.2 Project Phases

Project Design and Meter Retrofitting

Much work took place from 1 January 2008 to 31 May 2008 in establishing the structure of the DSM Trial. Work included substantial interaction between the project partners in the design and development of the trial structure and in project planning.

The Muirhevena Mór estate was selected, in cooperation with Dundalk Town Council, and work on replacing the electricity meters took place. Participants were allocated to the different stimulus groups. Groups 2 and 4 received and were trained in the use of the IHD. Finally, the energy-usage statement was designed and developed, and ready for issue during the Education and Awareness Phase.

Customer insight and feedback was an important aspect of this trial. Ad hoc but frequent communications took place with the residents association and individual householders. Two focus groups were held, complemented by one door-to-door survey.

Education and Awareness Phase

The active phase of the DSM Behavioural Trial commenced on 1 June 2008 and the participants received their first energy-usage statement in July (Appendix A). This statement provided participants with:

- breakdown of their electricity use by time of day
- tips on energy reduction
- information on the amount of units used by different appliances

Following focus-groups meetings in November 2008, this statement was further amended to incorporate feedback from participants. To avoid confusion, the phrase *This is not a bill* was used on each monthly statement as each participant of the Trial continued to receive their bi-monthly electricity bill.

Groups 2 and 4 were also asked to use their IHD during this phase. Advice and support was provided to participants on the use of the IHD.

Throughout the Education and Awareness Phase, interaction took place with the participants and with the residents association representatives. Their feedback was used to further refine the approach to engagement, particularly prior to the Energy Challenge.

The Energy Challenge Phase

At the end of the Education and Awareness Phase, it was considered worthwhile to test a further intervention. This intervention, The Energy Challenge, encouraged participants in Groups 3 and 4 to perform better than a set target, in return for which they would receive a credit to their bill. The resulting behavioural change in this phase was a combination of the impact of the earlier Education/Awareness building from phase I and the Energy Challenge from this phase.

The Energy Challenge took place from 1 October 2009 to 31 December 2009. It involved setting an overall energy-reduction target of 15% and a peak-energy reduction target of 10%, as compared to each resident's energy usage in the same period of the previous year. In return for achieving or outperforming both targets, participants received €40 off their electricity bill. This was based on:

- €25 for achieving the overall energy target
- €15 for achieving the peak energy target

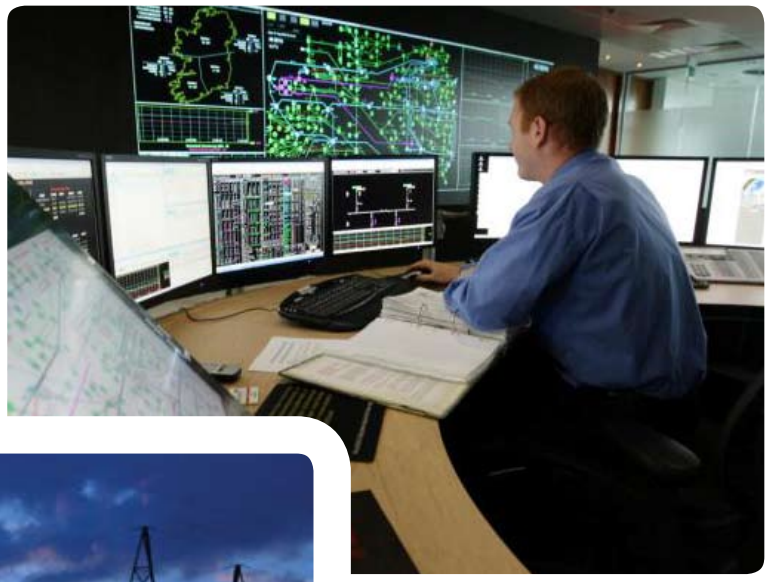
They were provided with a monthly statement of their progress, albeit for quite a short period (three months).

In addition, the monthly energy-usage statement was developed further and extra assistance was provided on using the IHD.

Note Group 2 did not participate in the Energy Challenge. The Energy Challenge took place over a 3 month period and centred on the use of the monthly statement. As Group 2 did not receive a monthly statement the time period involved was prohibitive to familiarising the Group with the monthly statement.

3.5 Trial Considerations

Competition for customers in the residential electricity marketplace increased in the middle of 2009, resulting in much customer switching nationally. This level of switching was also evident in Dundalk following targeted marketing and door-to-door campaigns by competing electricity suppliers. While there was natural movement of residents in the trial due to change of tenancy/ownership, the single largest contributor to movement was due to supplier switching, with over 20% of those participating in the DMS Trial switching supplier during the last six months of the trial. The effect of this activity may also have been felt by those who remained with ESB Electric Ireland, leading to an increased focus on the cost of electricity and value for money.



4.0 Results

The DSM Behavioural Trial was implemented over the period June 2008 to December 2009. The last three months of 2009 involved the implementation of the Energy Challenge. Notwithstanding the relatively small number of residents (200) compared to the national population of domestic electricity users (1.96 million), some clear outcomes were achieved:

- The overall energy reduction (when adjusted for group bias) was 11.2%. Of this, 6.4% can be attributed to the Education and Awareness phase and 4.8% to the Energy Challenge phase.
- The Energy Challenge achieved an overall reduction of 4.8% and an increase of 2% in peak energy.

