

Energy Demand Research Project (EDRP) Fifth progress report



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Target Audience: Energy suppliers, consumer groups, smart metering industry, academics and organisations with an interest in energy saving or behaviour change.

Overview:

This is the fifth – and penultimate – report for the Energy Demand Research Project (EDRP). The EDRP is a suite of trials designed to investigate consumer response to improved feedback on their energy use. The trials started in 2007 and data collection finished in September this year.

This progress report identifies some of the practical experiences from the trials and some of the headline messages emerging from our interim analysis. The final analysis of the EDRP data has begun. The report sets out our plans for the analysis of the final data which is due to be completed in early spring 2011. Alongside this report we are publishing a literature review of comparable trials around the world to help contextualise the EDRP trials.

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Context

- The Energy Demand Research Project (EDRP) is a suite of large scale trials across Great Britain. It seeks to better understand how consumers react to improved information about their energy consumption over the long term. The trials began in 2007 and are now drawing to a close.
- Ofgem oversees the EDRP on behalf of the Department of Energy and Climate Change (DECC).
- The Coalition's programme for government in May 2010 committed to the roll-out of smart meters. The findings from the EDRP can help inform the development of the roll out.

Associated Documents

- Previous progress reports from the EDRP are available on Ofgem's website, www.ofgem.gov.uk.
- The Smart Metering Implementation Programme Prospectus published by Ofgem and the Department of Energy and Climate Change (DECC) is also available at www.ofgem.gov.uk.

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Summary

The Energy Demand Research Project (EDRP) is a suite of large scale trials across Great Britain. It seeks to better understand how consumers react to improved information about their energy consumption over the long term. The EDRP has trialled a range of methods of providing customers with improved feedback on their energy consumption and other associated interventions. These interventions include smart meters, enhanced energy consumption information on bills, energy efficiency information, visual display units, incentives to reduce or shift consumption and community engagement. Some consumers received one intervention while others have received a combination of different interventions.

Ofgem oversees the EDRP on behalf of Government. Four suppliers were selected to conduct EDRP trials: E.ON, EDF Energy, Scottish Power and Scottish and Southern Energy. The Government allocated £9.75 million to fund the trials, which is match-funded by the energy suppliers taking part. In February 2010 there were over 47,000 households taking part in the trials and a further 16,000 households included in control groups. Around 17,000 households have had smart meters installed as part of the trial, many with both gas and electricity smart meters.

The suppliers have submitted reports to Ofgem every six months throughout the trial. This is the penultimate progress report before the final data is analysed. It identifies some of the practical experiences from the trials and some of the headline messages emerging from our interim analysis.

This document also sets out our plans for the final analysis of the EDRP. Since the last progress report we have sought independent academic advice to guide us on how best to use and analyse the large volume of data from the EDRP. We have put resources into doing some interim analysis and road-testing the database to ensure it is accurate and comprehensive for the final analysis. We ran a competitive tender and have chosen AECOM, working with the BRE, to conduct the analysis of the suppliers' final data. The final analysis is now underway and is due to be completed in March 2011.

Alongside this report we have published a literature review of comparable trials around the world to help contextualise the preliminary findings from the EDRP. From this review, improved feedback emerges as necessary for good understanding of energy use, but not always sufficient for effective action. This paper expands on our March 2010 EDRP progress report, which said that 'if households are to realise potential reductions in energy consumption, there must be a cycle of learning and action... it is assumed that this cycle has three inputs: feedback to customers about energy consumption, advice...about how to make savings, and motivation...to implement that information'. The literature review discusses possible mechanisms of change and examines evidence from a range of trials to consider the reasons for different outcomes.

1. Background

1.1. The EDRP trials were designed to investigate consumer response to improved feedback on their energy use. A range of interventions, and combinations of interventions, have been trialled, including smart meters, enhanced energy consumption information on bills, energy efficiency information, visual display units, incentives to reduce or shift consumption and community engagement. Chapter 2 sets out the different interventions trialled.

