Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

Smart Metering Information Paper 4
Results of Electricity Cost-Benefit Analysis, Customer Behaviour Trials and Technology Trials

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CER – Information Page

Abstract:

This Information Paper highlights the publication of a number of key documents that will be used to inform future decisions regarding electricity smart metering for residential consumers and SMEs in Ireland. The documents, which have been produced as part of Phase 1 of the CER Smart Metering Project, are:

- Customer behaviour trials findings report (CER/11/080a)
- Technology trials findings report (CER/11/080b)
- Cost-benefit analysis report (CER/11/080c)

This Information Paper gives an overview of the key findings of each of these reports and then goes on to outline the next steps for the CER Smart Metering Project.

Target Audience:

This paper is for the attention of members of the public, the energy industry, energy consumers and all interested parties.

For further information on this Information Paper, please contact Gary Martin (gmartin@cer.ie) at the CER.

Related Documents:

- Electricity Smart Metering Customer Behaviour Trials (CBT) Findings Report – CER/11/080a – 16th May 2011
- Electricity Smart Metering Technology Trial Findings Report – CER/11/080b – 16th May 2011
- Electricity Smart Metering Cost-Benefit Analysis Report – CER/11/080c – 16th May 2011

Table of Contents

1.0 Introduction

1.1 The Commission for Energy Regulation (CER)

The Commission for Energy Regulation ('the CER') is the independent body responsible for overseeing the regulation of Ireland's electricity and gas sectors. The CER was initially established and granted regulatory powers over the electricity market under the *Electricity Regulation Act*, *1999*. The enactment of the *Gas (Interim) (Regulation) Act*, *2002* expanded the CER's jurisdiction to include regulation of the natural gas market, while the *Energy (Miscellaneous Provisions) Act 2006* granted the CER powers to regulate electrical contractors with respect to safety, to regulate to natural gas undertakings involved in the transmission, distribution, storage, supply and shipping of gas and to regulate natural gas installers with respect to safety. The *Electricity Regulation Amendment (SEM) Act 2007* outlined the CER's functions in relation to the Single Electricity Market (SEM) for the island of Ireland. This market is regulated by the CER and the Northern Ireland Authority for Utility Regulation (NIAUR). The CER is working to ensure that consumers benefit from regulation and the introduction of competition in the energy sector.

1.2 Purpose of This Paper

The purpose of this Information Paper is to highlight the publication of a number of key documents that will be used to inform future decisions regarding electricity smart metering for residential consumers and SMEs in Ireland. The documents, which have been produced as part of Phase 1 of the CER Smart Metering Project, are:

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1.3 Background Information

1.3.1 What is Smart Metering?

"An intelligent metering system or 'smart meter' is an electronic device that can measure the consumption of energy, adding more information than a conventional meter, and can transmit data using a form of electronic communication. A key feature of a smart meter is the ability to provide bi-directional communication between the consumer and supplier/operator. It should also promote services that facilitate energy efficiency within the home. The move from old, isolated and static metering devices towards new smart/active devices is an important issue for competition in energy markets. The implementation of smart meters is an essential first step towards the implementation of smart grids."[1]

It is important to note that 'smart metering' encompasses more than just the meter itself. Smart metering should be viewed as a system rather than a single device. It is essentially a hybrid technology consisting of three high level layers:

- Physical meters and associated devices
- Communications layer covering data transport and communications network management
- IT systems which manage the data, applications and services

The following diagram (Figure 1) illustrates the general structure of a smart metering system.

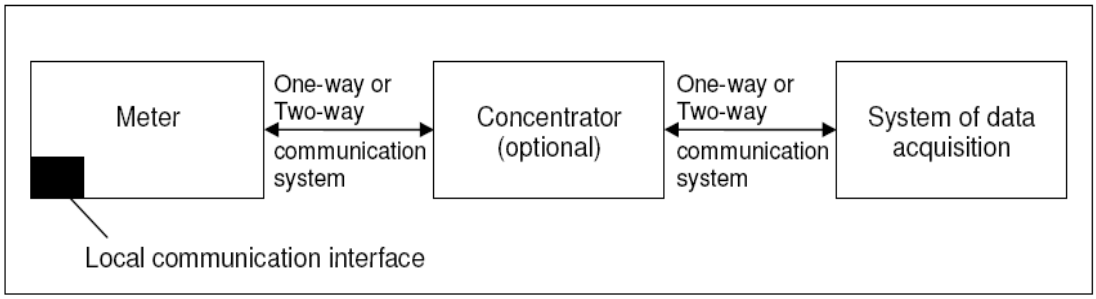

Figure 1: General structure of a smart metering system (Source: Figure 6, ERGEG Status Review of Regulatory Aspects of Smart Metering[2])

[1] Commission staff working paper - interpretative note on directive 2009/72/EC concerning common rules for the internal market in electricity and directive 2009/73/EC concerning common rules for the internal market in natural gas - retail markets - 22 January 2010 (Pg 7) http://ec.europa.eu/energy/gas_electricity/interpretative_notes/doc/implementation_notes/2010_01_21_retail_markets.pdf

[2] Ref: E09-RMF-17-03 www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_ERGEG_PAPERS/Customers/Tab/E09-RMF-17-03_SmartMetering-SR_19-Oct-09.pdf

Smart meters are the next generation of meters, which can replace existing electro-mechanical meters and offer a range of benefits for both the individual electricity and gas consumer and for the electricity and gas systems in general.

The existing standard mechanical meter records the total amount of electricity/gas used over time. These meters are read manually and the information is sent to the network company and then used to calculate customer bills. If a meter reader does not have access to the customer's meter, estimated consumption information (or a reading provided by the customer) is used to calculate the bill. If the estimated consumption is higher or lower than the actual meter read, this is corrected for when the meter is next read by the customer or the meter reader.

A smart meter provides a lot more information on the consumption patterns of users. It records customers' actual use of electricity/gas over short intervals (e.g. every 30 minutes). These meters are connected by a communications system to the network company / meter data collector providing the operator with automated, up-to-date information on the amounts of electricity/gas used by customers. Access to this information provides opportunities to reduce network operation costs, including reduced costs of visiting customer premises to manually read the meter and carrying out any necessary connections and disconnections. There are also savings due to reductions in technical losses and theft.

The data collected from smart meters can be used by electricity and gas suppliers (subject to data protection requirements) to deliver useful information to their customers regarding their electricity and gas consumption and costs. In particular, the installation of smart metering will allow electricity suppliers to create innovative pricing arrangements that can be offered to customers to support the efficient use of electricity, such as time-of-use electricity tariffs. This is where the price of electricity varies at different times of the day to reflect the changes in the costs of producing electricity. This will allow customers to manage their consumption of electricity in line with price movements and demand patterns.

Smart meters can facilitate improving energy efficiency by empowering consumers with more detailed, accurate and timely information regarding their energy consumption and costs, thus helping consumers reduce any unnecessary energy usage and shift any discretionary electricity usage away from peak consumption times.

1.3.2 EU Legislation, Initiatives and Rollout Status

There are a number of key EU legislative instruments promoting smart metering, which include (further details are contained in Appendix C):

- Third Legislative Package for Further Liberalisation of the Electricity and Gas Markets [3]
- Directive 2006/32/EC - Energy End-use Efficiency and Energy Services[4]
- Directive 2005/89/EC – Security of Supply[5]
- Directive 2004/22/EC - Measuring Instruments[6]

There are currently a number of EU coordinated smart metering initiatives underway which include (further details are contained in Appendix C):

- ERGEG Guidelines of Good Practice (GGP) on Regulatory Aspects of Smart Metering for Electricity and Gas (E10-RMF-23-03)[7].
- Mandate M/441[8]
- The Open Meter Project[9]
- Task Force on Smart Grids[10]

The status of smart metering rollouts for electricity and gas in Europe is diverse and changing at a rapid pace - further details are contained in Appendix C.

1.3.3 Smart Metering Progress in Ireland

1.3.3.1 Government Policy and Legislation

The National Smart Metering Plan is a key Government priority in the context of enabling the development of a Smart Grid, facilitating more efficient use of energy and underpinning smart and sustainable economic growth.

The importance of Smart Metering within the Government's energy policy, and indeed within its wider economic strategy, reflects the fact that, at EU level, Smart Metering is seen as a critical tool in managing energy demand in the interests of consumers and businesses.