Detailed results and findings are analysed under three headings:

- Changes in electricity usage and behavioural patterns
- Findings in relation to data communications and metering
- Customer insight and feedback during the trial

4.1 Change in Electricity Usage and Behavioural Patterns

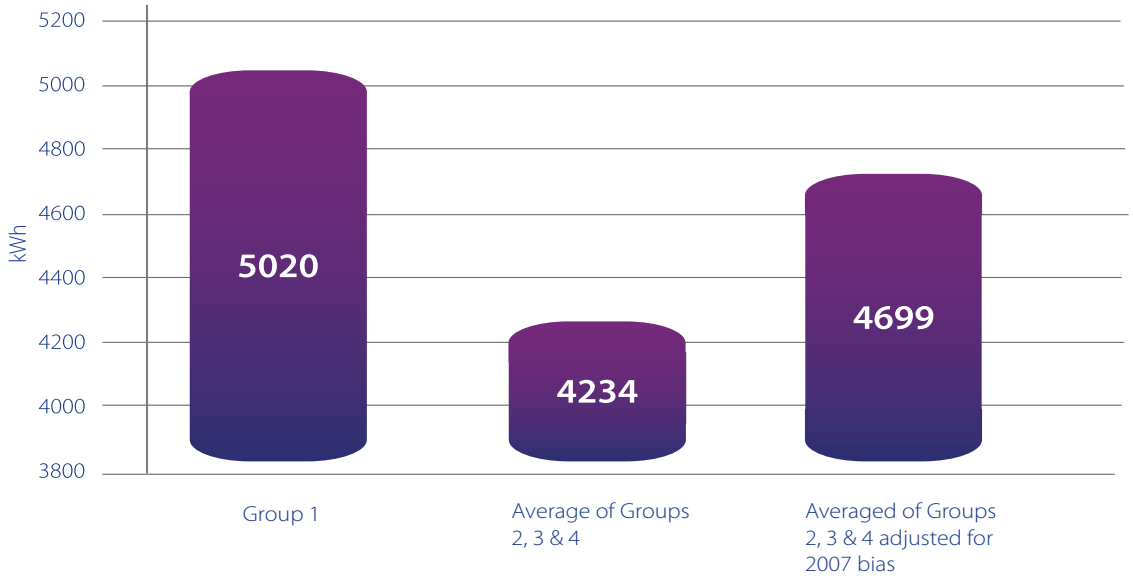
The results of the DSM Trial are based on an analysis of the changes in electricity consumption of the three stimulus groups, compared to the reference group, for the 12 months June 2008 – May 2009. This was supplemented with an analysis of change in usage during the Energy Challenge period (October – December 2009) compared with the same period in 2008. Finally, the focus-group survey identified qualitative and behavioural changes which were also incorporated into the results.

4.1.1 Change in Electricity Consumption June 2008 – May 2009

On initial analysis, the energy usage in kWh among the stimulus groups appears to be lower by 15.6%. However, although every effort was made to have directly comparable groups in terms of usage history, issues with data communications emerged in the early stages of the trial. Houses with data communications issues were thus moved to Groups 3 and 4. This, in effect, introduced some bias between the different groups.

To counteract this, an analysis was carried out of the usage of each group during 2007. This was then compared to the changes in behaviour during the trial. Adjusting for the bias between the groups and 2007 energy usage, it can be seen that the usage by the stimulus groups was 6.4% lower than the reference group in the period June 2008 to May 2009.

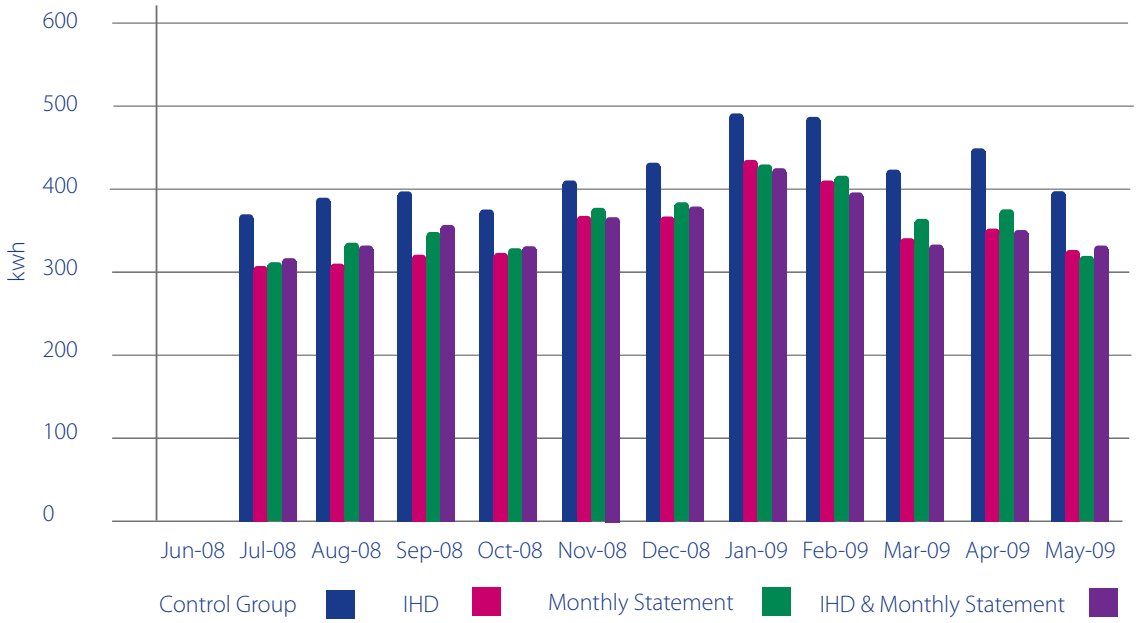
Figure 2: Average Consumption of Stimulus Groups compared to Reference Group, Adjusted for Ratio of 2007 Baseline Usage



At the early stages of the trial, it appears that IHD had a more positive influence on the behaviour of the householders, but by month 6 the effect of this stimulus lessened. From this point onwards the combined

stimulus of the IHD and monthly statement had a more positive impact. This data is reinforced by anecdotal comments during focus-group sessions.

