Oxera

Agenda

Advancing economics in business

Harvesting a windfall: energy efficiency for households

One of the major challenges faced by the UK government in achieving its long-term climate change goals is incentivising energy efficiency at the grass roots level. Encouraging consumers to implement basic energy-saving measures—from low-energy lightbulbs to cavity-wall insulation—could lead to a significant reduction in greenhouse gas emissions. But how aware are consumers of the costs of such measures? Oxera has been measuring this 'cost-perception gap' as part of the government's Energy Efficiency Innovation Review

Policy agenda

Under the Kyoto Protocol, the UK is committed to reducing greenhouse gas emissions by 12.5% from 1990 levels by 2008–12. The government currently has more ambitious goals, which are to cut the UK's CO_2 emissions to 20% below 1990 levels by 2010, and a 60% reduction in greenhouse gas emissions by 2050.

To address these ambitions, the UK is in the process of revising its Climate Change Programme, and energy efficiency is sure to play a continuing prominent role. Not only does it contribute to the central objective reductions in emissions, it reduces the demand for investment in energy infrastructure and contributes to the elimination of fuel poverty. The question of how best to take forward energy efficiency policies is thus of great interest, and has been the subject of attention for the Department for Environment, Food and Rural Affairs (Defra) and the Treasury.

In 2004, Defra and the Treasury jointly launched the Energy Efficiency Innovation Review (EEIR):[1]

> to examine how a step-change in energy efficiency in its domestic, business and public sectors in the UK could be delivered cost effectively and how energy efficiency improvement could be embedded into decision making across the economy.[2]

The conclusions of this review were published in December 2005 and are expected to be translated into policy during 2006 and 2007.[3] One of the key conclusions was the following.

> A further increase in the EEC [Energy Efficiency Commitment] target after 2008, to triple the EEC1 level, is feasible (roughly a 50% increase again on the current phase of EEC2),[4] provided that two key barriers are addressed: firstly the cost perception gap, where consumers have poor knowledge of the costs and benefits of measures, and tend to overestimate the costs and installation time while underestimating the savings; and secondly distrust of the supply chain. However, individual energy suppliers working alone are poorly placed to deal with these barriers, and Government will need to work with the suppliers and the Energy Saving Trust to ensure that they are overcome.[5]

This article describes some of the evidence behind this conclusion.

Facts and figures

Household energy efficiency affects the UK's overall energy demand and greenhouse gas emissions. Indeed, household energy consumption makes up around one-third of total energy use in the UK.[6]

By far the greatest use of energy in households is for space heating, which accounts for between one-half and two-thirds of domestic energy consumption. Water heating takes up approximately half the balance, and lighting and appliances share the remaining 10%.[7]

The insulation of dwellings therefore affords a great opportunity for energy savings. It also has another benefit—substantial savings on fuel bills. These savings are so large that many insulation investments generate

This article is based on a report commissioned by Defra as part of the Energy Efficiency Innovation Review: Oxera (2006), 'Policies for Energy Efficiency in the UK Household Sector', January, available at www.oxera.com.

Table 1 Value of net benefits generated by policies (£ billion present value)

	Lifetime benefit to consumers
Insulation: EEC enhanced to 2020	8
Tightening of white goods energy standards[1]	6
TV energy standard[1]	4
Lighting standard[1]	9.5
Total	28

Note: [1] Excludes the incremental costs of manufacture associated with higher energy efficiency. Figures do not sum due to rounding.
Source: Oxera (2006), op. cit.

net savings for households as well as benefits to society from reduced energy use. This is also the case for energy-efficient lighting and appliances such as fridges and washing machines. For every tonne of carbon saved,[8] households save £250 for insulation measures, £50 for energy-efficient lighting, and around £500 for appliances.[9]

The corollary of these figures is that policies that deliver energy efficiency measures generate a windfall benefit for society. Table 1 shows the net impact (including carbon benefit in monetary terms) by 2020 of an enhanced energy efficiency policy (the EEC) in delivering insulation, and various product standards in delivering higher energy efficiency performance in appliances and lighting. The figures show the benefits to consumers over the lifetime of the measures, excluding the higher costs of manufacturing bulbs and appliances to higher standards. The total benefits amount to around £30 billion, which is split more or less equally between efficient lighting, insulation and appliances.