1.2. The trials were undertaken by four different energy companies, namely EDF Energy Customers plc, E.ON UK plc, SSE Energy Supply Limited and Scottish Power Energy Retail Limited. The Government allocated £9.75 million to fund the trials, match-funded by the energy suppliers taking part. The EDRP was launched in July 2007 but, partly due to technical issues with some of the new equipment being tested, the majority of the trials began in late 2007/early 2008. The suppliers were required to submit their data and a report every six months during the project. Their penultimate reports were submitted in April and cover data up to February 2010, ie the first 18 months of the EDRP. Chapter 3 provides some of the headline messages emerging from the EDRP.

1.3. Due to the different nature of the trials, and some of the technical issues encountered at the beginning, the suppliers finished their data collection at different times. Scottish Power completed its trials in February 2010, EON at the end of July 2010 and EDF and SSE finished their data collection at the end of September 2010. Chapter 4 sets out our plans for the final analysis.

1.4. Given the scale and complexity of the EDRP, a range of organisations are involved in managing and evaluating the trials. Ofgem project manages the EDRP on behalf of DECC. The suppliers employ academics to conduct their statistical analyses. The Centre for Sustainable Energy (CSE) supports Ofgem in its evaluation and monitoring of the EDRP and recommends improvements in reporting practice. The University of Reading conducted some interim analysis on the first 18 months of data. University College London advised on preparations for the final analysis and will continue to provide independent advice to the final analysis. AECOM working with BRE have been selected by competitive tender to conduct the analysis of the final data.

1.5. The Coalition's programme for government in May 2010 committed to the roll-out of smart meters. In July 2010 the Department for Energy and Climate Change (DECC) and Ofgem published the Smart Metering Implementation Programme Prospectus¹. The Prospectus contains proposals for the delivery of electricity and gas smart metering in Great Britain. The EDRP is expected to be an important source of information for the Smart Metering Implementation Programme.

¹ Smart Metering Implementation Programme Prospectus www.ofgem.gov.uk

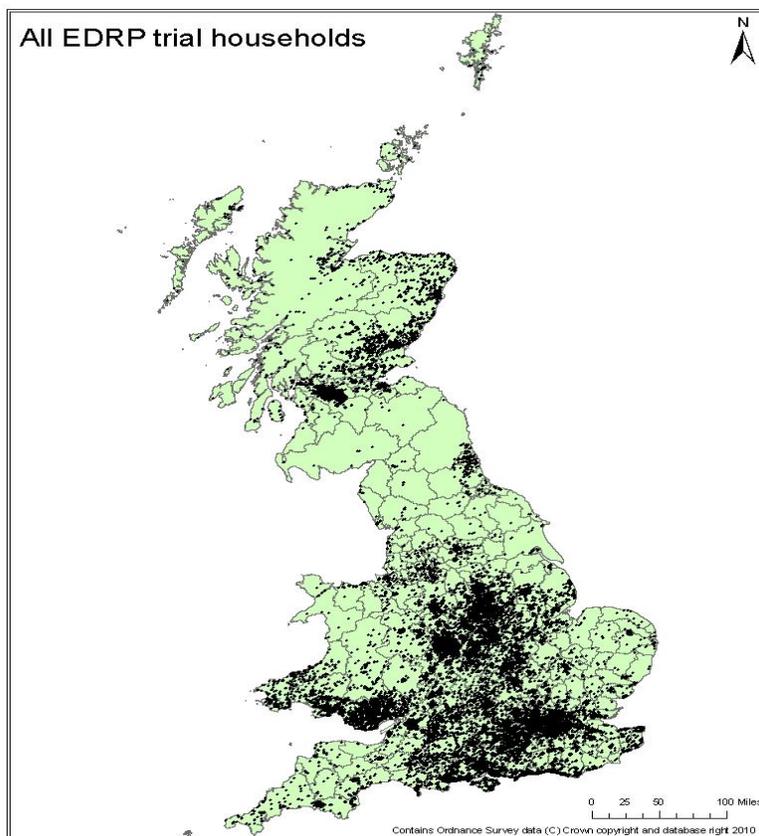
2. Interventions and trials

2.1. The EDRP is trialling a range of methods of providing customers with improved feedback on their energy consumption: smart meters, enhanced energy consumption information on bills, energy efficiency information, visual display units, incentives to reduce or shift consumption and community engagement. Some consumers have received one intervention while others have received a combination of different interventions.