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[3] http://ec.europa.eu/energy/gas_electricity/third_legislative_package_en.htm

[4] Article 13 of DIRECTIVE 2006/32/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:en:pdf

[5] Article 5 (2.d.) of DIRECTIVE 2005/89/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment www.energy.eu/directives/l_03320060204en00220027.pdf

[6] DIRECTIVE 2004/22/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 March 2004 on measuring instruments http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:135:0001:0080:EN:PDF

[7] ERGEG final Guidelines of Good Practice (GGP) on Regulatory Aspects of Smart Metering for Electricity and Gas (E10-RMF-23-03) http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_ERGEG_PAPERS/Guidelines%20of%20Good%20Practice/Other/E10-RMF-29-05_GGP_SM_8-Feb-2011.pdf

[8] Mandate M/441 http://www.openmeter.com/documents/m441en.pdf

[9] Open Meter Project http://www.openmeter.com/

[10] Smart Grids Task Force http://ec.europa.eu/energy/gas_electricity/smartgrids/taskforce_en.htm

On 22nd December 2009, the Energy Services Directive (Directive 2006/32/EC) was transposed into Irish law under the European Communities (Energy End Use Efficiency and Energy Services) Regulations 2009, **Statutory Instrument No. 542 of 2009**[11]. These Regulations also amend the Electricity Regulation Act 1999 to allow the Commission for Energy Regulation to place requirements on energy undertakings in relation to informative billing.

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> *"(5) The Commission may, by direction under subsection (1), require an energy undertaking to do any or all of the following—*
> *(a) provide bills to its final customers, based on actual energy use, at such frequency as may be specified by the Commission to enable those customers to regulate their own energy consumption in a timely manner,..."*

In May 2009 the first **National Energy Efficiency Action Plan** (NEEAP)[12] was adopted in line with EU requirements. The first NEEAP set out the key targets to met in order to achieve our 2020 commitments, including Action 33:

> *"We will encourage more energy efficient behaviour by householders through the introduction of smart meters".*

The second NEEAP, due to be published in June 2011, will reiterate the importance of smart metering as a key tool for realising long term energy demand management objectives.

1.3.3.2 CER Smart Metering Project

In March 2007 the Commission for Energy Regulation (CER) issued a Demand Side Management and Smart Metering Consultation Paper (CER/07/038)[13] in which the case for providing domestic and small business customers with time of use (ToU) electricity prices and smart metering arrangements was made. This was followed in November 2007 with the publication by the CER of an information paper, Smart Metering - The Next Step in Implementation (CER/07/198)[14,] which outlined a proposed framework in which the future scope of smart metering arrangements can be established.

Following on from the conclusions reached in the smart metering information paper CER/07/198 the CER established the Smart Metering Project Phase 1 in late 2007 with the objective of setting up and running smart metering trials and

[11] www.attorneygeneral.ie/esi/2009/B27331.pdf
[12] Chapter 07 – Residential Sector, Page 79
www.dcenr.gov.ie/Energy/Energy+Efficiency+and+Affordability+Division/National+Energy+Efficiency+Action+Plan.htm
[13] www.cer.ie/en/electricity-retail-market-current-consultations.aspx?article=01b6318d-3876-4630-8bb5-f54fb368be16
[14] www.cer.ie/en/electricity-retail-market-current-consultations.aspx?article=01b6318d-3876-4630-8bb5-f54fb368be16

assessing their costs and benefits, which will inform decisions relating to the full rollout of an optimally designed universal National Smart Metering Plan.

In order to draw on the experience and expertise of the electricity and gas market a Steering Group and a Working Group was established by the CER for the Smart Metering Project Phase 1. Both groups are chaired by the CER and consist of representatives from the Department of Communications, Energy and Natural Resources (DCENR), Sustainable Energy Authority of Ireland (SEAI), the Northern Ireland Authority for Utility Regulation (NIAUR) and Irish Gas and Electricity Industry Participants.

The reports published alongside this Information Paper CER/11/080 are key deliverables of Phase 1 of the CER Smart Metering Project. Further details of the Smart Metering Project Phase 1 are contained in Appendix B.

Customer Behaviour Trials Findings Report (CER/11/080a)

Technology Trials Findings Report (CER/11/080b)

Cost-Benefit Analysis Report (CER/11/080c)

1.4 Structure of This Paper

This paper is structured in the following manner:

- **Section 2.0** outlines the key findings from the electricity smart metering technology trials.
- **Section 3.0** outlines the key findings from the electricity smart metering customer behaviour trials.
- **Section 4.0** outlines the key findings from the electricity smart metering cost-benefit analysis.
- **Section 5.0** outlines the next steps for the CER Smart Metering Project.

- **Appendix A** contains a glossary of acronyms contained in this paper.
- **Appendix B** contains an overview of the CER Smart Metering Project Phase 1, including current status.
- **Appendix C** contains an overview of EU smart metering related legislation and initiatives, as well as an update on the status of smart metering rollouts in Europe.

1.5 Commenting on This Paper

This paper and its appended reports are provided as an information source on the results of the completed electricity smart metering trials and cost-benefit analysis. Any queries or comments on their contents can be forwarded, preferably in electronic format, to:

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2.0 Technology Trials Findings

2.1 Introduction

The CER established the Smart Metering Project Phase 1 in late 2007 with the objective of setting up and running smart metering trials. As part of this phase ESB Networks undertook a number of electricity smart metering technology trials. The purposes of these smart metering technology trials were:

- To enable learning about providing supporting systems, testing, and deploying smart meters.
- To assess the performance of representative available smart metering systems and communications technologies in the Irish environment.
- To identify risks and issues for a national smart metering rollout.
- To provide information for inputting into a cost-benefit analysis for a national rollout of electricity smart metering.

The systems trialled were selected from those offered during the procurement process in 2008. The systems were based on the three key communications technology areas: power-line carrier (PLC), wireless LAN (2.4GHz Wireless mesh) and point-to-point wireless (GPRS). ESB Networks focused on how these systems delivered a core set of smart metering functions which all require reliable communications.

It should be noted that for a full national rollout of smart metering the communications technology solution(s) deployed will ultimately be determined by the outcome of a competitive public procurement process. Other potential solutions not trialled can be considered at that stage.

The numbers of customer installations for the field trials were as follows:

- Metering systems with PLC communications – 1,100 single phase meters for customers in Limerick and Ennis. Eight of the locations chosen were urban and three were village areas.
- Metering system with GPRS communications - 5,800 single phase and 500 three phase meters throughout the country for customers selected for the customer behaviour trials (CBT).
- Metering systems with 2.4GHz Wireless mesh - 1591 meters installed in Cork City and 690 meters installed in the rural area of County Cork outside Bandon.

Desktop studies were carried out on two technologies – PLC from Aclara and 868 MHz RF from Elster.

The technology trials concluded in October 2010. A summary overview of the findings was published as an appendix to the CER Smart Metering Consultation Paper 2 (CER/10/197) in November 2010. The detailed findings report is now published as CER/11/080b alongside this Smart Metering Information Paper 4.

2.2 Key Findings of Technology Trials

2.2.1 Observations on Communication Technologies

ESB Networks noted that currently PLC could reliably deliver monthly readings. However, the PLC based communications trialled has major issues to be overcome to deliver reliable daily collection of profile data from every meter. Problems were also experienced with performance of on-demand tasks. Outside of ideal electricity network conditions the performance of the system deteriorated. These non-ideal conditions for PLC are frequently encountered on our network. Many of the issues ESB Networks identified with performance of PLC are currently being addressed by ongoing work in Europe by major utilities and vendors.

The GPRS based system generally worked well with good availability. Scaling the system to significantly larger numbers may be an issue. The longevity of GPRS as a technology in a large number of meters and mobile vendor lock-in is also a concern. However, if required to roll out a limited number of meters on a priority and dispersed basis over the next few years GPRS appears to be an appropriate solution.

The 2.4GHz mesh worked in the urban area where meters were relatively close to each other. The benefits of a mesh topology were shown here. The performance was disappointing in rural areas, where wireless is most needed. This was largely due to the European Regulatory limitations on the signal power at this licence exempt frequency. Mesh systems operating in the sub-1GHz range and at relatively higher transmit power outside of Europe appear to address many of these issues. ESB Networks believe that more suitable wireless spectrum should be made available in the sub 1GHz area to allow it access to a wider range of such solutions.

