

Improving Energy Efficiency Financed by a Charge on Customers



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Executive summary

1 This is a report about a scheme introduced by the Office of Electricity Regulation (OFFER) under which local electricity companies help their customers use electricity more efficiently. The scheme was introduced in England and Wales in 1994 and in Scotland in 1995. It was the first of its kind and created a unique partnership between a regulator and private companies to achieve public aims. Under the scheme:

- the companies raise about £26 million a year from charging their 26 million customers an average of £1 a year each;
- they spend this money on energy saving projects; about a quarter on subsidising low energy light bulbs (aimed at all customers), from which some 3 million customers have benefited so far, and most of the remaining three quarters on insulating the homes of domestic customers, which has so far assisted some 210,000 customers to achieve energy savings.

2 In 1998 OFFER extended the scheme for two years until 2000, by which time the charge on customers will have raised some £150 million¹.

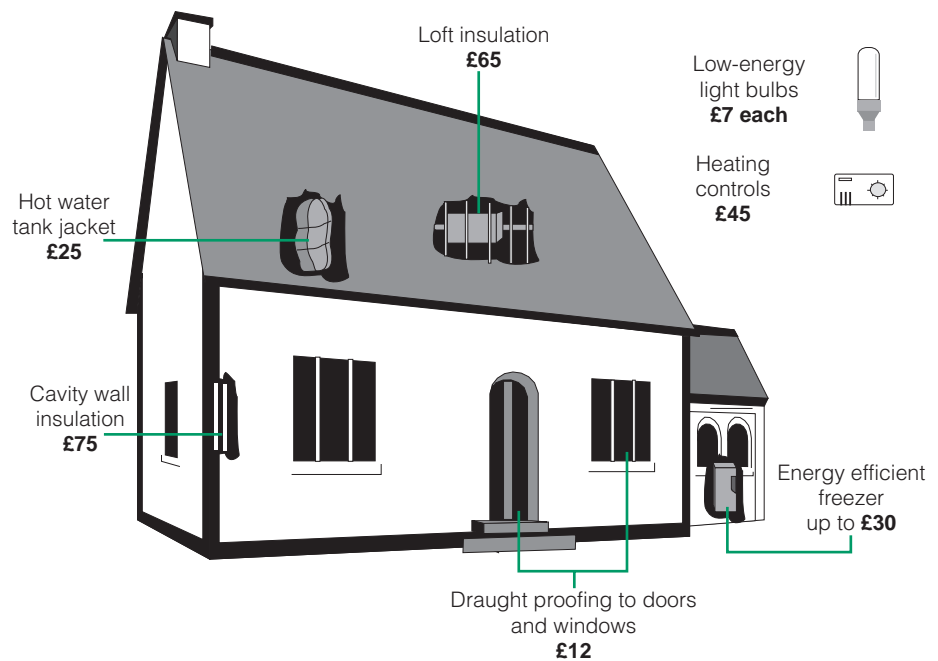
How customers benefit from the scheme

3 The scheme is intended to help customers obtain more of the benefits of using electricity - such as having a warm, well-lit home - while using less of it. There are three benefits:

- **Energy savings.** The scheme helps customers to use less electricity than they otherwise would do; for example, customers might use insulation installed through the scheme to keep their home as warm as before, while using less electricity.
- **Lower bills,** as a result of customers' lower electricity consumption.
- **Warmer homes.** Customers might use insulation to keep their homes warmer, as well as, or instead of, saving energy and reducing their bills.

¹ The requirement to carry out projects is imposed on companies by OFFER using powers in the Electricity Act 1989. OFFER have set separate requirements for each company covering the periods 1994-1998 (1995-1998 in Scotland) and 1998-2000 respectively.

Typical savings for customers from energy efficiency measures (per year)



Source: Department of the Environment, Transport and the Regions; and the Energy Saving Trust

Significant annual savings in electricity bills can be made by adopting energy efficient measures.

4 The diagram above shows some of the energy efficiency goods and services supplied to customers and the financial savings they can make. In a survey of a representative sample of 1,500 domestic customers, we found that many customers have not yet made all of these improvements, confirming that there is considerable scope for the scheme to help to improve energy efficiency. For example, nearly six out of ten customers said that they did not have any low energy light bulbs and one out of four customers who used electricity to heat their home did not have loft insulation.