2.2. 47,000 households took part in the trials. The total number of participants was over 50,000 at its peak but decreased over time as people switched supplier, moved house or requested to leave the trial. Around 17,000 of the households taking part had smart meters installed, many with both gas and electricity smart meters. A range of different meters were trialled.

2.3. Control groups, made up of 'business as usual' consumers, or consumers with minimal interventions, have been included. Their energy consumption is recorded to enable comparisons with the households that have received interventions under the EDRP. There are over 16,000 control households.

Figure 1 Distribution of the EDRP trial participants



Types of interventions included in the EDRP

2.4. The EDRP has trialled different combinations of these interventions.

- Enhanced billing
 - More accurate bills
 - More frequent bills
 - Information on bills such as graphs showing historic consumption
- Information
 - Written energy saving information and advice
 - Information regarding time of use and costs/tariffs
- Smart meters on their own or with
 - A remote visual display of consumption of energy and cost information used for electricity (and sometimes also gas)
 - Links to heating control units which allow customers to control their heating through a wall panel whilst having access to accurate electricity and gas consumption data
 - An alarm which alerts the user to certain electricity consumption levels (load limiting alarm)
 - A time of day tariff which rewards the user if they move their consumption to 'off peak' hours (for example by running the dishwasher overnight)
 - Incentives to reduce consumption, eg challenging consumers to reduce their consumption to below a specific level in return for a shopping voucher
 - Incentives to shift time of use away from the peak demand period
- Feedback displays, via
 - Daily consumption information sent to the households' TV
 - Daily consumption information available on the internet
 - In-home displays (IHDs)
 - Connected (clipped on) to a conventional non-smart meter
 - Connected to smart meters
- Community schemes, including
 - A metered local substation monitoring the community's consumption
 - A community financial reward of £20,000 for a 10% reduction in consumption at the community level
 - Smart meters, energy efficiency advice and various community events
- Control groups

2.5. The smart electricity and gas meters that have been installed collect meter values on a half hourly or daily basis and transmit the data back to the supplier without the need for a meter reader or the consumer to read the meter manually. The trials included IHDs linked to smart meters and those linked to non-smart meters to show the household how much electricity they are consuming at any point in time through an electronic display in the house. A sensor can be attached (clipped on) to a conventional meter to then transmit information to an IHD which displays electricity consumption and load, as well as the cost of energy use. However, it is important to note that where IHDs are connected to conventional meters they do not communicate remotely with a supplier's billing system and may not show the same units as is being recorded by the customers' meter.

3. Lessons learnt to date

3.1. This chapter sets out some of the practical experiences from the trials and lessons emerging from interim analysis of the first 18 months of data. We cannot draw final conclusions from the EDRP until the analysis has been completed.

3.2. The suppliers' practical experiences from the trials provide useful insights for the national roll out. Some of the common experiences are set out below.

Technology

- Different geographical locations had different signal strengths which affected the ability of the meter to send or receive information.
- The location of a smart meter within a property was also important, eg communications could be affected if the meter was in a metal box, in a basement or was too far from the in-home display.
- The location or set-up of a meter sometimes required remedial work to move it. Reasons for this included if it was on an asbestos board, if the smart meter was larger than the original meter and did not fit into the meter box, or if the meter was inaccessible due to refurbishment work or a cupboard.
- Installing smart metering in basements, blocks of flats and communal housing was problematic when gaining access, getting a signal and utilising the Home Area Network (HAN).
- Practical issues affecting installation were generally obvious and easy to spot in a property; however, in some cases technical problems were not be recognised until the meters and interfaces had been installed in a property for some time.
- These practical issues were sometimes challenging and in some cases potential smart meter installations were aborted. However, the majority of issues were not insurmountable.
- The EDRP trials started late, mainly due to problems with the new technology. Metering technology, from the communications technology to in-home displays, has been evolving since 2007 when the trials started.

