Delivering Energy Efficiency Savings

Background Note by Department for Environment, Food and Rural Affairs
April 2003

Introduction

Energy efficiency is a measure of how economically one is meeting the demands for energy services – warmth, illumination, hot water, cooling, motive power, industrial process energy, etc. Investments in energy efficiency can have a significant, positive impact on the key objectives of Government's energy policy: cutting carbon dioxide emissions, maintaining the reliability of energy supplies, competitive markets helping to raise the rate of sustainable economic growth, and (if properly targeted) combating fuel poverty.

Energy efficiency has been improving steadily over the past decades as building standards, product design and industrial productivity have advanced; as the existing building stock has been insulated; and as energy management techniques have been developed. For example, new houses typically require only half as much heating fuel as the average stock, and new fridges only half as much electricity. Marginal increases in the rate of take up of energy efficiency tend to yield private financial benefits in the form of lower energy bills over a number of years. There remain market failures and barriers that prevent a wider take up of available energy efficiency measures. However, there are examples of successful policies already tackling these market failures and barriers, both in the UK and abroad, and there is well-documented potential for significantly increasing the rate at which energy efficiency improvements can occur. The Government is now seeking a step change in this uptake rate so we need to be confident that we can achieve:

- high volume savings,
- at reasonable costs,
- over a sustained period of time.

Summary

This paper sets out the basis for our confidence in the ability to deliver accelerated energy and carbon emission savings, concluding that:

- Evidence from the past decades suggests that energy expenditure is not a major concern for most users, particularly for households and for non-energy intensive industry.
- In recent years and particularly in business and the public sector, price mechanisms like the Climate Change Levy and the UK emissions trading scheme have begun to change this attitude. But price mechanisms alone are not a sufficient incentive in this area. Their application to the household sector at a significant level would also raise social concerns.
- Additional measures are therefore needed to tackle the complex of market failures and other barriers that constrain investment in energy efficiency. Policies will need to rely on low-cost regulatory measures where possible, supplemented by targeted financial incentives where these can also be effective.
- Targeted information and advice will raise awareness and help business and consumers make more energy efficient investments.
- Early indications are good: in heavy industry, there appears to be more "low hanging fruit" than expected; in the household sector the energy efficiency commitment is on track to double the rate of household energy efficiency improvements; and good progress on product standards is being made at EU level.
- We believe further substantial savings can be achieved, and still at relatively low cost.

The links between prices, energy usage, and investment in energy efficiency

Historically the relationship between energy prices and energy consumption has been weak, in terms of elasticity of demand. The available evidence indicates that energy consumption in the UK is relatively inelastic, especially in the short term. Similarly, the take up of energy-efficiency measures does not seem to be very sensitive to energy prices.

In other words, households and businesses have not, in the recent past, altered their behaviour much in relation to variations in energy prices, in terms either of energy consumption or of investment in energy efficiency. This behaviour reflects the fact that for most users energy costs have typically represented a very small percentage of total expenditure and not a high priority item. Also, variations in energy prices might have been perceived as temporary perturbations of a decreasing long-term trend. In recent years and particularly in business and the public sector, price mechanisms like the Climate Change Levy and the UK emissions trading scheme have successfully begun to change this attitude. But in policy terms, the fact that most energy users do not seem to respond very much to variation in energy prices would support the view that price mechanisms alone are not sufficient in this area. Their application to the household sector would also raise social concerns in terms of their impact on fuel poverty. Therefore, other measures also need to be put in place to ensure an effective policy package.

Experience has shown that a higher priority for energy efficiency investment can be generated through awareness-raising, financial inducements and targeted support; or by regulatory mechanisms (including obligations and negotiated agreements) which can be used effectively to remove the inefficient options from the users' range of choice. Effective support includes cases where an energy service provider offers to deal with all of the hassle and risk, in return for a share in the energy cost saving benefits.

Investment hurdles for business

DoE (as was) commissioned Touche Ross in the 1990s to investigate why industrial companies ignored apparently very good returns on energy efficiency investments. The conclusion was that most companies made a clear distinction between "core" and "non-core" business, with little or no senior management effort devoted to the latter unless opportunities survived some very high initial hurdles, eg payback periods of 18–24 months. Touche Ross recommended that energy efficiency schemes would stand a much better chance of funding if they could be presented as integral parts of investments seen as having strategic importance.

For businesses which are not energy-intensive, energy costs were either regarded as "fixed overheads", or else largely ignored as their costs fall below a "threshold" share of total costs, and no particular effort was made to optimise investment or management activity. But the study also found that companies for which energy costs were a much more significant share of total costs did not appear to exploit the available opportunities for "no regrets" investment. Recent Carbon Trust experience in delivering its programmes supports this model of business behaviour.

The Climate Change Levy and associated measures (in particular the Climate Change Agreements) introduced in 2001 have been successful in highlighting the role of energy efficiency and raising the profile of energy costs to industry and business.

Defra will continue to monitor and explore the behaviour of businesses and households alike in relation to energy efficiency investment.