While developments on standardisation of the systems are advancing much work still has to be done. The recent entry of major communications systems vendors into the market is accelerating the availability of solutions complying with IP (Internet Protocol) standards.

2.2.2 Importance of Defining Requirements and Performance Levels

The trial showed that the performance levels will have a significant impact on the choice of communications technology and its operational cost.

2.2.3 Meter Design

Based on the meters used in the trial ESB Networks believe there will be a good choice of available metering technology to meet the functional requirements for a full rollout. However, more progress needs to be made on the full adoption of open standards.

2.2.4 Installation Work

For the half of electricity customers with indoor meters the management of access to install the smart meter was a key deployment issue. The time spent with the vendors to ensure that the meter install process was 'plug and play' was of great benefit. However, it is to be noted that technical issues were encountered in at least 3% of installations which required a lot more work than simply installing the smart meters in. This would have to be factored into the costing and planning of a full rollout.

2.2.5 Testing

The trial demonstrated the importance of a comprehensive testing strategy. Sufficient time must be allowed for soak testing of meters and devices in the field. Major security testing should also take place at this time.

2.2.6 Security and Data Protection

It is essential that all data collected and processed via the smart metering infrastructure be handled securely and that customer privacy is safeguarded at all times. The security associated with the solutions used in the trials were deemed fit for purpose. The trial included encryption of data and full compliance with Data Protection Legislation. As a general rule for a full rollout there will have to be an increased focus on areas such as:

- standards based security solutions leveraging security protocols deployed in other sensitive industries such as internet banking, telecomm's and defence.
- robust mechanisms for protecting the integrity of the smart metering network.
- secure hardware manufacturing processes and software development lifecycles.
- a robust, secure and speedy process to provide firmware upgrades to meters and devices in the field.

2.2.7 Timetable

Smart metering is a complex program. The experience in the trial and that of other utilities that have undertaken smart metering deployment reinforces this view. The programme can be up to 7 years duration with almost half the time required before full deployment. The key phases include:

- Definition of requirements, design, planning, specification and procurement. At the end of this phase solutions will have been selected.
- Design test and installation of IT systems including integration to meters.
- Rollout of communications infrastructure and installation of meters and other devices.

2.2.8 Further Work

The recent entry of major communications systems vendors into the market is accelerating the availability of solutions complying with IP standards which will be of benefit. It is important that ESB Networks build on the learning from the technology trials and continue to be involved in examining other potential solutions as they arise.

2.3 Further Information

The full content of the electricity smart metering technology trials findings report is available in CER/11/080b published alongside this Smart Metering Information Paper 4.

3.0 Customer Behaviour Trials Findings

3.1 Introduction

At the outset of the Smart Metering Project the CER emphasised the importance of a robust trial of how the introduction of smart metering in Ireland could impact energy consumers. Customer behaviour trials for residential consumers and SMEs (small-to-medium enterprises) were thus placed at the centre of the Smart Metering Project Phase 1. The focus was on trialling a number of different smart metering enabled energy efficiency measures with a view to measuring their impact on customer consumption.

The measures tested were time of use tariffs (ToU) in conjunction with a number of demand side management (DSM) informational stimuli i.e. detailed billing on a bi-monthly and monthly frequency, in-home displays, an overall load reduction (OLR) incentive and Web access.

- **Time of Use Pricing (ToU)**: Improved pricing signals in the form of a number of time of use tariffs, where different prices are charged at different times of the day in order to more accurately reflect the real variable price of electricity on the wholesale Single Electricity Market (SEM) in Ireland.
- **Bi-monthly detailed billing:** Enhanced information for customers on their electricity consumption and costs via an electricity usage statement included with bi-monthly bills which used the accurate consumption information from the smart meters to give customers more detailed information on how much electricity they used during the billing period and associated costs (e.g. graph of average usage costs by ToU, appliance ToU cost table, text based messages that were personalised and motivational with some historic and peer comparisons.
- **Monthly detailed billing**: Same as bi-monthly but with billing and provision of enhanced information on a monthly frequency.
- **In-home displays (IHDs)**: Electronic devices linked to the smart meters that give near real-time information to consumers on their electricity consumption and associated costs. They also provide historical information in the form of day-on-day, week-on-week and month-on-month comparisons, as well a daily budget setting function. IHDs were referred to as ‘electricity monitors’ for the purposes of the customer behaviour trials.
- **Overall load reduction (OLR) incentive:** A financial reward is available to customers who can reduce their electricity usage by a certain percentage target when compared to the same period in the previous year.

- **Web access:** Detailed electricity consumption and cost information was made available to customers via a Web account. The Web account was targeted specifically at SMEs but was also available to residential consumers on request.

A representative sample of over 5,000 residential consumers and 650 businesses throughout Ireland participated in the electricity customer behaviour trials. These participants were allocated across different test groups and a control group by the statistical advisors to ensure a robust experimental trial design. Recruitment for the trials began in September 2008 and all smart meters were installed by end-June 2009. A six month benchmark period was conducted between July and December 2009 which allowed electricity usage profiles of participants to be recorded before the introduction of the test measures on 1st January 2010. The test period ended on 31st December 2010.

Statisticians then analysed the consumption data collated from the trials to determine the consumer response to the smart metering enabled measures tested in terms of the impact on their overall and peak electricity usage. Pre-trial and post-trial surveys of trial participants were also conducted to help inform demographic, behavioural and experiential conclusions from the trials.

3.2 Key Findings of Customer Behaviour Trials

The electricity customer behaviour trials are among the largest and most statistically robust smart metering behavioural trials conducted internationally to date and thus provide a wealth of insightful information on the impact of smart metering enabled initiatives on electricity consumers.

The statistical evidence from the residential customer behaviour trial is that the deployment of time of use tariffs in combination with other demand side management stimuli results in a change in electricity consumption. Specifically, the residential trial participants achieved statistically significant reductions in electricity consumption, both overall usage and at times of peak usage.

3.2.1 Residential Customer Behaviour Trial Findings

The main findings of the residential customer behaviour trial may be summarised as follows:

Response to ToU tariffs and DSM stimuli

- the deployment of a range of ToU tariffs in conjunction with DSM stimuli are found on average to reduce overall electricity usage by 2.5% and peak usage by 8.8%;

- a specific trial DSM stimulus combining bi-monthly bill, energy usage statement and electricity monitor is found to be more effective than other DSM stimuli in reducing peak usage with a peak shift of 11.3%;
- overall energy reduction is linked with the level of usage: Households with higher consumption tended to deliver greater reductions in usage;
- analysis of the load distribution suggests shifting of load from peak to the post-peak period and in general to night usage from peak;
- of the tariff groups tested, no single one in combination with DSM stimuli stands out as being more effective than the others.
- the peak and overall load reductions detected for all the stimuli tested proved to be statistically significant with the exception of the overall load reduction detected for the bi-monthly bill and detailed energy statement stimulus, although the peak load reduction for this stimulus was statistically significant;
- the data from the Trial provides no evidence of a tipping point, with demand for peak usage estimated as being highly inelastic relative to price.

Demographic, behavioural and experiential conclusions

- Participants adapted usage to realise the potentially positive impact of the tariffs on their bills. 82% of participants made some change to the way they use electricity due to the Trial with 74% stating major changes were made by their households;
- Simple information can also be effective: The fridge magnet and stickers achieved 80% recall with 75% finding the magnet useful and 63% finding the sticker useful;
- The electricity monitor was deemed to be effective as a support to those achieving peak reduction (91% rated it as an important support) and shifting to night rates (87% deemed it an important support).
- Barriers to peak reduction relate to the difficulty of linking behaviour change to bill reduction. These perceptions may have contributed to the current recorded reduction. This may be hard to address due to exaggerated expectations of savings and similar exaggerated expectations of consequences if reduction is not achieved;
- Barriers to shifting to night usage relate to safety and convenience.
- The OLR incentive was impacted by a low recall rate (58%). However, the scores for communications, reasonableness of the target and effectiveness of the OLR incentive in motivating change were all very good.
- The detected benefits of the Trial are focused on behaviour changes in response to the price signals and DSM stimuli applied. No secondary benefits were identified in increased awareness of general energy efficiency or investment in energy efficiency enhancements for the home;

- The Trial succeeded in making participants more aware of energy usage (54% agreed) which is in keeping with the reduction in usage recorded. Only 18% stated that there had been no impact on the way their household uses electricity;
- Households headed by individuals with greater educational achievement or social grade achieved higher levels of reduction than those with lower levels. This was in part related to the typically higher level of usage associated with these households. Therefore, the impact of education or social grade on the ability to gain benefit from the tariffs is limited
- The impact of the time of use tariffs on recipients of FEA shows that these individuals exhibited the same level of change as other households and therefore do not appear to be disadvantaged over other groups;
- Fuel poor households (which lack financial means to adequately heat their homes) also benefit from the deployment of time of use tariffs.

