Case Study 4: The United Kingdom

4.1 Context

Energy Efficiency Obligations have been in place in the UK since 1994, initially on the electricity industry but since 2000 on both the electricity and gas suppliers. During this time, the electricity companies moved from fourteen regional monopolies (and gas from one national monopoly) to a fuller liberalised market with six major energy suppliers all of whom supply both gas and electricity. Since 2002, the Government has been responsible for setting the size of the obligation which was initially called the Energy Efficiency Commitment (EEC) and from April 2008 is now called the Carbon Emissions Reduction Target (CERT).

CERT is intended to represent an approximate doubling of energy efficiency activity compared to the second phase of its predecessor EEC. EEC/CERT, along with Building Regulation, form the main energy policy policies for tackling household carbon dioxide emissions as part of the UK 2006 programme for tackling Climate Change.

4.2 Objective

EEC/CERT has always been viewed primarily as an environmental policy to tackle carbon dioxide emissions. Household energy use in the residential sector is responsible for around 27% of total UK carbon dioxide emissions on an end used basis. EEC/CERT is intended to stimulate greater investment in energy efficiency measures in the household sector than would otherwise have occurred and at the same time to support progress towards wider economic and social objectives.

4.3 Main Characteristics of the Programme

Under the UK energy efficiency obligations, electricity and gas suppliers are required to achieve targets for the promotion of energy efficiency improvements in the residential sector. The targets are specified as follows: for EEC2 in lifetime energy savings discounted at 3.5% and weighted for the CO2 content of the fuels saved; for CERT, in lifetime CO2 savings (undiscounted). The CERT target in the 3 year period to the end of April 2011 is lifetime CO2 savings of 185 MtCO2.

The targets do not prescribe how suppliers should attain these improvements and suppliers can fulfil their obligations by carrying out any combination of approved measures including installing insulation or supplying and promoting low energy light bulbs, high efficiency appliances or boilers. The only constraint on the suppliers’ activities is that in CERT they must achieve at least 40% of their energy savings in low

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1 There is a separate policy initiative targeted at tackling the problem of “fuel poverty” defined as requiring more than 10% of disposable income to heat the property to a modern acceptable standard.
income households (those households on income related benefits and tax credits)\(^2\). As the UK energy market is fully liberalised, the CERT obligation only applies to those energy suppliers with more than 50,000 customers to ensure that such obligations do not act as an entry barrier to new suppliers.

As energy supply price restraints were removed in 2002 for electricity and gas in the residential sector, there is no longer an allowance to cover the costs of this activity. In other words, it has become a “cost of business” like other environmental considerations or health and safety, etc. The Government makes a (conservative estimate) of the likely costs of EEC/CERT to customers when it is setting a target. For example in the 3 year period 2005-8, the EEC cost was nearly £7 per household per fuel per year. This was 23\% less than Government had expected, allowing for inflation. The current CERT is estimated by Government to be around £23 per fuel per household per year but is expected to once again be at least 20\% lower. This figure is still less than 4\% of average household energy bills.

In the two EEC obligation periods covering 2002-08, all energy suppliers met their target and the indication is that this will also be the case for CERT (2008-11).

In terms of energy efficiency measures used by the energy suppliers, there has been a tremendous growth in annual installations as shown in Figures 4.1.

Figure 4.1: The average annual installations of various insulation measures over the period 2000-08 associated with UK energy efficiency obligations (N.B. in the period 2005-08, annual CFLs are actually 34 million etc.).

In terms of number of measures, CFLs and appliances dominate, but in terms of energy saving insulation, particularly of empty cavity walls, is the most important activity. In EEC2, insulation accounted for 75\% of the energy savings achieved.

\(^2\) For EEC2, the corresponding figure for savings to be obtained for low income households was 50\% of the target.
4.4 Monitoring and Verification

This important function is carried out by the Energy Regulator, Ofgem. They are responsible for providing guidance on the preparation, measurement and evaluation of individual projects to the energy suppliers. It is by monitoring and verifying the suppliers’ activity on an individual project by project basis that Ofgem satisfies itself that the energy supplier has met their overall target.