Figure 3: Averaged Electricity Consumption per Stimulus Group in Comparison to Control group



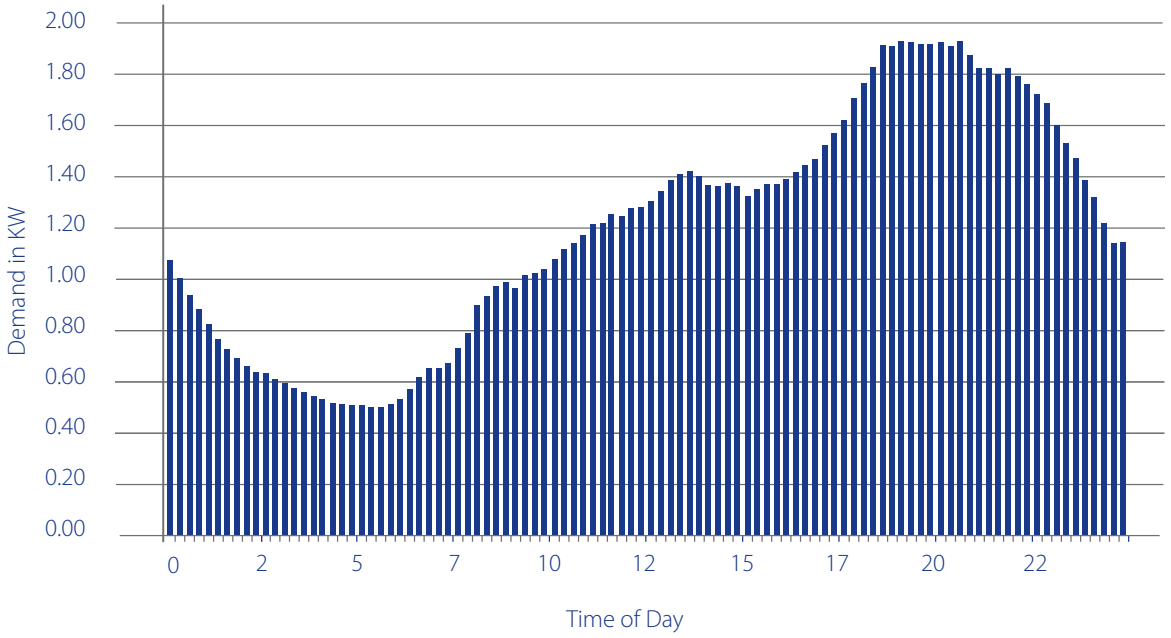
The energy usage of each of the three stimulus groups suggests a clear pattern of reduced consumption relative to the control group (Group 1). The winter months clearly have higher energy use; this was particularly the case in January and February of 2009. The reductions achieved by the three stimulus groups were sustained over the duration of the trial. This is supported by the focus-group findings.

Daily Profile

The daily profile of participants was analysed as part of the DSM Trial and this provided some useful learnings:

- The demand profile follows a similar pattern to those published nationally for the domestic tariff category – publicly available on the Retail Market Design Service website: http://www.rmdservice.com/guidance/standard_load_profiles.htm

Figure 4: Daily Demand Profile for Reference Group - kW averaged over period June 2008 to May 2009



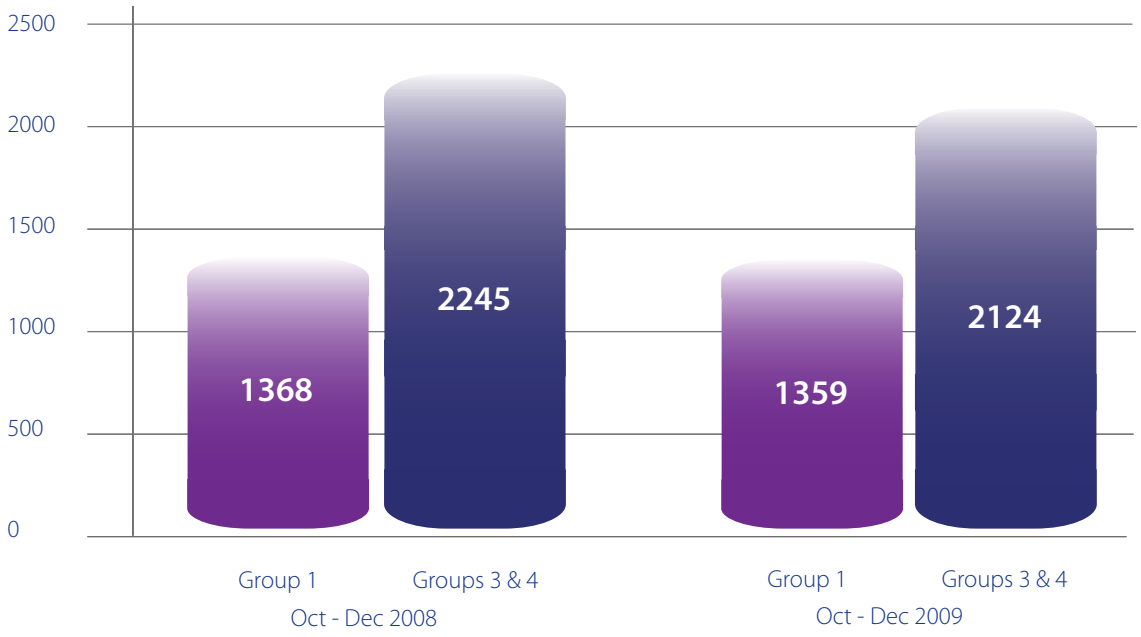
- Peak energy use for trial participants extended from 17.00 to 19.00 though the actual energy profile suggests a sustained level of usage from 17.00 until 21.00.
- Night-time demand was found to have a narrower timeframe than would be expected at typically 4.5 hours of low energy use between 2.30 and 6.00.
- Mid-day peak is not well pronounced, unlike the national demand energy profile as published by EirGrid.
- Demand for the groups fluctuates from 0.25 kW to almost 1 kW. It should be noted, however, that these residents have natural gas as their main source of heating.