3.2.2 SME Customer Behaviour Trial Findings

The main findings of the SME customer behaviour trial may be summarised as follows:

Response to tariffs and DSM stimuli

- the deployment of ToU tariffs and DSM stimuli are found to reduce overall electricity usage by 0.3% and peak usage by 2.2%, although neither result is found to be statistically significant;
- there is no tariff, DSM stimulus or tariff/DSM stimulus group which reduced overall electricity usage or peak usage by a statistically significant amount;

Empirical, behavioural and experiential conclusions

- 41% of participants believed that they reduced overall usage with 59% stating they reduced peak usage. The tariffs were regarded as effective in supporting this reduction with 71% stating the peak cost forced their business to attempt to reduce usage at this time.
- Participants have an increased level of regular monitoring of their electricity usage with 13% reporting this to be the case compared to 8% among the control group with 45% stating that they reviewed usage to identify ways of reducing it;
- The main barrier to reduction was the perception that it was not possible to move the usage to other times. This was stated as a very important reason by 72% of businesses who stated they did not reduce peak usage and 61% of those who did not reduce overall usage;
- Among the participants who had an overall load reduction the level of reduction was on average 8.51% with an average peak reduction of

8.33%. Among the participants who had a peak load reduction the level of overall reduction was on average 5.74% with an average peak reduction of 10.25%.

- Among participants who reduced either peak or overall usage, the electricity monitor was deemed to be effective with 93% of those reducing overall usage stating it was important and 85% of those reducing peak usage stating it was important;
- In contrast, the web-site information was rated as important to overall usage by 24% of reducing businesses with access to the stimulus. This reflects the low level of usage of the system (at 15% stating they logged in).

3.3 Further Information

The full content of the electricity smart metering customer behaviour trials findings report is available in CER/11/080a published alongside this Smart Metering Information Paper 4.

The CER intends to publish in due course the source data used to derive the electricity customer behaviour trial findings (in an anonymised format that complies with data protection regulations). This will enable academia, industry and other interested parties to benefit from the wealth of useful data which has been collated as part of the smart metering customer behaviour trials.

It is intended that this data will be made available via the Irish Social Science Data Archive www.ucd.ie/issda/. The CER will publish a notice on its Website when this data is made available.

4.0 Cost-Benefit Analysis Findings

4.1 Introduction

The cost-benefit analysis (CBA) delivers a robust economic assessment of all the long-term costs and benefits to the market and the individual consumer (residential and SME) of a national electricity smart metering rollout.

This CBA is a key deliverable of Phase 1 of the CER Smart Metering Project. It draws information from other key Phase 1 deliverables which are published alongside it i.e. the Electricity Customer Behaviour Trials (CBT) Findings Report (CER/11/080a) and the Electricity Technology Trials Findings Report (CER/11/080b). The Economic and Social Research Institute (ESRI) developed the methodology for the cost-benefit analysis, processed the multiple iterations of data inputs through their CBA model and reported on the results.

It should be noted that, for the purposes of compiling the CBA, ESB Networks and electricity suppliers were requested by the CER to provide smart metering related costs and benefits in accordance with the national smart metering high level design and implementation assumptions, which had been developed by the CER via the Smart Metering Project industry forums and a public consultation process (CER/10/197). The CER reviewed and validated the submitted costs and benefits, including an audit by a contracted independent third party.

The CBA results will inform the Commission for Energy Regulation (CER), the Department of Communications, Energy and Natural Resources (DCENR), and stakeholders about of the possible merits of providing smart electricity meters to residential and SME customers in Ireland. In addition, the analysis should help cast light on the relative attractiveness of various design options for implementation of smart meters and the main sources of risk associated with a rollout. Some sources of costs and benefits are more amenable to quantification than others, so the analysis is divided between “quantifiable” and “qualitative” sources of costs and benefits. To place some structure on the analysis of the quantifiable elements, the costs and benefits are also divided into rough categories by source: networks, suppliers, generation, and consumers (residential and SME).

The overall attractiveness of each option is identified for the quantifiable costs and benefits by computing the net present value (NPV) of the project in 2011, taking into account predicted cash flows from 2011-2032. However, these results make up only part of the assessment. Particularly on the benefits side, there are important possible future developments that might give rise to significant changes in the value of having smart meters in place but are difficult to quantify at this stage, including facilitation of increased renewable generation, electric vehicles

and 'smart grids'. These are described in the CBA in a section on qualitative costs and benefits.

4.2 Key Findings of Cost-Benefit Analysis

The key findings from the cost-benefit analysis can be summarised as follows:

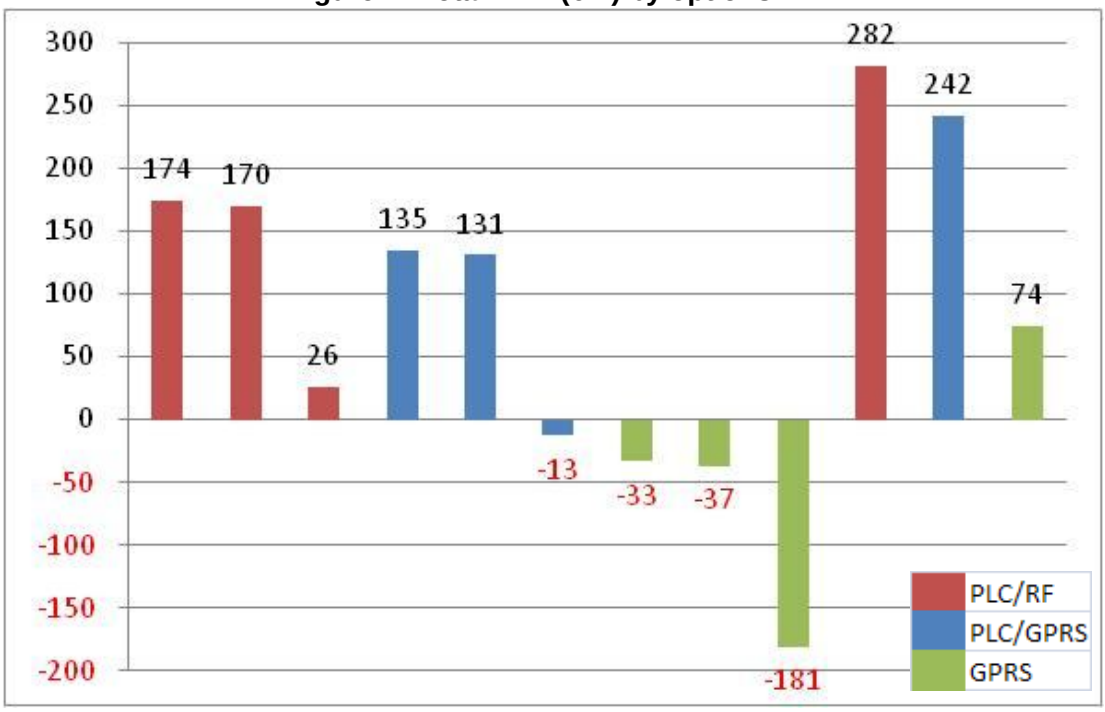
4.2.1 Overall Results from Quantifiable Analysis

- The estimated total net present values (NPVs) for the 12 main national electricity smart metering rollout options analysed are generally positive, and often substantially so (see Table 1 and Figure 2 below).
- These positive NPVs remain strong under a range of sensitivity analyses carried out.
- If these results were borne out in an actual deployment of smart metering, the project would bring about substantial net benefits for Ireland in comparison with the base case (counterfactual) scenario.