Despite the large benefits to be gained from energy efficiency, the rate of take-up by households is low. The questions posed by government are: why is this; and how could it be increased through policy action?

Understanding households

There are several hypotheses as to why householders do not take up energy efficiency opportunities that appear to be in their best interests:

- they do not know about them, and market failures prevent them from becoming well informed;
- the opportunities are not actually in their best interests, because some costs are omitted from the calculations, or the benefits are overestimated;
- they do not regard them as in their best interests because they are misinformed, or they evaluate decisions in a way which is very different to the cost–benefit analysis calculation that government or a firm would undertake.

To test these hypotheses and to help in the formulation of policy, Oxera sought answers to the following questions:

- what do consumers know about energy efficiency?
- how do consumers make decisions about whether to improve their energy efficiency?
- what policies would consumers respond well to?
- how big do incentives need to be to stimulate demand for energy efficiency measures?

A survey of owner-occupier householders was designed and piloted in 30 households. It was then completed by 1,069 respondents by in-house computer-aided interviews lasting around 40 minutes each. The survey revealed what consumers know about insulation and efficient appliances, and what does, and does not, make them buy them these measures.[10]

Are householders well informed?

A striking finding was the level of ignorance of the cost of installation and the savings available on domestic heating bills from loft insulation (LI) and cavity-wall insulation (CWI). These insulation measures represent the largest sources of potential energy savings, and were therefore chosen as a major focus of the study. Respondents were asked to say what the costs and benefits of these measures were. If they were within 50% of the correct answer, they were classed as 'informed'; otherwise they were classed as optimistic or pessimistic.

Table 2 shows the proportions of the population within these three categories with respect to the costs and benefits of installed CWI.

Table 2 Breakdown of population according to knowledge of the costs and benefits of installing CWI (%)

		Benefits				
		Pessimistic	Informed	Optimistic	Don't know	Sub-total
Costs	Pessimistic	2.8	11	12	7.1	**33**
	Informed	3.6	6.6	3.3	3.7	**17**
	Optimistic	0.5	1.4	0.4	1.2	**3.5**
	Don't know	2.0	4.9	4.8	35	47
	Sub-total	**8.9**	**24**	**20**	**47**	**100**

Note: Figures may not sum due to rounding.
Source: Oxera calculations.

The table indicates that a major factor affecting householders' decisions on the take-up of insulation is poor knowledge of the costs and benefits. Looking at the unshaded cells, only 12% of consumers have an accurate or optimistic perception of the costs and benefits of CWI. Others could be discouraged from exploring energy efficiency opportunities by their preconception of poor value for money. Between 25% and 50% of the sample 'don't know' and the remainder are mainly pessimistic, particularly about the benefits. The actual costs of installing insulation vary between £265 for a flat and £550 for a detached house for CWI,[11] yet many consumers believe the costs to be greater than £1,000—they are actually being offered subsidised installations under the EEC at typically £100–£300.

Do households value future savings in energy bills?

Since many houses are poorly insulated, it is clear that consumers do not invest in energy efficiency measures to a level that appears to be privately optimal. One of the hypotheses to explain this phenomenon is that householders have strong preferences for cash today over cash tomorrow—a high discount rate—and thus dislike investments with long-term benefits and upfront costs.

The survey identified the weight placed by householders on installation costs in the take-up decision, and the weight placed on annual fuel bill savings. The installation costs are incurred at the start, when an insulation measure is purchased, and the fuel bill savings are incurred at a constant rate in the future. The relative weights attached to them reflect the consumer's time preferences (discount rate).

In general, the weight on savings was at least an order of magnitude smaller than that on costs, showing that upfront costs are a considerably more important determinant in consumers' decisions to take up LI or CWI than the ongoing benefits. The interpretation of this result is that savings do not feature strongly in consumers' decisions about energy efficiency measures.