4.1.2 The Energy Challenge: Change in usage October to December 2008 and 2009.

Analysis of change during the Energy Challenge is based on the data analysis provided by ESB Electric Ireland for the relevant three months – October to December 2009 – compared to the same period in 2008.

In effect this grouping have the impact of both DSM initiatives with the earlier Education Awareness building followed by the Energy Challenge. Results show that the two stimulus groups saw an overall reduction of 5.4% in their consumption during the period, while the reference group had a marginal reduction of 0.7%. This gives an overall net reduction for the stimulus groups of 4.8%.

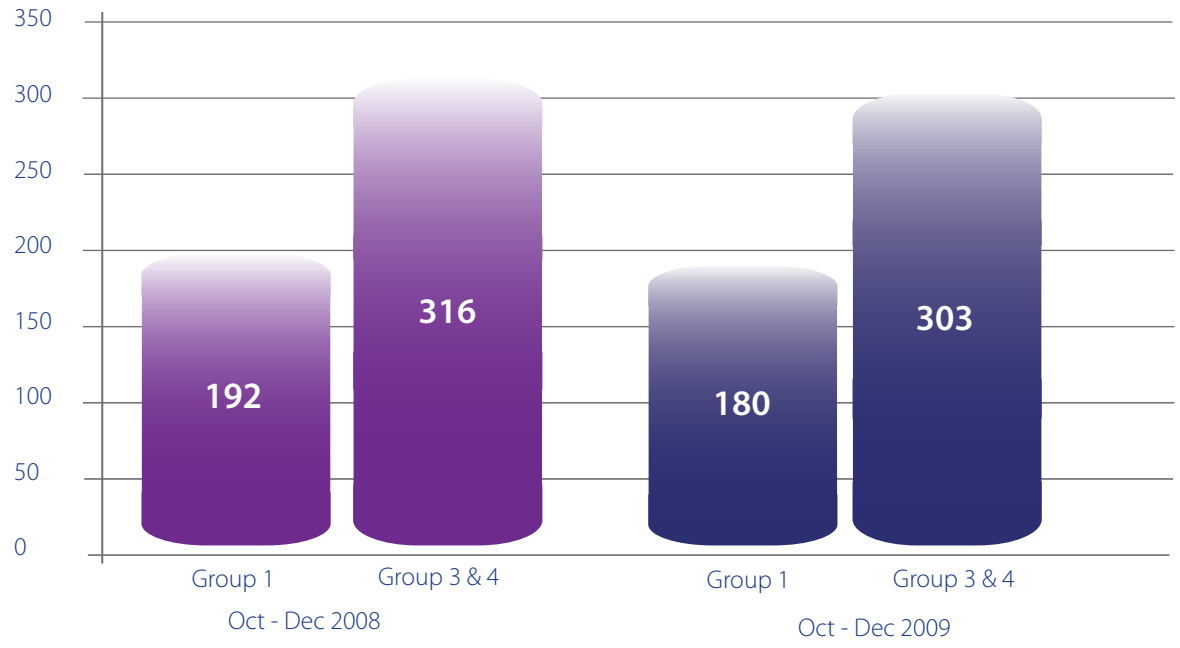
Figure 5: Overall Energy Consumption during The Energy Challenge compared to 2008



Peak Usage

The reference group reduced its peak energy use by 6% over the three months of the Energy Challenge. The stimulus groups reduced their peak usage by 4.8%. This in effect means the net impact for the stimulus groups was an increase in peak usage of 2% during the Energy Challenge. While there is however no clear reason for this increase though it is likely that factors such as winter weather conditions and relatively small group sizes in the trial may be contributory factors here.

Figure 6: Peak Energy Consumption during The Energy Challenge compared to 2008



Achievement of the overall and peak reduction targets may be broken down further as follows:

Figure 7: Performance of Participants (%) in The Energy Challenge Targets

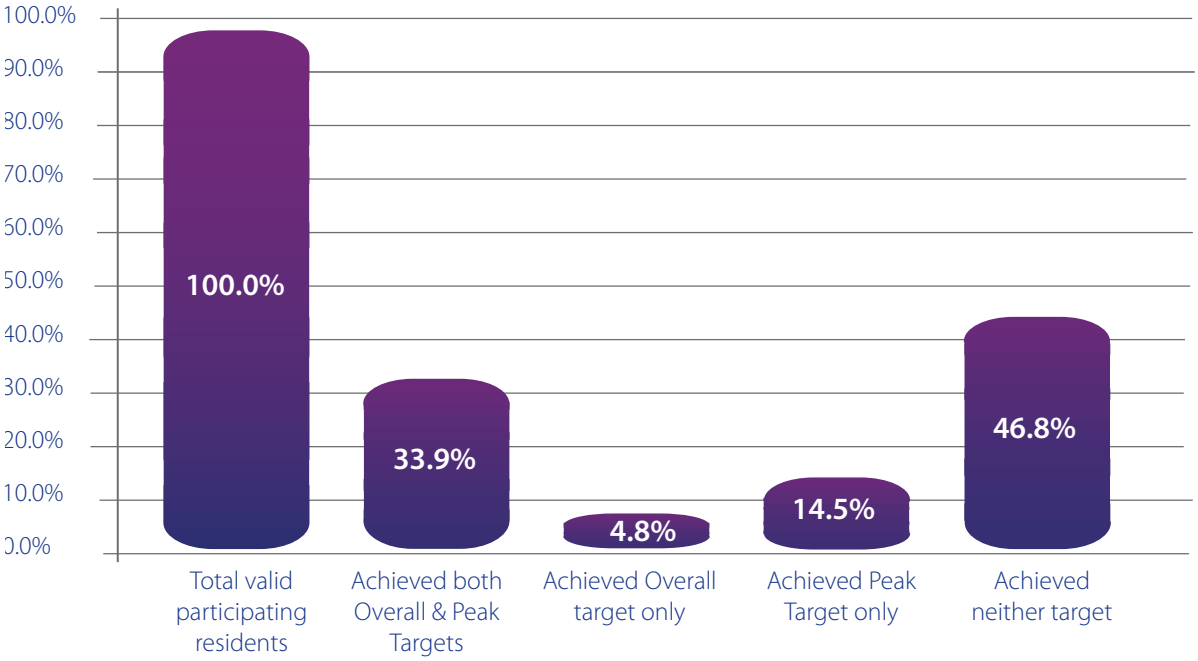


Table 2: Energy Challenge Outcomes – Groups 3 and 4

	Number	%
Total Valid Participants	62	100.0%
Achieved Overall & Peak targets	21	33.9%
Achieved Overall Target	3	4.8%
Achieve Peak Target	9	14.5%
Achieved neither target	29	46.8%

- One-third of the residents achieved or exceeded both the overall and peak targets.
- Despite regular support and intervention, approximately 50% of participants did not fully engage in the DSM Trial. The precise reason for this is not fully clear, but section 4.3 suggests factors that may provide some insight. It can be reasonably assumed that this group would require additional education at the start of any trial. This reinforces the value of a financial incentive or other drivers for engagement. Identification of these drivers will require further exploration.
- Of those who engaged in the Energy Challenge, 34% achieved both the overall and peak energy-reduction targets. A further 19.3% achieved either the overall target (4.8%) or the peak target (14.5%). Compared to those who did not engage, they achieved an overall energy reduction of 630 units (kWh) during the Energy Challenge period, or 25% of usage.
- In contrast, those who did not engage actually increased their overall energy usage during the Challenge by 11.6% and their peak usage by 15.6%.

4.2 Findings in relation to Data communications and Metering

4.2.1 Meter Retrofitting

The DSM Behavioural Trial involved the replacement of all electromechanical meters by an Elster interval meter[3]. This work was carried out by ESB Networks.

4.2.2. Data Reliability

Data being reliably available was not expected to present any difficulty as the telecommunications technology had been the standard method used by ESB Networks for remote reading and downloading of interval data for some commercial and industrial customer categories. As the trial progressed, however, interval data transfer needed more focus to ensure that monthly usage statements could be issued to trial participants within a reasonable timeframe of typically two to three weeks after month end.[4]

4.2.3 Installation of the Elster Meters

A number of issues arose during the installation process:

- During the installation process Meter/GSM details were recorded locally by ESB Networks technicians and forwarded to ESB Networks' Profile Data Services (PDS) for communications connectivity verification later. Only 0.5% needed a return visit by an ESB Networks technician as a result of follow-up queries after the electromechanical meter had been exchanged.

Following meter installation additional work was required, mainly due to the poor signal strength of the GSM modems, in order to bring performance up to the required level. This work included:

- External antennae were retrofitted at the identified meter locations for 5% of residents where the signal strength was too weak to be polled.
- Where a gap in the transferred data was discovered the data transfer process was re-run or alternatively the meter involved could be re-polled, bringing monthly reads down to manageable levels of 1%-2%. It is important to note, that the back-office procedure used for validating and processing production data from commercial/ industrial customers (current users of these meters) is highly automated. However, because this was a pilot process, in the case of the DSM Behavioural Trial, the data for Dundalk residential meters, was automatically collected from the meters, but then had to be manually transferred and uploaded. This proved problematic at times.
- A more automated data system, similar to that currently used by ESB Networks, involves a series of iterations to ensure data integrity; Performance using such automation typically reaches over 99%.

3 Product name A1140, a 15 minute Elster Interval meter.
4 Two to three weeks was considered reasonable for this trial. This trial required some manual intervention to build the 1 to 3% data gaps.

4.2.4 Findings from the Meter Installation Programme

- The GSM used in the trial was shown to be 97% reliable. The meters were found to be 100% reliable. (Note: GSM technology was readily available in Dundalk and used in the trial. At the time the infrastructure required to test an alternative communications technology was not available.)

- The reliability of an automated meter reading (AMR) system is essential for this type of demand-side management programme. A range of other options were explored through the National Smart Meter Programme Technology Trial.

- The implementation of a national DSM programme would be more automated as the methods used and agreed with the partners in this trial were designed to achieve a cost effective method of delivery of information to the residents but fully acknowledged the limited application of automated IT technologies adopted for this trial.

- The batteries used in the IHD required replacement every three to four months. A combined option of mains power with battery back-up is preferable.

4.3 Customer Insight and Feedback throughout the Trial

Given the importance of engaging with the consumer and effecting behavioural change, insights and feedback from customers were used to structure and refine the trial as it progressed. These insights and feedback were gathered using both focus groups and door-to-door surveys:

- Focus-group research of 40 participants was undertaken in November 2008.
- Door-to-door surveys of 150 residents were carried out in January 2009.
- A final focus-group research session was carried out in Dundalk, in May 2010, once the results from the Energy Challenge became available.

4.3.1 Focus Group Survey – November 2008

Focus-group research is a form of qualitative research. The purpose of this focus-group survey was to provide customer feedback about the IHD and the energy-usage statement in use in the trial. This feedback would also be used in the design of the electricity monitor for the National Smart Meter Plan. Focus-group participants were selected from the DSM Behavioural Trial. As such they represented the C2DE social grades.