Table 1: Total NPV by option

Option	Billing baseline	Billing scenario	Comm's	IHD	Total NPV (€m)
Option 1	Bi-monthly	Bi-monthly	PLC-RF	N	**174**
Option 2	Bi-monthly	Bi-monthly	PLC-RF	Y	**170**
Option 3	Bi-monthly	Monthly	PLC-RF	N	**26**
Option 4	Bi-monthly	Bi-monthly	PLC-GPRS	N	**135**
Option 5	Bi-monthly	Bi-monthly	PLC-GPRS	Y	**131**
Option 6	Bi-monthly	Monthly	PLC-GPRS	N	**-13**
Option 7	Bi-monthly	Bi-monthly	GPRS	N	**-33**
Option 8	Bi-monthly	Bi-monthly	GPRS	Y	**-37**
Option 9	Bi-monthly	Monthly	GPRS	N	**-181**
Option 10	Monthly	Monthly	PLC-RF	N	**282**
Option 11	Monthly	Monthly	PLC-GPRS	N	**242**
Option 12	Monthly	Monthly	GPRS	N	**74**

Figure 2: Total NPV (€m) by options 1-12



4.2.2 Communications Technology

Regarding the wide area network (WAN) communications technology scenarios:

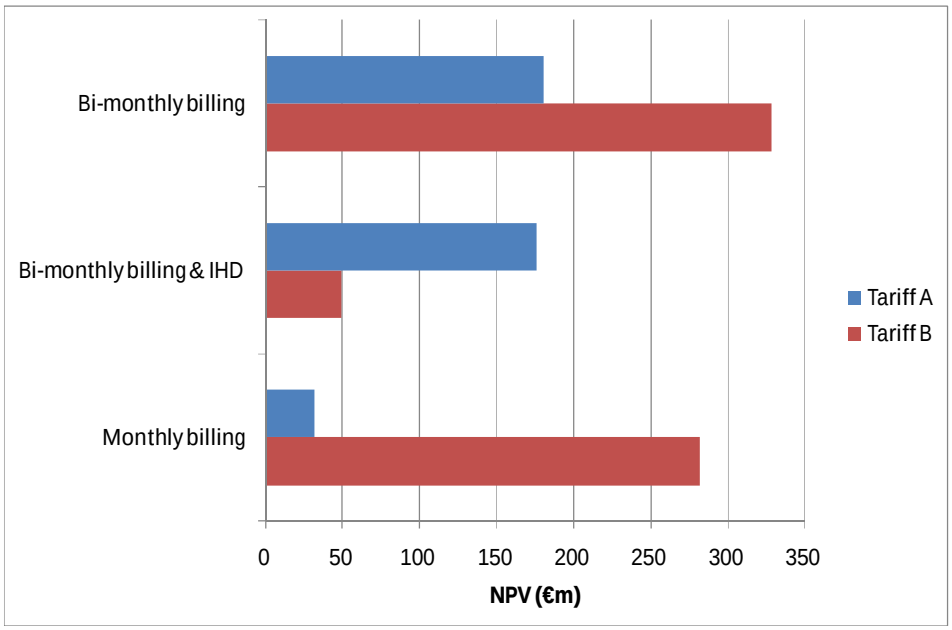
- Power line carrier (PLC) / Radio frequency (RF) communications shows higher net benefits than the other technologies examined, although the difference to PLC / GPRS may depend upon the value of key parameter assumptions.
- The attractiveness of GPRS communications depends heavily on the assumed cost of network services and, to a lesser extent, on the perceived need to build in compatibility with more advanced communication standards.

4.2.3 Informational Stimuli

Regarding the informational stimuli:

- Bi-monthly billing with no in-home display (IHD) consistently exhibits the highest total NPV, but the margin is only €4m compared to the next best option (bi-monthly billing with an IHD) under Tariff A.
- The relative merits of different informational stimuli proved to be quite sensitive to the CBT tariff band chosen, with IHDs showing a substantial reduction in NPV under Tariff B and monthly billing showing a big increase (see Figure 3 below).
- This suggests that one should be cautious in basing decisions about the choice of stimulus in a rollout on the estimates of quantifiable benefits alone.

Figure 3: Summary Comparison of NPVs for Informational Stimuli by Time of Use Tariffs A and B



4.2.4 Sensitivity Analyses

Regarding the sensitivity analyses carried out:

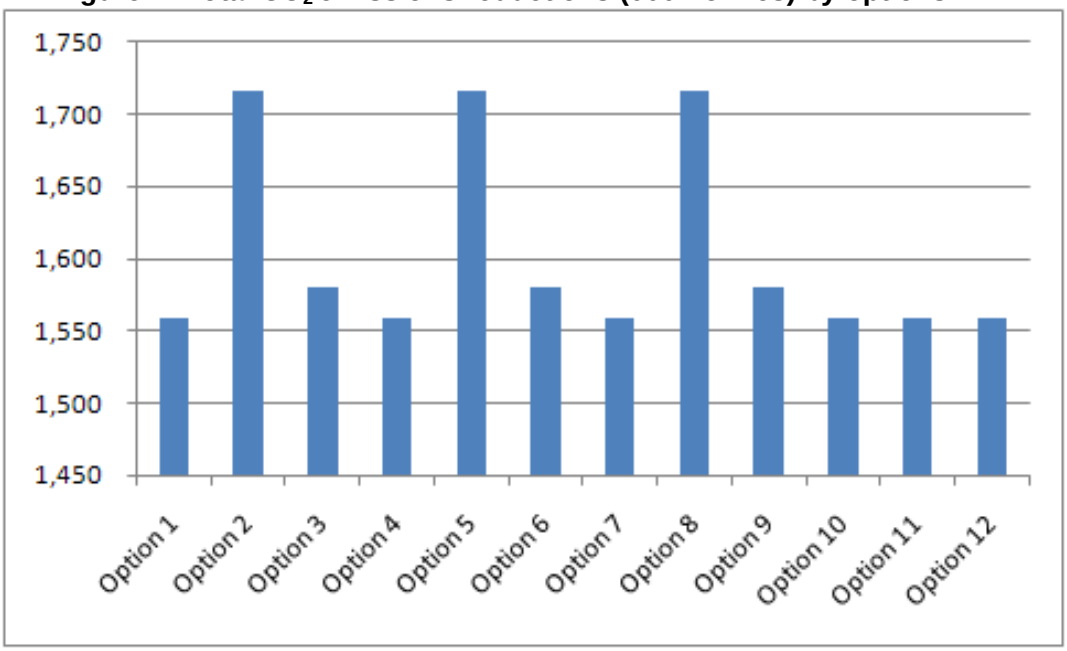
- Important sources of variation in estimated NPVs arose from assumptions about the expected pattern of residential demand response, the level of additional billing system operational expenditure (OPEX) by suppliers and network costs such as the costs of meters, meter installation and IHDs.
- Most other sensitivity tests on network cost items showed modest effects,
- The project's viability does not appear to be particularly sensitive to the assumed discount rate.

4.2.5 Societal Benefit

Regarding the societal benefit from reduced emissions of greenhouse gases:

- By the end of the CBA period, we estimate CO_2 emissions at 100,000-110,000 Tonnes below baseline each year and annual SO_2 emission to be lower by 117-129 Tonnes.
- The value of CO_2 emissions is assumed already to be included in electricity prices, so it is not added into the savings estimates in quantifiable analysis.
- Figure 4 below illustrates graphically the total CO_2 emissions reductions by each option.

Figure 4: Total CO_2 emissions reductions (000 Tonnes) by options 1-12



4.2.6 Qualitative Benefits

There are a number of potential costs and benefits from a national rollout of electricity smart metering that are very difficult to put a robust quantifiable estimate on and therefore they have been excluded from the quantifiable analysis and are only described qualitatively, such as facilitation of and/or synergies with a 'smart grid' implementation, micro generation, electric vehicles, gas smart metering and water smart metering. Generally, these exclusions reflect the conservative approach taken to the quantifiable CBA, which tends towards a likely underestimation of the potential benefits from a national electricity smart metering rollout.

4.3 Further Information

The full content of the electricity smart metering cost-benefit analysis report is available in CER/11/080c published alongside this Smart Metering Information Paper 4.