As the UK system has always focussed only on small energy users and now just householders, then the deemed, or ex ante, energy saving values has been the sole method used by energy suppliers to deliver their targets. This has meant that Ofgem’s role has effectively become verifying that the energy efficiency measures are on the list which have deemed savings and that subsequently these measures were installed and are in place. The process is subject to random audits by the Regulator and its agents to ensure these conditions are met.

4.5 Evaluation and Impact of EEC

Full evaluations are available for the six years, i.e. the periods 2002-5 and 2005-8 are available from eoinleesenergy.com.

4.5.1 Energy and Carbon Savings

Unfortunately, the EEC target was measured in lifetime discounted fuel standardised units which although correctly carbon weighted between the differing fuels, do not translate easily into actual electricity and fossil fuel savings. Unravelling these fuel standardised units, the EEC2 savings. In terms of annual energy saving, these EEC2 savings would be around 3.9 TWh/year for electricity and around 6.3 TWh/year for fossil fuels. The carbon savings from EEC2 (excluding deadweight) are estimated at 59 million tons CO2 lifetime or 2.1 million tons of CO2 per year in the middle of the Kyoto period 2010 (1.4% of household emissions).

The 6 years of EEC schemes have resulted in annual energy saving of around 6 TWh/year for electricity and around 8 TWh/year for fossil fuels. As a percentage of residential final energy consumption in 2008 this equates to 5.1% and 2.2% respectively.

From April 2008, the CERT target is expressed in lifetime carbon savings which are not discounted with time. The first year’s results have been dominated by CFLs; 152 million (equivalent to 6 per household) of which the great majority were distributed

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3 A correction also needs to be made for the innovation factor which is used to encourage quicker penetration of innovative technologies being used in EEC for the first time by increasing the value of the energy savings from such technologies by 50%, i.e. they are awarded 150% of the energy saving value rather than 100%. Also a “snap back” or comfort taking of approximately 30% of the predicted energy savings from insulation measures needs to be removed to reflect the real electricity and fossil fuel savings.
4 These values are the life time energy savings discounted at a rate of 3.5%.
5 Digest of UK Energy Statistics 2009, Tables 5.1 and 4.1 respectively.
free by the energy suppliers. In terms of savings actually achieved in the first year (i.e. excluding the energy savings carried forward from EEC2 to CERT), lighting accounted for 38% of accredited savings. Although insulation is still the dominant measure in terms of energy saving (56% of savings actually achieved in the first year), the scale of the insulation activity has been much less than that expected by Government (75%). As insulation measures are the major contribution to GB’s ambitious CO2 reduction plans in the exiting residential housing stock, a review is underway to ensure that more emphasis is placed on solutions which save a significant fraction of the properties CO2 emissions. From January 2010, CO2 savings from CFLs given away free will no longer be counted towards the CERT target and it is possible that CFLs sold through the retail route will no longer be eligible after April 2011.

4.5.2 Financial Benefit

During EEC2, the net resource benefit for saving each ton of carbon dioxide is around £53, i.e. the net present value of the ongoing energy savings set against the costs of all the parties involved is such that the UK benefits by £53 for every ton of carbon dioxide saved. (See the evaluation of EEC2 for more details).

The net present value of the measures necessary to meet the EEC2 target after including all party costs and benefits (including comfort but excluding deadweight) was £3.1 billion over the life time of the measures discounted at 3.5%. This NPV figure includes a total cost to all players of £1.3 billion6.

An alternative way of looking at this is that the cost to the nation of saving a delivered unit of electricity or gas is 2.0p/kWh and 0.6 p/kWh respectively; both figures are significantly less than the average consumer prices of those fuels in the EEC2 period of 10.1p/kWh and 2.6 p/kWh respectively.

4.5.3 Market Transformation

A) Penetration of the best energy efficiency products and associated deadweight

In general the market transformation effects in EEC2 have not been as marked as they were in EEC1 for energy efficient appliances. Figures 4.2 and 4.3 show the situations for the important cold appliances, fridge freezers and freezers. In each case the market penetration prior to the start of EEC1 was fitted using a standard s-shaped curve widely used in innovation and market transformation studies. This s-shaped curve was then extrapolated to provide a baseline to estimate the genuine additional sales over the baseline. The data points on the actual market penetration of A-rated products sold in each of the financial years are joined by the dashed line in each of the figures.