Managing data

- Installing, commissioning and collecting data from smart meters involved a large volume of data transfer and collection. These processes need to be managed and tracked to ensure accurate and timely records of which model numbers are installed where. Data synchronisation issues occurred which affected the quality of data supplied to the customer or caused problems between partners along the supplier chain.
- Problems and faults needed to be logged accurately to enable suppliers to pinpoint where in the data transfer process a fault was occurring and rectify it.

Skills

- Installers needed the right technical skills, especially to install both gas and electricity meters and to deal with any unforeseen safety or legacy issues (for example where previous workmanship had been of a poor standard).
- 'Softer' skills were essential to enable installers to explain the new technology to customers.

- The suppliers' customer advice lines linked to the trial had to build up their knowledge of the new technologies and services to be able to answer consumer enquiries.

Consumers

- Getting access to a property could prove to be difficult. If a second visit was required, for example to deal with a fault with the meter, it was even harder to get access second time around.
- Generally, the interaction with the supplier around receiving an intervention promoted an increase in telephone enquiries from those consumers.

3.3. Practical lessons from the EDRP have been used to inform the development of the Smart Metering Implementation Programme including the proposals for the minimum functional requirements for IHDs, the Installation Code of Practice, the consumer engagement strategy and the central 'DataCommsCo' (DCC) to be established.

3.4. In March this year the four suppliers submitted their penultimate reports and analysis of their data as collected to February 2010. The University of Reading was employed to check the suppliers' data and, for the first time, conduct some central analysis on each data set. Ensuring the data is accurate and comprehensive has been a challenge for suppliers given the massive volume of smart and non-smart meter data involved (the final database contains over 800 million meter readings). Issues with some of the data did limit the scope of the central analysis. However, these issues have now been addressed and this process has helped to ensure that the data is more comprehensive and robust going forward.

3.5. Interim analysis was conducted on the first 18 months of data collected. Emerging lessons around consumer benefits are set out below and with commentary provided in italics.

- The presence of a smart meter in combination with other interventions was often associated with a reduction in consumption, but interventions without smart meters were not. *This suggests that smart meters can be a vehicle for effective action to reduce domestic energy demand.*
- Following on from the previous point, the trials have not found a consistent energy saving impact across the many interventions involving different forms of real-time feedback. *This suggests that a focus on technology alone is unlikely to have a major effect on consumption and that other action to engage and motivate consumers will be required.*
- Information presented in pounds and pence is more meaningful than information presented in kWh or tonnes of carbon. *This is not surprising as we know that consumers are not particularly energy literate. The key message here is that most consumers are motivated to understand the cost of energy consumption rather than being motivated to understand energy or carbon consumption per se.*

3.6. Alongside this report we have published a literature review of comparable trials around the world to help contextualise the preliminary findings from the EDRP. For example, other trials suggest that multiple interventions appear more likely to lead to a long term reduction in consumption than one single intervention. This, along with the lessons learnt from the EDRP, suggests that technology and information need to be tailored to individuals and households rather than adopting a “one-size fits all” approach. Further work is needed to try to identify what has worked best for different types of consumers.

3.7. As further lessons emerge from the analysis they will be taken into account by the Smart Metering Implementation Programme and policy development. The Programme is already considering initiatives to promote consumer engagement that would support and guide consumers to achieve savings.

4. The final analysis

4.1. The EDRP is entering its final stages. Due to the different nature of the trials, and some of the technical issues encountered at the beginning, the suppliers finished their data collection at different times. Scottish Power completed its trials in February, EON at the end of July and EDF and SSE finished their data collection at the end of September.

4.2. The final analysis and final report are due to be completed by the end of March 2011. Over the last six months we have taken stock of the EDRP to identify what information it may or may not be able to tell us, and how best to analyse and contextualise the data to get such results. This has enabled us to set the groundwork for the final analysis.

Independent review

4.3. Experts at University College London (UCL) were appointed to conduct an independent review of the EDRP data, processes and aims. Their advice recommended that the analysis of the EDRP could be strengthened in the following ways.