Feedback indicated that people used the IHD in different ways. A small group used all screens and all information, but the majority focused on one screen only. The recommendation for the National Trial was therefore:

- Many customers will use the first screen only; as these customers tend to have less interest; this screen must quickly and simply convey key information.
- A default screen showing either € or kWh should be set up.

In the focus groups, feedback on the energy-usage statement used in the trial since June 2008 was also sought. This statement was revised slightly in September 2008.

The research found that:

- Reports should be simple and clear.
- Details of consumption must be clearly linked to cost, to have relevance for the consumer.
- The provision of energy tips and advice in the report is critical and was viewed positively by residents.
- Some residents found graphical depiction of energy consumption difficult to understand.
- The report should be dynamic and provide information and advice in an integrated manner.
- The report should have historic comparisons and show day-to-day usage.

The outputs from this research informed the development of communications and of the detailed bill for the National Smart Meter User Trial.

4.3.2 Door-to-door surveys - December 2008 to January 2009

Door-to-door surveys were carried out in December 2008 and January 2009. Their purpose was to elicit initial feedback from participants on the usefulness of the education and awareness material, the in-home display unit and the monthly energy-usage statement.

Some comments included:

> *"The only thing I didn't manage to reduce was my VAT rate". (Customer had the IHD and the monthly energy-usage statement.)*
>
> *"The monitor was there in the kitchen and you could see the immediate result of turning on/off an appliance."*
>
> *"… the tips were great as they told you how you could save money on the ESB bill."*
>
> *"The trial is very good for our home because it makes you think about how you could reduce the amount of energy you use."*

The results confirmed the need for clear and simple messages on the monthly statements. Feedback from participants was used in the development of further tips and advice during the trial.

4.3.3 Focus Group Survey – May 2010

A second series of focus groups took place on conclusion of the Energy Challenge in May 2010. Once again participants were selected from the DSM Behavioural Trial and as such represented the C2DE social grades. The focus groups included both those who had achieved the targets set under the Energy Challenge and those who had not. A lower number of the latter group, however, chose to participate in the focus group.

The main findings from the Focus Group Research included the following:

- The DSM Behavioural Trial succeeded in creating a perception of ownership, responsibility and control of household energy use. This is strikingly different from the perception of lack of control and responsibility prevalent among the wider community.
- Some of the participants perceived that they had made behaviour changes, noticed reductions in bill size, and sustained these changes beyond the period of the DSM Trial.
- The Energy Challenge participants followed a well-defined learning journey, which included a skills acquisition period (1 – 2 months); reinforcement and embedding of behaviour changes; and an indeterminate period of sustained behaviour changes.
- This learning journey can inform the rollout of any larger pilot programme – essentially, behaviour-change initiatives should come after the initial education and awareness period.
- The IHD supported this learning journey, but was used less after the first six months. This implies that a simple, low-cost device would be preferable in any full rollout.
- Participants were more open to purchasing AAA appliances and were aware of and put value on energy-saving appliances. This was evidenced by selection of these appliances when replacing them during the trial.

Some additional feedback was received about communications during the user trial and placement of key messages for this group. These were used to provide information to the National Smart Meter Trial, for more information please go to www.cer.ie.

5.0 Conclusions

DSM activities are vital for Ireland to meet its sustainability targets and objectives. As noted elsewhere, the DSM Behaviour Trial adopted an interactive, partnership approach. This, in effect, resulted in a live research project where participant feedback helped to shape interventions. The results, therefore, while not statistically valid, do provide important learning as to how to engage with consumers through the lifetime of a project, the types of communication required, and the timing of certain interventions. The main findings are summarised below.

5.1 Actual DSM impact:

The case study has highlighted the correlation between support, engagement and reduction in electricity demand. The trial created a sense of ownership, responsibility and control of household energy use which contrasts strongly with the perception of lack of control and responsibility prevalent in the wider community. This ownership brings long term dividends, it empowers the householder to actively engage in the management of their energy consumption and share this knowledge with the wider community. This creates a strong foundation for continued participation in energy efficiency initiatives.

Targeted support to householders resulted in the engagement of approximately 50% of the participants. This resulted in an overall energy reduction of 11.2%, of which 6.4% can be attributed to Education and Awareness and a further 4.8% to a combination of the Education/Awareness and the Energy Challenge phases.

Despite regular support and intervention, however, approximately 50% of participants did not fully engage and actually saw their energy usage increase by 11.6% and their peak usage by 15.6%. Reaching this group will present a challenge in any larger-scale DSM programme.

5.2 Conclusions from the Focus Group Survey

The learning journey model should inform the planning of any future DSM programmes in order to maximise the impact of initiatives. This can be achieved through appropriate timing of rollouts – for example, focusing on education and awareness at the start of the programme to support skills acquisition.

The limited window of opportunity to change behaviours at the start of an initiative and to build knowledge and expertise incrementally must also be considered. This is supported by the initial response to stimuli and the subsequent lessening of that impact in line with stimuli-familiarity.

Communications should be clear and easy to understand, with optimum use of graphics and tips. They should avoid the appearance of being an official type of communication as written communications using official letterhead were generally discarded without review.

Development of segmented communications for specific demographic groups highlighting key engagement messages may also be useful.