How large are the omitted costs of disruption?

There has been much discussion over recent years of barriers to energy efficiency measures, including 'hidden costs', which are not taken into account in conventional assessments of cost. The most likely and largest hidden cost is the disruption caused to households by the process of seeking a contractor and installing the insulation.

Householders were questioned about whether they would fit CWI and LI under a variety of scenarios. Using statistical methods, their answers to questions about days of disruption were converted into values of disruption time, and were found to be £50 for every loft insulated and £70 for CWI. These are respondents' estimates, which tend to be pessimistic. Outturn disruption is likely to be smaller. This is the first time, to Oxera's knowledge, that these costs have been estimated empirically. The approach taken on previous occasions has been to estimate (but not empirically) how much time householders spend at home preparing for, supervising and clearing up after installations, and then to value them at an hourly rate related to average earnings, similar to the way in which travel time is valued in estimates of the costs of road congestion.

Do householders trust installers?

Following anecdotal evidence that some consumers might be put off CWI or LI because of mistrust of installers, the survey tested the influence of installer accreditation on the likelihood of take-up of insulation measures. The respondents made their own interpretation of what accreditation meant. Accreditation is equivalent in value to a discount on the installation cost of £400 for LI and £580 for CWI. These implicit values show, in monetary terms, the magnitude of the influence of accreditation in the take-up decision. The results are unequivocal. Installer accreditation is highly influential.

Policy conclusions

The survey provided enough information to build a model to simulate the impact of policies on householders' take-up of energy efficiency over time. A model of 5,000 representative owner-occupier households was built and adjusted to reproduce the take-up rates seen under the EEC with the levels of subsidy currently offered by suppliers. The carbon savings under this regime are around 0.3MtC per annum by 2010.

The parameters in the model were then adjusted, to represent a bolder package of policy measures, maintaining the same rate of subsidy offered by suppliers, but improving householders' knowledge through information campaigns and raising awareness of installer accreditation. The new package is predicted to increase carbon savings by around three-fold. These results indicate that faster take-up rates are achievable and can be stimulated through policy action. It is a promising indication that government could harvest the windfall of benefits from energy efficiency.

Energy efficiency in homes, although highly desirable, will not be a panacea. The 2050 target requires around 2.8MtCe absolute reduction in greenhouse gas emissions to be found every year for the next 45 years.

[1] The review was announced in the Pre-Budget Report 2004.
[2] HM Treasury, Defra, The Carbon Trust, Energy Saving Trust (2005), 'Energy Efficiency Review: Summary Report', December.
[3] In December 2005, in the Pre-Budget Report 2005, the Chancellor explained that 'the Government will respond to the EEIR through the revised Climate Change Programme and later policy processes such as the Energy Review and Comprehensive Spending Review 2007'.
[4] EEC1, Energy Efficiency Commitment 2002–05; EEC2, Energy Efficiency Commitment 2005–08.
[5] HM Treasury, Carbon Trust, Defra, Energy Saving Trust (2005), 'Energy Efficiency Innovation Review: Summary Report', December, available at www.hm-treasury.gov.uk.
[6] DTI (2005), 'Digest of United Kingdom Energy Statistics', July.
[7] BRE (Building Research Establishment), 'Domestic Energy Fact File', http://projects.bre.co.uk/factfile.
[8] One tonne of carbon here refers to the carbon content of CO_2 emissions, and is the standard unit of greenhouse gas emissions global warming potential.
[9] Oxera calculations of present values over the lifetimes of the measures. Appliances generate the largest net savings, but this may be because the incremental costs of manufacture (and therefore retail prices) have been omitted from the calculations because they are unknown.
[10] Oxera (2006), op. cit. The work was commissioned by Defra and HM Treasury as part of the EEIR. Oxera was assisted by Taylor Nelson Sofres, the School of Economics at the University of East Anglia, BRE (The Building Research Establishment), the Energy Saving Trust and Defra.
[11] Energy Saving Trust (2005), 'Domestic Energy Efficiency Primer', February.