- The collection of additional meta-data. This will aid comparative analysis and interpretation of the suppliers' findings. Meta-data means data about the trials, eg information on how participants were recruited to the trial or details of the process for giving a consumer an IHD.
- Provision of additional competencies to the EDRP analysis team. UCL identified the specialist skills required to complete the very complex final analysis and the best approach to conducting it.
- Appropriate analysis of the primary data. For example, the data needs to be assessed for sources of bias to guard against artefactual results, and existing variables need to be assessed to gauge harmonisability.

Final analysis

4.4. AECOM, working with BRE, has been selected through competitive tender to conduct analysis of the final data. CSE will continue to manage the data from the EDRP by checking the accuracy and completeness of the huge volumes of data submitted by the suppliers.

4.5. There is a huge amount of information being collected through the EDRP, not just consumption data. The final analysis will consider all of the information collected during the trials, as follows.

- 1.** Consumption data, including half-hourly smart metered consumption data and manually read non-smart meter data depending on the trial.
- 2.** Supplier reports - the suppliers produce a report of their trials every six months. These reports are commercially sensitive so have not been published. Each energy supplier conducts its own statistical analysis of its trials, with three of the four suppliers employing academic experts to conduct or advise the analysis.
- 3.** Meta-data – this is effectively 'data about data', ie information about the trials to help frame and understand the findings. A huge amount of this has been collected through the suppliers' reports, as mentioned above.
- 4.** Consumer surveys – each supplier was required to survey a sample of participants during the last few months of the trial. These surveys gather information about their household circumstances and about responses or attitudes towards the interventions.
- 5.** The interventions – the final reports will collect details of the intervention tools (such as advice leaflets or different formats for billing) used by each supplier so their format and content can be compared and considered.
- 6.** In designing trials and delivering this range of interventions to consumers, suppliers have identified a number of practical and technical lessons learnt.
- 7.** Wider literature and research – a number of trials around providing better information and encouraging behaviour change have been carried out, many of them outside of the UK. The results of this work will help us to consider and contextualise the findings of the EDRP.

4.6. The EDRP has tested a range of interventions and numerous different combinations of those interventions. We expect that the impact of each intervention can be affected by a range of factors, such as the nature and circumstances of a household and whether they requested or were automatically given an intervention. Similarly, some consumers knew they were part of a trial, others didn't. Some suppliers found it hard to recruit customers to their trials so had to incentivise participation. All of these factors can influence a consumer's response in different ways.

4.7. This analysis will test the statistical outputs of each supplier. It will identify and seek to understand consistencies or any differences across the suppliers' results. We are not therefore pre-empting the final report with detailed interim conclusions which could be changed or undermined on fuller analysis. The final analysis is due to be finished in March 2011.

4.8. The final analysis will look at the primary data to corroborate each energy supplier's own analysis and findings and identify any trends across all the trials. There will be a work stream to assess the broader issues of the interventions and the wider social and economic benefits of the interventions such as more accurate billing and levels of customer satisfaction, as well as the practical and technical issues around technologies, communications and installation. All of this information will then be contextualised within broader literature and studies. Alongside this report we are publishing a literature review of comparable trials around the world to help contextualise the EDRP trials.

Access to EDRP data for use in independent research

4.9. Through the EDRP we are collating a database of anonymised² half-hourly meter readings, with granularity covering a large range of situations, which could potentially be made available for research purposes. DECC will consider options for making subsets of the data available to researchers (for example for studies which require domestic energy consumption profile data) once the database being developed by CSE is complete and in a suitable format. At this stage in the process we cannot confirm when this database might be available or in what format.

² All data on participants in the trials was anonymised by suppliers before it was provided to CSE for collation and analysis.

Appendix 1 - The Authority's Powers and Duties

1.1. Ofgem is the Office of Gas and Electricity Markets which supports the Gas and Electricity Markets Authority ("the Authority"), the regulator of the gas and electricity industries in Great Britain. This appendix summarises the primary powers and duties of the Authority. It is not comprehensive and is not a substitute to reference to the relevant legal instruments (including, but not limited to, those referred to below).