Appendix A: Sample Monthly Statement for Education/Awareness building:

June '08

This is your monthly Electricity Use Statement
This is not a bill

Mrs J Bloggs
No 1
Muirheivenamore
Dundalk

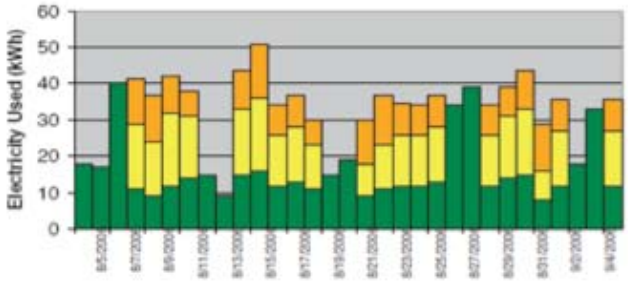
Ref No: ABC1234

MPRN: 1234567

Thank you for continuing to participate in the energy trial being run as part of SEI's Dundalk 2020 programme to develop a sustainable energy community in Dundalk.

Figure 1 shows how much electricity you used each day over the last month. For each day we show you how much you used in 3 different time periods. In **Figure 2** we give you the total units and associated cost for each time period for the month of June. The most important time to note is 'Peak (5pm-7pm).' This is what we call the 'rush hour' for electricity. It is the time when most customers want to use electricity and less efficient power stations are brought into operation to meet this demand. **Figure 3** overleaf shows you the day you used most electricity and the day you used least.

1 Electricity use by day



NOTE: GRAPH WILL BE GENERATED IN SAME COLOURS AND SHADES AS FIGURE 2 BELOW

2 Use by time band

Band	Time	Cost per unit (including VAT)	Units	Total unit cost
Peak	5pm to 7pm	15.03c	200	€30.60
Normal	8am to 5pm and 7pm to 11pm	15.03c	500	€70.20
Night	11pm to 8am	15.03c	300	€45.90
Total				

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Appendix A: Sample Monthly Statement for Education/Awareness building:

3

Highest usage | Lowest usage

Did you know?

Irish homes use a quarter of all energy used in the country and electricity accounts for a significant proportion of this. By using electricity more efficiently you will not only save money on your bills but you will also help our environment.

For further electricity saving tips, visit www.esb.ie/interactivehouse or www.sei.ie/yourhome

For further information contact: ESB Customer Supply on **1850 211 650** or call SEI on **042 939 1518**.

What can one unit costing 15.03c buy you?

Instantaneous electrical shower	7 – 10 mins
Immersion water heater	15 – 20 mins
Cooker (1 large ring) Kettle Tumble dryer	20 – 40 mins
Toaster (2 slice)	40 – 60 min
Washing machine Dishwasher	70 – 100 mins
Desktop computer (including monitor)	4 – 6 hours
TV 28"	7 – 9 hours
100 watt ordinary light bulb	10 hours
20watt energy saving (CFL) light bulbs	50 hours

The figures above give an average usage guide. Actual usage will depend on the age and efficiency of appliances.

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Appendix B: Engagement (Second) letter for Energy Challenge:

Dear

Thank you for continuing to be involved in the Dundalk Energy Trial. You may remember we wrote to you recently to tell you about the Energy Challenge, which we are introducing.

The main points about the Energy Challenge are:

- In addition to the €50 you have received for your participation in the trial to date, you can earn up to **€40** off your electricity bill by participating in this Energy Challenge and keeping your electricity use for **the last three months** of 2009 below the target set for you.
- We will let you know in September what your **target** is for each month of the Energy Challenge so that you will be ready to go when it starts in October.
- Each month we will also tell you how you are doing. This information will be included in your **monthly statement**.

In the meantime, have a look at your Energy Statement and familiarise yourself with using it as this will be an important aid/assistance in the Challenge.

For more information on the Energy Statement and the different sections, including the Energy Challenge Section, please see the enclosed guide.

Thank you again for your continued support and participation in the Dundalk 2020 Energy Trial. If you have any questions or queries, please call us in SEI on 042 939 1518 or ESB Customer Supply on 1850 21 16 50.

Yours Sincerely

Pat Fenlon
General Manager
ESB Customer Supply

Yours Sincerely

Declan Meally
SEI Manager Dundalk 2020

ESB Customer Supply

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Appendix C: Sample Monthly Statement for Energy Challenge:

This is your monthly Electricity Use Statement
This is not a bill

1st to 30th September 2009
MPRN: 11119991111

Mr John Smith,
Main Street,
Dundalk,
Co Louth

1 Household Appliances

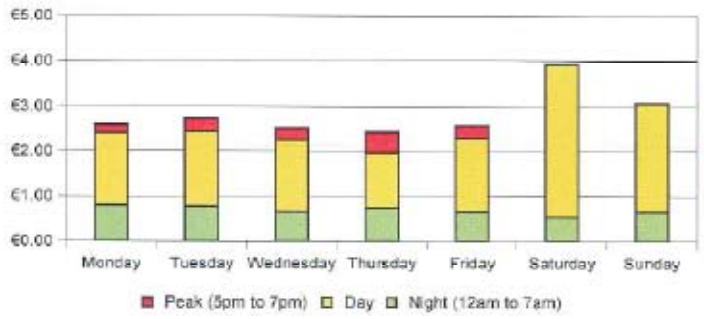
Top 5 energy users	Cost per hour	Yearly cost (2 hours per day)
Immersion	€1.50	€1,095.00
Tumble Dryer	€0.55	€401.50
Washing Machine	€0.28	€204.40
Dishwasher	€0.20	€146.00
Cooker	€0.18	€131.40

2 How you can save energy

Energy Tip - Fridges and Freezers

- Make sure your fridge/freezer is positioned in a cool place. Do not locate it next to a boiler, cooker or in the path of direct sunlight.
- Fridges and freezers require good air circulation around them to run efficiently. Make sure air can escape at the top of the fridge/freezer and enter at the bottom.
- Do not let frost build up on the inside of the freezer as this increases electricity usage. If possible defrost the freezer once every 6 months.