5.0 Conclusions and Next Steps

5.1 Summary

This Information Paper highlights the key findings from a number of reports that will be used to inform future decisions regarding electricity smart metering for residential consumers and SMEs in Ireland. These reports, which have been produced as part of Phase 1 of the CER Smart Metering Project, are:

- Customer behaviour trials findings report (CER/11/080a)
- Technology trials findings report (CER/11/080b)
- Cost-benefit analysis report (CER/11/080c)

The findings from these reports generally indicate that a national rollout of electricity smart metering and associated initiatives can assist consumers in being more efficient in their use of electricity and as a result reduce their electricity costs and their carbon emissions. The findings also indicate that generally there is quantifiable net benefit to Ireland, often substantially so, arising from the different national electricity smart metering rollout options analysed.

5.2 Next Steps

The rollout of smart meters represents a major national infrastructure project and the publication of these reports is one of the defining milestones in its delivery. Given the scale of investment required to deliver smart metering, a thorough and robust analysis is required to substantiate any rollout decision. The CBA, which concludes a positive net benefit for electricity consumers, will facilitate the further development of the Smart Metering Project. The CER appreciates the significant contribution of all stakeholders that have been involved in compiling these reports and looks forward to their ongoing involvement in the next steps for the Smart Metering Project.

The CER will now focus on using the findings contained in the reports published with this information paper to develop a consultation on the proposed high level design and implementation approach for a national smart metering rollout. The CER intend to publish this consultation in August 2011. The intention is that this consultation will also cover gas smart metering pending the results of the gas trials and cost-benefit analysis.

The CER will focus on managing the gas customer behaviour and technology trials to their conclusion in May 2011 and ensuring that the associated findings

reports and a cost-benefit analysis for a national gas smart metering rollout is developed by September 2011.

The CER envisages that it will be in a position by October 2011 to publish a Decision Paper on a national smart metering rollout for Ireland (electricity and gas). This would mark the formal conclusion of Phase 1 of the Smart Metering Project.

The next steps milestones for the remainder of Phase 1 of the Smart Metering Project are outlined in the table below. Please note that these timelines will be kept under review and any changes will be communicated by the CER.

In order to assist interested parties in understanding the vast and diverse content of the three reports published with this Information Paper the CER will hold an open information session. This session will give an overview of the reports and give interested parties the opportunity to ask questions on the content of the reports. Details of the venue, timings and agenda for this workshop will be published on the CER Web site in due course.

The next steps for Phase 1 of the CER Smart Metering Project are outlined in the table below:

Date	Action
16th May 2011	Electricity Smart Metering Findings Reports Published (Customer Behaviour Trials, Cost-Benefit Analysis and Technology Trials)
TBC	Hold Open Information Session on Electricity Smart Metering Findings Reports
31st May 2011	Conclude Gas Customer Behaviour Trials and Technology Trial
August 2011	Publish Consultation Paper on Proposed National Smart Metering High Level Design and Implementation Approach (Electricity and Gas)
September 2011	Publish Gas Smart Metering Findings Reports (Customer Behaviour Trials, Cost-Benefit Analysis and Technology Trial)
October 2011	Publish Decision Paper on National Smart Metering High Level Design and Implementation Approach (Electricity and Gas)

While this is not a formal consultation any interested parties who would like to comment on the Smart Metering Information Paper 4 and its appended reports can submit their comments to Gary Martin (gmartin@cer.ie).

Appendix A – Glossary

This appendix outlines a glossary of acronyms included in this paper. Terms are listed in alphabetical order.

CBA:	Cost-benefit analysis
CBT:	Customer behaviour trials
CER:	Commission for Energy Regulation
ESRI:	Economic and Social Research Institute
IHD:	In-Home Display
NPV:	Net Present Value
NRA:	National Regulatory Authority
PLC:	Power Line Carrier
RF:	Radio Frequency
SME:	Small-to-Medium Enterprises
TOU:	Time of Use
WAN:	Wide Area Network

Appendix B – CER Smart Metering Project Phase 1

In March 2007 the Commission for Energy Regulation (CER) issued a Demand Side Management and Smart Metering Consultation Paper (CER/07/038)[15] in which the case for providing domestic and small business customers with time-of-day electricity prices and smart metering arrangements was made. This was followed in November 2007 with the publication by the CER of an information paper, Smart Metering - The Next Step in Implementation (CER/07/198)[16,] which outlined a proposed framework in which the future scope of smart metering arrangements can be established.

Following on from the conclusions reached in the smart metering information paper CER/07/198 the CER established the Smart Metering Project Phase 1 in late 2007 with the objective of setting up and running smart metering trials and assessing their costs and benefits, which will inform decisions relating to the full rollout of an optimally designed universal National Smart Metering Plan.

In order to draw on the experience and expertise of the electricity and gas market a Steering Group and a Working Group was established by the CER for the Smart Metering Project Phase 1. Both groups are chaired by the CER and consist of representatives from the Department of Communications, Energy and Natural Resources (DCENR), Sustainable Energy Authority of Ireland (SEAI), the Northern Ireland Authority for Utility Regulation (NIAUR) and Irish Gas and Electricity Industry Participants.

Figure 4: Smart Metering Project Phase 1 – Overview of Participants

[15] www.cer.ie/en/electricity-retail-market-current-consultations.aspx?article=01b6318d-3876-4630-8bb5-f54fb368be16

[16] www.cer.ie/en/electricity-retail-market-current-consultations.aspx?article=01b6318d-3876-4630-8bb5-f54fb368be16

To achieve its objectives the Smart Metering Working Group was divided into four Work Streams each focusing on separate aspects of the Smart Metering Project Phase 1:

- **Networks**: Technical design and rollout of Smart Metering infrastructure.
  Lead: ESB Networks (electricity) and Bord Gáis Networks (gas).
- **Customer Behaviour**: Mainly focusing on the design and implementation of all aspects of the customer behavioural trials, including participant selection, communications and analysis of results.
  Lead: Sustainable Energy Authority of Ireland (SEAI).
- **Tariffs**: Mainly focusing on design of Tariffs (Time of Use) and development of a Prepayment Market Model.
  Lead: Electric Ireland.
- **Billing / Data**: Mainly focusing on data flows from the Smart Metering infrastructure to Suppliers for customer behaviour trial billing options.
  Lead: Bord Gáis Energy Supply.

The CER was responsible for undertaking a Smart Metering Cost-Benefit Analysis (CBA), which is published alongside the CBT report, and worked with the Economic and Social Research Institute (ESRI) in this regard. As part of this work, the CER identified all information requirements for a CBA, the parties responsible for providing such information and coordinated the transfer of the required information to the ESRI for their modelling. The CER also arranged for an independent audit of the supplier and network operator cost and benefits included in the CBA, which was conducted by Frontier Economics.

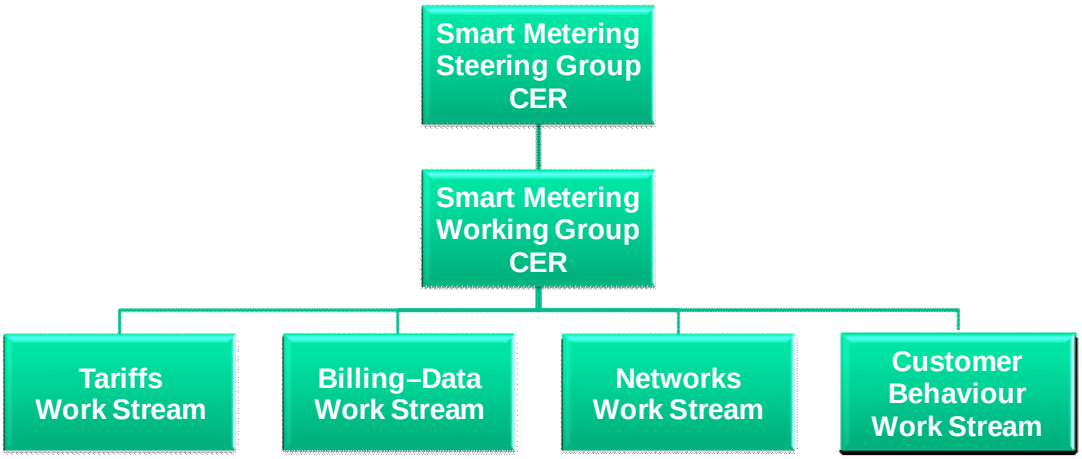


Figure 5: Smart Metering Project Phase 1 – Governance Structure

The key deliverables of the Smart Metering Project Phase 1 are depicted below:

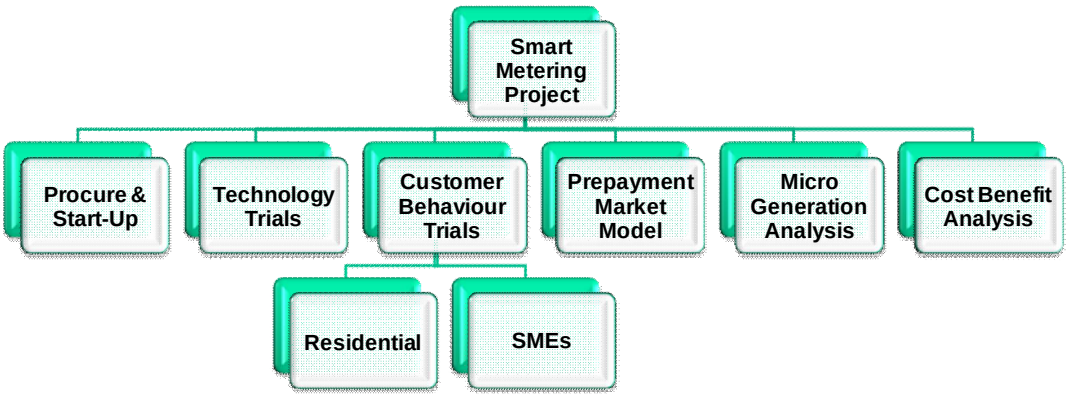


Figure 6: Smart Metering Project Phase 1 – High-Level Work Breakdown Structure (WBS)

Overall, project progress has been very positive with all key milestones having been achieved. The main highlights to date have been the:

- Completion of the electricity technology trials in September 2010, the detailed report of which is published alongside this CBT report
- Completion of the electricity customer behaviour trials (CBT) for residential and SME customers in December 2010 and completion of associated analysis and reporting in April 2011
- Completion of the 'smart prepayment' trial in February 2011, the findings of which are included in this CBT report.
- Initiation of the gas customer behaviour trials (CBT) for residential and SME customers which will complete in May 2011. Associated analysis and reporting is due to be completed by September 2011.
- Completion of the electricity cost-benefit analysis in April 2011, which is published alongside this CBT report. An addendum to the CBA for gas is due to be completed by September 2011.

Figure 7 below gives an overview of the status of the key deliverables of Phase 1 of the Smart Metering Project.

Electricity CBT	•c.5,500 residential & c.750 SME trial participants. •Benchmark period completed 31 Dec 2009. •Active test period completed 31 Dec 2010 - ToU tariffs, Detailed Billing, IHD, Web. **Report**	G
Gas CBT	•c.2,000 residential & 50 SME trial participants. •Benchmark period completed 31 May 2010. •Active test period began 1 Jun 2010 - Detailed Billing, IHD, Tariff. Continues to 31 May 2011.	G
Technology Trials	•GPRS in CBT & c.3,500 participants in PLC & RF 2.4GHz trials & desktop studies (RF 868MHz & MV PLC) - completed Sept 2010. **Report** •Duel Fuel Trial in progress.	G
Prepayment	•"Proof of Concept" Trial of 'thin prepayment meter' completed Feb 2010. **Report**	G
Micro Gen	•Superseded by scheme launched Feb 2009.	
Cost Benefit Analysis	•ESRI partnering CER in completing CBA. •Electricity smart metering CBA completed. **Report**	G

Figure 7: Smart Metering Project Phase 1 – Deliverables Status

Further detailed information on the CER Smart Metering Project and its progress to date is available via the consultation papers and information papers that have been published on www.cer.ie/en/information-centre-reports-and-publications.aspx.

- Consultation Paper 2 – CER/10/197 – 11th November 2010
- Consultation Paper 1 – CER/10/082 – 11th June 2010
- Information Paper 3 - CER/09/186 - 7th December 2009
- Information Paper 2 - CER/09/118 - 31st July 2009
- Information Paper 1 - CER/09/024 - 6th February 2009

Other CER publications on at this same Website location relating to smart metering which may be of interest are:

- Approved Smart Metering CBTs Gas Tariff – published 1st April 2010
- Approved Smart Metering CBTs Electricity Time of Use (TOU) Tariffs – original published 2nd October 2009 and renewed 7th September 2010
- Arrangements for Micro Generation Decision and Response to Comments Received (CER/07/208) – 20th Nov 2007
- Smart Metering - The Next Step in Implementation (CER/07/198) – 5th Nov 2007

- Demand Side Management and Smart Metering Consultation Paper (CER/07/038) - March 2007

For further information on the Smart Metering Project Phase 1 you can contact Gary Martin at the Commission for Energy Regulation (e-mail: gmartin@cer.ie or tel.: 01-4000800).

Appendix C – EU Smart Metering Policy, Initiatives and Rollout Status

C.1 EU Smart Metering Related Legislation

There are a number of key EU legislative instruments promoting smart metering, which include:

a) Third Legislative Package for Further Liberalisation of the Electricity and Gas Markets [17]

The 3rd Package contains provisions regarding intelligent metering systems, with the aim of better informing customers of their consumption and helping to increase awareness of energy consumption. The implementation of those metering systems may be subject to an economic assessment of all the long-term costs and benefits to the market and the individual consumer or of which form of intelligent metering is economically reasonable and cost-effective and which timeframe is feasible for their installation.

The general principle is that consumers must have access to their consumption data. National Regulatory Authorities (NRAs) must ensure access to customer consumption data, and the existence of a nationwide harmonised format for consumption data and a process for suppliers and consumers to access the data must be defined.

Intelligent metering systems are promoted twice in the Directives: first, with the aim to promote energy efficiency and demand side management measures; second, with the aim to ensure active participation of consumers in the market. Different provisions apply for electricity and for gas – details below. There are also a number of EU Interpretive Notes which cover smart metering published on these directives.

i) Electricity - Directive 2009/72/EC (Annex 1) [18]

This directive states that:

1. (i) [Member States shall ensure that customers] *are properly informed of actual electricity consumption and costs frequently enough to enable them to regulate their electricity consumption'*

2. *'Member States shall ensure the implementation of intelligent metering systems that shall assist the active participation of consumers in the*

[17] http://ec.europa.eu/energy/gas_electricity/third_legislative_package_en.htm
[18] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0072:EN:NOT

electricity supply market. The implementation of those metering systems may be subject to an economic assessment of all the long-term costs and benefits to the market and the individual consumer or which form of intelligent metering is economically reasonable and cost-effective and which timeframe is feasible for their distribution.

Such assessment shall take place by 3 September 2012'.

Subject to that assessment, Member States or any competent authority they designate shall prepare a timetable with a target of up to 10 years for the implementation of intelligent metering systems.

Where roll-out of smart meters is assessed positively, at least 80 % of consumers shall be equipped with intelligent metering systems by 2020.

An EU Retail Markets Interpretive Note[19] on Electricity Directive 2009/72/EC highlights a European Commission Declaration[20] which clarifies that:

"It is understood that in the case no economic assessment of the long-term costs and benefits is made, at least 80% of all consumers have to be equipped with intelligent metering systems by 2020."

ii) Gas - Directive 2009/73/EC (Annex 1)[21]

This directive states that:

1. (i) [Member States shall ensure that customers] *are properly informed of actual gas consumption and costs frequently enough to enable them to regulate their own gas consumption.*

2. *Member States shall ensure the implementation of intelligent metering systems that shall assist the active participation of consumers in the gas supply market. The implementation of those metering systems may be subject to an economic assessment of all the long-term costs and benefits to the market and the individual consumer or which form of intelligent metering is economically reasonable and cost-effective and which timeframe is feasible for their distribution.*

   Such assessment shall take place by 3 September 2012.