1.2. The Authority's powers and duties are largely provided for in statute (such as the Gas Act 1986, the Electricity Act 1989, the Utilities Act 2000, the Competition Act 1998, the Enterprise Act 2002 and the Energy Acts of 2004, 2008 and 2010) as well as arising from directly effective European Community legislation.

1.3. References to the Gas Act and the Electricity Act in this appendix are to Part 1 of those Acts.³ Duties and functions relating to gas are set out in the Gas Act and those relating to electricity are set out in the Electricity Act. This appendix must be read accordingly.⁴

1.4. The Authority's principal objective is to protect the interests of existing and future consumers in relation to gas conveyed through pipes and electricity conveyed by distribution or transmission systems. The interests of such consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases and in the security of the supply of gas and electricity to them.

1.5. The Authority is generally required to carry out its functions in the manner it considers is best calculated to further the principal objective, wherever appropriate by promoting effective competition between persons engaged in, or commercial activities connected with,

- the shipping, transportation or supply of gas conveyed through pipes;
- the generation, transmission, distribution or supply of electricity;
- the provision or use of electricity interconnectors.

1.6. Before deciding to carry out its functions in a particular manner with a view to promoting competition, the Authority will have to consider the extent to which the interests of consumers would be protected by that manner of carrying out those functions and whether there is any other manner (whether or not it would promote competition) in which the Authority could carry out those functions which would better protect those interests.

1.7. In performing these duties, the Authority must have regard to:

³ Entitled "Gas Supply" and "Electricity Supply" respectively.

⁴ However, in exercising a function under the Electricity Act the Authority may have regard to the interests of consumers in relation to gas conveyed through pipes and vice versa in the case of it exercising a function under the Gas Act.

- the need to secure that, so far as it is economical to meet them, all reasonable demands in Great Britain for gas conveyed through pipes are met;
- the need to secure that all reasonable demands for electricity are met;
- the need to secure that licence holders are able to finance the activities which are the subject of obligations on them⁵; and
- the need to contribute to the achievement of sustainable development.

1.8. In performing these duties, the Authority must have regard to the interests of individuals who are disabled or chronically sick, of pensionable age, with low incomes, or residing in rural areas.⁶

1.9. Subject to the above, the Authority is required to carry out the functions referred to in the manner which it considers is best calculated to:

- promote efficiency and economy on the part of those licensed⁷ under the relevant Act and the efficient use of gas conveyed through pipes and electricity conveyed by distribution systems or transmission systems; protect the public from dangers arising from the conveyance of gas through pipes or the use of gas conveyed through pipes and from the generation, transmission, distribution or supply of electricity; and secure a diverse and viable long-term energy supply, and shall, in carrying out those functions, have regard to the effect on the environment.

1.10. In carrying out these functions the Authority must also have regard to:

- the principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed and any other principles that appear to it to represent the best regulatory practice; and
- certain statutory guidance on social and environmental matters issued by the Secretary of State.

1.11. The Authority may, in carrying out a function under the Gas Act and the Electricity Act, have regard to any interests of consumers in relation to communications services and electronic communications apparatus or to water or sewerage services (within the meaning of the Water Industry Act 1991), which are affected by the carrying out of that function.

1.12. The Authority has powers under the Competition Act to investigate suspected anti-competitive activity and take action for breaches of the prohibitions in the legislation in respect of the gas and electricity sectors in Great Britain and is a

⁵ Under the Gas Act and the Utilities Act, in the case of Gas Act functions, or the Electricity Act, the Utilities Act and certain parts of the Energy Acts in the case of Electricity Act functions.

⁶ The Authority may have regard to other descriptions of consumers.

⁷ Or persons authorised by exemptions to carry on any activity.

designated National Competition Authority under the EC Modernisation Regulation⁸ and therefore part of the European Competition Network. The Authority also has concurrent powers with the Office of Fair Trading in respect of market investigation references to the Competition Commission.

⁸ Council Regulation (EC) 1/2003.