Evidence from policies already applied

In business, the best evidence so far comes from the Climate Change Agreements with IPPC-regulated companies, which include the most energy intensive. The 80% rebate on the Climate Change Levy , in return for considerably improved energy efficiency performance by 2010, indicates that a substantial incentive – the threat of a significant tax increase – can produce a major improvement in efficiency. During the first year of the CCAs, many energy intensive companies had to make significant new efforts to measure their energy consumption or cost – many metering problems were uncovered and many receive only estimated bills for long periods of time. Furthermore, from the sector returns now coming in it appears that many companies have achieved their "first milestone" targets more easily than expected. This may be simply by tightening up on management rather than having to invest heavily, in which case expected savings in future years can be increased. Or it may be that investment has been brought forward faster than expected when returns became apparent. Nevertheless it is obvious that, despite strong claims to have little scope for further efficiency improvement during the negotiations, this part of industry was much less efficient than it believed, once proper scrutiny took place. This supports anecdotal evidence collected under the former Energy Efficiency Best Practice Programme that energy efficient companies were more likely to identify larger (further) scope for improvements than inefficient ones. If this situation holds true for companies whose energy costs may constitute some 10-20% of their total costs, then for companies with energy costs at the 1-2% level, this situation is even more likely.

In households, apart from the Homes Insulation Scheme (HIS) and the Energy Efficiency Standards of Performance schemes (EESoPs), the evidence is limited to a few past, mainly very short schemes – almost pilots - which do not provide statistical evidence but do suggest that substantial financial incentives can considerably increase the uptake of energy efficiency measures, eg subsidies of 30% or more have doubled take-up on budget-limited schemes. Early indications from the Energy Efficiency Commitment (EEC), which began in April 2002, together with the success of its 3 predecessor EESoPs, dating from 1994, support this assumption that such incentives should be able to induce very much larger numbers of households to install energy efficiency measures.

Individual schemes include:

- The Homes Insulation Scheme (principally in the late 1970s and early 1980s) when subsidies of up to 67% were available, subject to budget constraints, for owner occupiers to insulate their lofts; additional take-up was considerable;

- The EST Cashback scheme in the late 1990s, when a £200 subsidy was available from registered installers (who provided a guarantee for the first time) and the EST for the installation of Cavity Wall Insulation (CWI) – although the final price, around £400, was close to the open market price (but without a guarantee), the number of annual installations by owner occupiers doubled over the two years, for an apparent price reduction of one third – a price elasticity of take up of 3;

- The corresponding EST Cashback scheme for condensing boilers at the same time had mixed fortunes. A 50% subsidy, of £200 on the boiler-only price difference, produced a substantial increase in sales; but two years later, a 25% subsidy had a very much smaller impact.

- Sales of low energy lamps first took off in the mid-1990s when the retail price was reduced by 1/3, from £15 to just under £10, as a result of action under the first EESoP.

BRE[1] have analysed many of these schemes and concluded that "the grants were very effective at increasing the uptake of energy efficiency measures".

In the Netherlands, subsidies for condensing boilers were introduced in the early 1980s, along with other supporting policy measures, and these now account for 75% of the Dutch market. In the UK, where their promotion has been limited to information-based campaigns until very recently, market share reached 12% last year, having doubled over the previous year's share following the introduction of EEC and new minimum efficiency standards under the Building Regulations in April 2002. Further details are on p35 of the White Paper.

Incentives to invest in energy efficiency

The magnitude of incentive needed to stimulate significant extra investment is indicated by the two largest current policy measures – the Energy Efficiency Commitment (EEC) and the Climate Change Agreements (CCAs). Both programmes are intended to double the rate of energy efficiency improvement in their respective sectors, and for each the relationships between capital expenditure, support costs and savings are remarkably similar.

For the EEC, subsidies are typically in the range 50-100% of the investment cost. Simple payback is in the region of 2-3 years, and the capital expenditure per annual tonne of carbon saved is around £1,100. For the CCAs the additional investment required to save 2.5 MtC in 2010 is estimated to be £300-400 million per year (typically £1,000-1,500 per annual tC). In return, the 80% CCL rebate amounts to around £300 million a year, i.e. about 75-100% of the investment cost.

Of course, there is concern that, particularly amongst householders, the uptake of such measures may not lead to the equivalent reductions in consumption as householders reap the benefits as increased comfort instead. This is accepted and allowed for in the Defra calculations, which allow around 50% rebound in all low income households and 15% elsewhere. Preliminary evidence from monitoring EESoPs 1&2 indicates that rebound effects may be small in homes which were adequately heated beforehand, irrespective of income. Monitoring is continuing under EESoP3 and EEC.

Policy mix to deliver high-volume savings at low cost

Regulation

The regulatory approach has the major benefit of relative certainty of delivery, though it is not universally applicable in a market economy, and policies need to take account of any cost implications – for builders, manufacturers or users. It can be used most straightforwardly for new capital stock, e.g. new building work and refurbishment, replacement industrial plant, domestic heating equipment and other appliances. Supply-chain costs can be minimised through advance planning and negotiation with the industries concerned.