In Figure 4.2, the area between the two curves represents those sales of A-rated fridge freezers that have been advanced by the EEC1 and EEC2 energy supplier activity. Conversely, if the sales supported by EEC exceed the sales between these two curves, there is clear evidence of deadweight.

The deadweight in EEC2 was quantified by the equation:

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6 The accuracy quoted is a precision of +/- 10%.
% deadweight = 100* (EEC2 supported sales – sales advanced in EEC2 period) / EEC2 supported sales.

The results for EEC1 are that deadweight was 34% whereas in EEC2 this rose to 52%. Nevertheless, over the EEC2 period over 2 million fridge freezers were advanced ahead of what would have happened otherwise.

![Penetration of A-rated Fridge Freezers](image)

**Figure 4.2: Development of the A-rated penetration of the fridge freezer market 1998 to end of March 2008 (source EST using GFK data).**

For upright freezers, the deadweight figures were worked out in an identical fashion to those for the fridge freezers and are much lower for the case of upright freezers. For the two EEC periods they are respectively 22% for EEC1 and zero for EEC2, the latter reflecting the recent upsurge in sales of A-rated upright freezers. As this is a much lower selling product (total sales of around 630,000 per annum) than fridge freezers, then the sales advanced during the EEC2 period are around 0.72 million.

However, this analysis also highlighted much higher deadweight associated with other appliances such as washing machines which were virtually 100% deadweight in EEC2. As a result of the above market developments, only A+ rated or better appliances are being supported in CERT and recommendations have been proposed for 2011 onwards that only measures whose market penetration is below 30% should be eligible for promotion in such energy efficiency obligations.
The market transformed markedly in the three year period of EEC1. As the EEC2 evaluation discusses, there are many factors contributing to the growth in sales of A-rated cold appliances as shown in Figures 4.2 and 4.3. However, without the financial incentives available from the energy suppliers, it is doubtful whether the transformation could have taken off as quickly as it did.

B) Reduction of the costs of energy efficiency measures
As the scale of the energy efficiency measures has increased, then the costs of the energy efficiency measures have fallen in real terms. This is shown in Figure 4.4 where all measures, apart from cavity wall insulation (a mature technology), have fallen considerably\(^7\). (See evaluation of EEC2 for more details).

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\(^7\) Note: the price shown for condensing boilers is the marginal increase relative to the non-condensing boiler.
4.6 Deadweight/Additionality

Deadweight is taken here to mean the subsidising or support for those measures which would have happened anyway. In the early days of the Energy Efficiency Obligations, deadweight was minimised by careful design of the projects, e.g. having local blitz campaigns for insulation. However as the activity in EEC1 increased to such a level, it was clear that energy suppliers would unavoidably pick up and meet the cost of assisting consumers who would have taken the measures in any event\(^8\).

The Government’s solution to the problem was to include the deadweight (based on historical trends of “free market” installations) and to effectively build this into the energy saving target. Deadweight is then removed from the carbon savings attained under EEC1 to deduce the additional carbon dioxide savings.

The EEC2 evaluation looked at deadweight on a measure by measure basis and concluded that the total deadweight in the EEC2 target was around 20%. This figure is less than that expected by the Government.

4.7 Cost Recovery

There is no supply price regulation in GB and so effectively the energy efficiency obligations are “a cost of doing business” – similar to complying with health and safety and other environmental regulation. In reality, the costs are ultimately borne by the residential end user customers.

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\(^8\)This is particularly true for energy efficiency measures sold through retailers – see section 4.5.
4.8 Trading

Trading is permissible under EEC and CERT only between obligated parties, i.e. energy suppliers. In EEC2, there were some sales of energy savings between energy suppliers, but this was very small (<1% of overall target).

Nevertheless the way that EEC/CERT operates, there are many similarities between trading and EEC’s operation. Energy suppliers have the ability since 2002 to trade between different obligation periods and this has been utilised by the carry forward of excess energy savings between the various phases of the obligation. This has the great advantage of ensuring a smooth transition for the energy efficiency industry between different phases and thus avoids the “stop start” nature of activity which was witnessed in the earlier, more rigid transitions.