3 Energy saving advice for you



Avg Cost per Day this month: €2.80

Total Energy Cost this month: €84.03

4

Your total energy budget for the three month challenge will be € 270.60
Your combined energy costs for October, November and December 2009 should not exceed this budget.

Your total rush hour (5pm - 7pm) energy budget for the three month challenge will be €33.40
Your combined peak energy costs for October, November and December 2009 should not exceed this budget

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Appendix D: Energy Tips Sheet for Energy Challenge:

Energy Tips

Cooking Tips
- The oven can be expensive to use - so try to use it as sparingly and efficiently as possible. Where possible use it for more than just one item and remember you can cook at a higher temperature at the top of the oven and simultaneously at a lower temperature at the bottom.
- Do not open the oven door to check cooking - every time you do so, you lose 20% of the accumulated heat.
- Put lids on pots and turn down the heat when the water starts to boil. The lids not only keep heat in the pot but also reduce condensation in the kitchen.
- At a certain point in cooking, turn off electric rings and use their residual heat.

Kitchen Tips
- Do not run the sink hot tap unnecessarily.
- Fill the kettle with just the amount of water you need.
- Toast bread in toaster rather than with the oven grill.
- Use a microwave oven to reheat food rather than a cooker oven.
- Use saucepans that are flat based and match the size to the cooker hotplates.
- Use the 'economy' wash in your dishwasher for lightly soiled crockery and cutlery. Wait until you have a full load before washing.

Lighting
- Use CFL bulbs instead of traditional bulbs - they use only 20% of the energy and last up to 15 times as long.
- Turn off lighting when you don't need it.

Hot Water Tips
- It costs about €1.35 to heat your immersion tank so it makes good sense to use it wisely.
- Switch on and off the immersion as required - do not leave it switched on continuously.
- Fit a timer switch and control your hot water needs automatically.
- Insulate your hot water tank with a good quality lagging jacket.

Fridges and Freezers
- Make sure your fridge/freezer is positioned in a cool place. Do not locate it next to a boiler, cooker or in the path of direct sunlight.
- Fridges and freezers require good air circulation around them to run efficiently. Make sure air can escape at the top of the fridge/freezer and enter at the bottom.
- Do not let frost build up on the inside of the freezer compartment as this increases electricity usage. If possible, defrost the freezer once every 6 months.

Washing machine / Tumble dryer
- Use a 40°C wash instead of 60°C, when possible.
- Use the 'half load' option when washing a reduced load of clothes.
- Drying a full load of clothes in a tumble dryer costs about 60 cent. Where possible dry clothes outdoors.
- Clean the 'fluff' filter in your tumble dryer before drying a load of clothes.
- When purchasing a new washing machine choose one with an 'AAA' energy rating.
- When purchasing a new tumble dryer choose one with a 'B' rating.

TV's/DVD's
- Do not leave electrical appliances on standby.
- Make sure TV's, PC's, DVD's, VCR's, Printers, Game Consoles, Player/Recorders, and kitchen appliances are fully switched off. This will save up to 20% of your appliances energy use.
- Putting your TV, DVD player and video recorder on one power block will allow you easily switch them on and off at once. You can do this also with your PC, monitor, printer, scanner and speakers.

Electric Blankets
- Switch on electric blankets no more than 30 minutes before you go to bed and switch it off just before you get into bed.

For further electricity saving tips, visit www.esb.ie/interactivehouse or www.sei.ie/yourhome

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Appendix E: In Home Display Unit Information Sheet:

Dundalk 2020

Home Display Monitor for electricity usage in the Home

Introduction

The Home Display Monitor is for your use in the home and may provide you with a number of benefits to help you understand the amount of electricity and the cost that you are using in your home. It is independent of the ESB meter and is for your use only in the home. We have provided this as part of the Dundalk 2020 trial and we hope that you will use it and also provide us with some feedback during the year. We will be in touch with later in the year about that and more about the Home Display monitors.

What is a Home Display monitor?

The Home Display Monitor is a wireless smart electricity meter that helps you track how much energy you use encouraging a reduction in energy while saving money, because the monitor gives instantly an accurate reading of how much energy you are consuming.

How does it Work?

The monitor tells you every 6 seconds how much power you are consuming, how much money this is costing you and an estimate of your personal contribution to the climate change. If you turn a set of lights or the kettle ON or OFF, you can see INSTANTLY the change this has to your energy use. Once you have this information to hand means you, your family can visually see the benefits of saving energy.

How can I save money?

Knowing how much electricity you are using, and having the information in front of you can make a real difference. It can't save you money on its own but it can help you change your habits.

How do I use the Efergy meter?

Take the display unit from room to room and keep an eye on the monitor when different appliances turn on and off, check the consumption against the manufacturer's specification, it may differ slightly and older machines are almost certain to use more. There will come a time when the appliance is using far more than it should and replacement should be considered.

Will the Efergy meter calculate my electricity bill?

The Efergy meter is not designed to act as a replacement to your billing. The meters are accurate to approximately 10%. The designs of the meters are to make you more aware and react by instantly seeing how much power you are using.

Would you like more Information about the Monitor?

If you would like more information try anyone of the following:

- Go to www.efergy.com for this particular Home Display monitor.
- Call us here at SEI in Dundalk on telephone number: **9391518.**
- Call into our office on the 2nd Floor at the Vesta Building in Finnebair Industrial Park.
- Read the explanation booklet provided when the monitor was installed in you home.

Sustainable Energy Authority of Ireland
Wilton Park House, Wilton Place, Dublin 2, Ireland.

t +353 1 808 2100
f +353 1 808 2002

e info@seai.ie
w www.seai.ie

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EUROPEAN UNION STRUCTURAL FUNDS

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