[19] Commission staff working paper - interpretative note on directive 2009/72/EC concerning common rules for the internal market in electricity and directive 2009/73/EC concerning common rules for the internal market in natural gas - retail markets - 22 January 2010 http://ec.europa.eu/energy/gas_electricity/interpretative_notes/doc/implementation_notes/2010_01_21_retail_markets.pdf

[20] Council document 10814/09 ADD 1 REV 1 http://register.consilium.europa.eu/pdf/en/09/st10/st10814-ad01re03.en09.pdf

[21] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0073:EN:NOT

Subject to that assessment, Member States or any competent authority they designate, shall prepare a timetable for the implementation of intelligent metering systems.

b) Directive 2006/32/EC - Energy End-use Efficiency and Energy Services[22]

It has been estimated that EU energy consumption is around 20% higher than can be justified on economic grounds. This has led to the view that there is a large potential for unrealised economic energy savings which can be realised through energy services and other end-use efficiency measures. In pursuit of this objective the European Commission adopted EU Directive EC 2006/32 on 5th April 2006. Article 13 of this Directive requires that:

"Member states shall ensure that, in so far as is technically possible, financially reasonable and proportionate in relation to the potential energy savings, final customers for electricity … are provided with competitively priced individual meters that accurately reflect the final customer's actual energy consumption and that provide information on actual time of use"

"Appropriate information shall be made available with the bill to provide final customers with a comprehensive account of energy costs. Billing on the basis of actual energy consumption shall be performed frequently enough to enable customers to regulate their own energy consumption".

c) Directive 2005/89/EC – Security of Supply[23]

This Directive specifies that member states may encourage *"the adoption of real-time demand management technologies, such as advanced metering systems"* to maintain balance between electricity demand and supply.

d) Directive 2004/22/EC - Measuring Instruments[24]

The Directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments (MID) establishes the requirements that measurement devices and systems have to satisfy before being put on the market and/or put into use. Each measuring instrument must meet the essential requirements (laid down in Annex I of the Directive) and in the relevant instrument-specific Annex.

[22] Article 13 of DIRECTIVE 2006/32/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:en:pdf

[23] Article 5 (2.d.) of DIRECTIVE 2005/89/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment www.energy.eu/directives/l_03320060204en00220027.pdf

[24] DIRECTIVE 2004/22/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 March 2004 on measuring instruments http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:135:0001:0080:EN:PDF

C.2 EU Smart Metering Related Initiatives

There are currently a number of EU coordinated smart metering initiatives underway which include:

- On 8th February 2011 ERGEG published its final **Guidelines of Good Practice (GGP)** on Regulatory Aspects of Smart Metering for Electricity and Gas (E10-RMF-23-03)[25]. These final recommendations aim to provide guidance regarding the European Commission's 3rd Energy Package provisions on the installation of intelligent metering systems for electricity and gas, focusing on customer services, roll-out of smart meters, cost-benefit analysis and data security and integrity.

- European Standards Organisations are progressing **Mandate M/441**[26] for the development of an open architecture for utility meters involving communication protocols and functionalities enabling interoperability. The Mandate has the general objective to highlight or to harmonise European standards that will enable interoperability of utility meters (water, gas, electricity, heat), which can then improve the means by which customers' awareness of actual consumption can be raised in order to allow timely adaptation to their demands. According to Mandate M/441, the implementation of this provision requires the definition of new functionalities for smart meters – in addition to those in the Measuring Instruments Directive (MID)[27], and as stated by the European Commission in the Mandate M/441.

- The **Open Meter Project**[28] began in January 2009 with the main objective to specify a comprehensive set of open and public standards for advanced metering infrastructure (AMI), supporting electricity, gas, water and heat metering. This project is due to conclude in June 2011.

- In January 2010 a **Task Force on Smart Grids**[29] was launched whose mission is to advice the European Commission on policy and regulatory directions at European level and to coordinate the first steps towards the implementation of smart grids under the provision of the 3rd Package. The initial duration of the Task Force is 20 months, to May 2011.

[25] ERGEG final Guidelines of Good Practice (GGP) on Regulatory Aspects of Smart Metering for Electricity and Gas (E10-RMF-23-03) http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_ERGEG_PAPERS/Guidelines%20of%20Good%20Practice/Other/E10-RMF-29-05_GGP_SM_8-Feb-2011.pdf

[26] Mandate M/441 http://www.openmeter.com/documents/m441en.pdf

[27] Directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0022:en:NOT

[28] Open Meter Project http://www.openmeter.com/

[29] Smart Grids Task Force http://ec.europa.eu/energy/gas_electricity/smartgrids/taskforce_en.htm

C.3 Smart Metering Roll-out Status in Europe

The status of smart metering for electricity and gas in Europe is diverse and changing at a rapid pace.

The last publicly available official report on the status of each country is the *ERGEG Summary of Member State experiences on cost benefit analysis (CBA) of smart meters* published 2nd February 2011[30] but this document focuses on smart metering cost-benefit analysis (CBA) development rather than specific meter rollout status. Figure 8 below is an excerpt from this report and it indicates that, out of the 24 member states that responded to the ERGEG survey, as of 1st January 2011 eleven had completed an electricity CBA and six had completed a gas CBA.

Status of CBA in CEER countries	Electricity	Gas
Countries have conducted a CBA	11[1]	6[2]
Positive result of CBA	7[3]	5[4]
Countries plan (or ongoing) to conduct a CBA (in some cases for the 2nd time – France, Hungary, Poland, Portugal)	12[5]	14[6]
Countries do not plan a CBA	2[7]	5[8]
Countries with no CBA, but no longer relevant (yes/no of roll-out already decided)	3[9]	0

1: Austria, Denmark, France, Hungary, the Netherlands, Norway, Poland, Portugal, Slovenia, Sweden, United Kingdom
2: Austria, France, Hungary, Italy, the Netherlands, United Kingdom
3: Austria, France, the Netherlands, Norway, Poland, Portugal, United Kingdom (Poland – study was TSO, not gov't authority. In Sweden, although result was negative, roll-out for electricity proceeded.)
4: Austria, France, the Netherlands, Italy, United Kingdom
5: Belgium, Czech Republic, Germany, France, Greece, Hungary, Ireland, Luxembourg, Latvia, Poland, Portugal, Romania (Belgium - each region conducting its own, no federal one planned) (Portugal - to be decided by gov't)
6: Belgium, Czech Republic, Germany, Spain, Finland, Greece, Hungary, Ireland, Latvia, Luxemburg, Lithuania, Portugal, Slovenia, Sweden (Portugal - to be decided by gov't)
7: Lithuania, Slovak Republic
8: Denmark, Norway, Poland, Romania, Slovak Republic (Norway has no gas)
9: Spain, Finland, Italy

Figure 8: Status of Smart Metering CBA Development in EU Member States (Source: Page 2, ERGEG Summary of Member State experiences on cost benefit analysis (CBA) of smart meters published 2nd February 2011)

[30] Summary of Member State experiences on cost benefit analysis (CBA) of smart meters 2 February 2011 http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_CONSULT/CLOSED%20PUBLIC%20CONSULTATIONS/CUSTOMERS/Smart%20metering/CD/C11-RMC-44-03_CBA%20SM_2-Feb-2011.pdf

The *ERGEG Status review on regulatory aspects of smart metering* report, published October 2009[31] is still the last publicly available official report on the status of each country regarding trials and rollouts of smart metering. Because of the fast pace of development in the area of smart metering it should be noted that the national situations which are reflected in the status review may no longer provide a complete and accurate picture of the national situations.

- Generally in electricity only two countries have undertaken a large scale meter installation programme for customers - these early adopters are Italy and Sweden with full roll-outs. In addition, some other countries have decided to undertake a large scale rollout of smart meters, such as Britain which mandated a national roll-out of smart electricity and gas meters.[32]. Other countries are considering roll-out plans with some undertaking smart metering trials to inform their decisions.

- In gas, there are fewer uptakes of smart meters, with Italy and Britain having planned roll-outs, while a small number of countries are discussing the possibility.

The ERGEG Status review on regulatory aspects of smart metering report also found that the most important policy objectives for supporting and encouraging a roll-out of smart meters in both electricity and gas are energy efficiency, peak load management and more frequent meter readings.

[31] E09-RMF-17-03 ERGEG Status review on regulatory aspects of smart metering as of May 2009 www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_ERGEG_PAPERS/Customers/Tab/E09-RMF-17-03_SmartMetering-SR_19-Oct-09.pdf

[32] www.decc.gov.uk/en/content/cms/what_we_do/consumers/smart_meters/smart_meters.aspx