Throughout the 6 years of EEC, energy suppliers continued to show variation in the way they choose to deliver the energy efficiency targets that they have been set. Some of the variations in EEC2 mirror the previous observed variations in EEC1, e.g. preference by E.ON for lighting, British Gas for heating and npower for appliances. Variation is to be expected as there will be different positioning within the market on issues such as the importance of branding (especially with appliance sales), home services and maintenance, geographical location of (historical) customer base etc. Additionally, some companies may have been more effective at securing lower prices than others in certain energy efficiency areas.

4.9 Reduction in Peak Electricity Demand

A precise evaluation is beyond the scope of this paper, not least because of the different technologies which reduce the peak demand in different seasons. Eyre et al\(^9\) attempted a similar broad estimate by assuming that the energy savings followed the load curve. This can be either an over or underestimate depending on which season the peak demand occurs and the energy efficiency measures itself.

The present analysis has reviewed that work and concluded that the peak reduction for UK due to electricity savings in the 3 year EEC2 period 2005-8 is likely to be at least 0.4 GWe. This estimate could double depending on the extent of the correlation between the use of CFLs as intuitively they will be a strong correlation with the UK winter peak demand for electricity. Quantification of this is beyond the scope of the present study as no information is readily available.

4.10 Areas for Improvement

A major criticism of EEC had been that it is not conducive to the introduction of new energy saving technologies although there has been considerable innovation in the way that energy efficient products are marketed and sold to householders. On the technical

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\(^9\) N J Eyre et al at ecpee summer conference 2009
http://www.eccee.org/conference_proceedings/eccee/2009/Panel_2/2.164/
innovation side, only in CFL design and performance over the past 10 years was there considerable change. Consequently the whole question of encouraging more innovation was addressed in the design of CERT. As well as continuing with the uplift of savings by 50% for innovative technology, there was also a demonstration option introduced to encourage energy suppliers to utilise new technologies or techniques which had no proven or deemed energy saving values. In effect, energy suppliers are awarded a nominal CO2 saving from the demonstration project commensurate with the costs of the project and this saving is guaranteed irrespective of the outcome of the monitored CO2 savings from the demonstration project. It is too early to say whether this has been successful or not.

As alluded to in section 4.5.1, there has been disappointment expressed by the Government that the experience of CERT to date has not developed along the lines necessary for the challenging CO2 goals set by Government for the residential sector. This envisages “deep energy efficiency” retrofits to the existing housing stock i.e. making improvements in lowering CO2 emissions from individual properties by typically 40% or more. Particular concerns include:

- Cherry picking of the most cost effective measures in a house rather than addressing all cost effective energy saving measures
- Very little area based approaches to both stimulate community involvement in tackling climate change by reducing CO2 emissions as well as benefitting from economy of scale in installation of measures by minimising driving time between installations
- Lack of significant energy service company approach despite 10 years of Government support and initiatives within EEC
- Confusion in householders’ minds by the competing brands and offers from the energy suppliers
- Suspicion from the householders that it is “unnatural” for an energy supplier to want to sell less of its product

Consequently, the Government is undertaking a major review of how the energy efficiency obligations from January 2013 might better address these concerns.

### 4.11 Future Trends

The UK Government has already signalled that post 2011 some form of supplier obligation is likely to remain in place at an expanded level compared to today. The Government has decided to bring the CERT scheme in to the same timeframe as other trading schemes (e.g. EU ETS and the UK’s own Carbon Reduction Commitment\(^\text{10}\)). Consequently, the existing CERT scheme has been extended to the end of 2012 and the proposed target covering the period April 2011 to December 2012 will be published soon. Additionally, the Government have launched the Community Energy Saving Programme (CESP) which is a pilot whose results will help shape the energy supplier obligation from 2012. CESP will be a local area approach focussing on the most disadvantaged areas and trying to get several energy efficiency measures installed in

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\(^\text{10}\) The CRC is a national CO2 trading scheme for larger companies and organisations (e.g. retail chains, universities etc) who will have to buy permits to emit CO2 from April 2011.
each property by building in local community support. The rules for CESP are based on those for CERT but are not identical.