Regulation is less easy to apply where the 'do nothing' option exists – as in the case of household cavity wall and loft insulation – and financial inducements may be a necessary lever. However, costs may be minimised and likelihood of uptake increased by using an obligation on energy suppliers – as in the Energy Efficiency Commitment – thereby concentrating the activity in the hands of a relatively small number of organisations, who can exploit economies of scale in marketing and purchasing.

[1] See Shorrock, Henderson Utley and Walters (2001), "Carbon emission reductions from energy efficiency improvements to the UK housing stock", BRE Report to Defra

The proposed EU Emissions Trading Scheme, due to commence in 2005 and involving compulsory capping of carbon emissions, employs market mechanisms to minimise overall costs. The scheme covers the power generation sector which is likely to result in an increase in the price of electricity for the economy as a whole as generators are required to take into account the environmental externalities associated with their operations. It also covers the direct emissions from some of the energy intensive industrial sectors currently involved in Climate Change Agreements (CCAs). The UK is committed to developing a smooth transition to the EU scheme and ensuring that energy efficiency savings achieved by companies currently in CCAs are maintained when they move their direct emissions across to the EU scheme.

Fiscal and other financial incentives

These can take different forms. The Climate Change Levy (CCL) has not only increased energy prices for business (and the public sector) but has also raised the profile of energy costs amongst senior managers. Furthermore, the CCAs are already proving successful in the more intensive sectors, as discussed earlier.

Well-designed financial incentives (or disincentives) can achieve high leverage in situations where there is a relatively small price difference between the energy efficient choice and the standard option, eg on the purchase of equipment. Bridging the gap with a subsidy (or a charge on the inefficient alternative) could induce a significant behavioural response, provided that the market is restrained from absorbing the subsidy or charge within an adjusted price structure.

Financial support, eg in the form of Carbon Trust's small business loan scheme, or the subsidies to householders from energy suppliers under EEC, are expected to generate substantially increased uptake of energy efficiency measures.

Voluntary agreements

Negotiated voluntary agreements also have a role, for example amongst manufacturers of electrical equipment who work together to achieve innovative market transformation, thereby phasing out inefficient products and avoiding the need for regulation or other measures.

Information

Provision of information and advice is an essential tool for overcoming barriers to energy efficient investment, and realising the full potential of the policy mix. Regulation and negotiated agreements can remove undesirable options to a large extent, but there will remain large areas of choice where guidance is needed by business and by consumers – both at a practical level, and to facilitate financial support. Targeted advice, whether to individual householders by the EST's Energy Efficiency Advice Centres, or to individual companies via Carbon Trust's Action Energy programme, can help overcome many of the non-financial barriers which currently stop action being taken.

Very specific information to consumers can also be imparted via labelling of products, and shortly, of homes via the "Seller's Pack" mechanism under the forthcoming EU Directive on the Energy Performance of Buildings. Since this is presented at the point of purchase, it can serve both as a reminder of energy efficiency as well as a source of performance information.

Social objectives

The Government remains fully committed to eliminating fuel poverty in the UK, and the policy mix developed for the domestic sector will include special provision for ensuring adequate warmth for vulnerable households, and reducing energy bills through insulation and support for efficient lights and appliances.

Future costs and potentials

The technical potential for energy efficiency improvement is well established in all sectors of the economy[2], and studies have indicated that it should be possible, although challenging, to achieve energy efficiency savings in 2050 of around 25 MtC relative to the IAG baseline. To be on track for this goal would necessitate savings of around 8 – 12 MtC from energy efficiency by 2020, as envisaged in the Energy White Paper. Central to this are the views that (i) a substantial fraction of the technical potential can be realised at relatively low cost, and (ii) that this potential will be replenished over time – by market innovation supported by R&D – rather than used up once and for all.

Support for the existence of a large realisable potential comes from examples cited above (e.g. the Climate Change Agreements), coupled with the fact that the sought-after new savings are based mainly on accelerating a range of investments that are already commonplace, rather than a qualitative departure from normal practice. Identifiable investments with capital expenditure in the range £1,000-2,000 per annual tonne of carbon saved – i.e. offering a simple payback on energy costs of just a few years – are available in sufficient quantity to double the historical rate of efficiency improvement, and put the UK on track to reach the RCEP target for 2050. Even allowing for hidden costs – e.g., limited management resources, transaction costs and the "hassle factor"– the marginal cost of energy efficiency is still considerably less than any of the alternative means of emission abatement.

Renewal of the energy efficiency potential is a process which is already going on continuously, as commercialisation of existing technologies increases their accessibility and reduces their cost[3]. The implication for accelerated uptake is that innovation rates need to increase to match. Part of this acceleration will occur via market forces, and will include accessing new technology from abroad as well as within the UK. Overall, there will also be a need for increased support for energy-related R&D.

[2] See for example the PIU and IAG reports, and references therein (www.piu.gov.uk/2002/energy/report/index.htm, www.dti.gov.uk/energy/greenhousegas/index.shtml).
[3] See IAG Report, Appendix D.