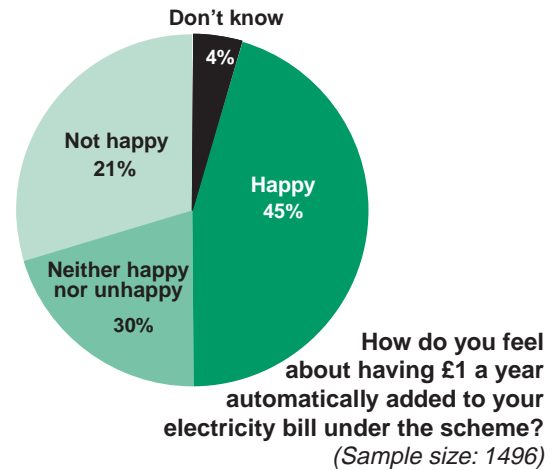
5 Companies have used many methods to supply customers with energy efficiency goods and services under the scheme, but two have been particularly common:

- **Subsidy.** All the companies have joined with manufacturers and retailers to subsidise the price of low energy light bulbs on sale to the public.
- **Direct installation.** All the companies have carried out projects to fit insulation in electrically heated homes at a reduced price, or sometimes free of charge.



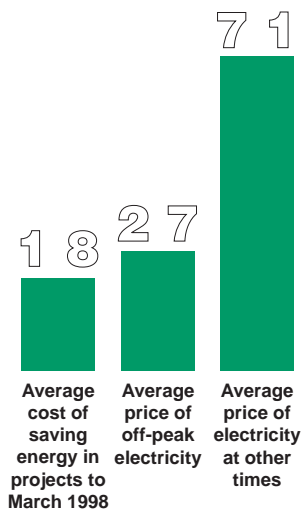
What customers say about the scheme

6 In our survey of domestic customers, we found that one in five said they were aware of the scheme. Of these one in five, over half said they knew it was funded out of the price they paid for electricity. After they had been told about the scheme, nearly half of all customers said they were happy to pay £1 a year for it, while one in five said they were not (paragraph 1.26 and Appendix 2).



What the scheme has achieved for customers

How the cost of saving energy compares with electricity prices (pence per unit)

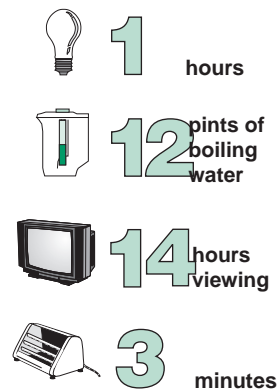


(a) Customers will save energy

7 OFFER originally set an overall target of total energy savings for customers of 6.1 billion units of electricity over the life of the energy efficiency goods and services supplied by projects to March 1998. We estimate that total energy savings for customers from these projects could amount to some 6.8 billion units. At current rates of consumption, these savings represent around 1½ per cent of the electricity used by domestic customers between 1994 and 1998. These savings are being achieved at an average cost of 1.8 pence for each unit saved. This is lower than any price paid for electricity by customers, showing that the scheme has provided a net financial benefit for customers. And taking into account contributions to the cost of projects by third parties, such as local authority landlords and lighting manufacturers, the overall financial benefit achieved by the scheme has been some £250 million (paragraphs 2.4 to 2.16, 2.22 and 2.25 to 2.26).

What do customers get for ...

one unit of electricity?



one billion units of electricity?



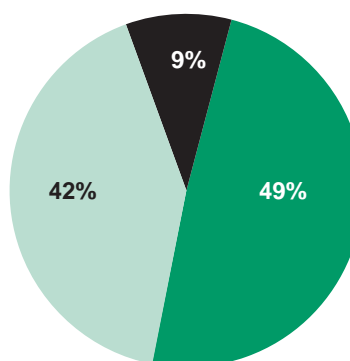
(b) The bills of three million customers will be reduced

8 Approximately three million customers have benefited from projects up to the end of March 1998. On average, the bills of the customers benefiting from the scheme will be reduced by a total of about £120 each over a period of years (paragraphs 2.17 to 2.24).

(c) Customers will benefit from warmer homes

9 In our survey of domestic customers, nine per cent of customers who used electricity as their main source of heating said that they had been cold the previous winter, most often because they could not afford to spend more on heating. The insulation projects completed or begun by companies by March 1998 will provide the 173,000 customers participating in these projects with extra warmth worth in total some £80 million. Low-income customers have benefited particularly from the scheme - half of expenditure on these projects has gone to help such customers (paragraphs 2.27 to 2.33).

Who will benefit from the scheme?



(d) The environment will also benefit

10 By saving electricity, the scheme is reducing the amount of carbon dioxide emitted by power stations and having a positive effect on the environment. We estimate that total carbon dioxide emissions will be reduced by around six million tonnes by the projects up to the end of March 1998 - equivalent to around $\frac{1}{4}$ per cent of United Kingdom carbon emissions in this period (paragraph 2.34).

The scope for the scheme to achieve more for customers

11 When OFFER introduced the scheme it was the first of its kind in Great Britain and there was some uncertainty about what it was possible for the scheme to achieve. On the basis of the experience of projects so far, we examined whether there was now scope for the scheme to achieve more for customers in the future, either by changing the type of energy efficiency goods and services supplied by projects or by reducing the cost of projects.

(a) Changing the type of energy efficiency goods and services supplied by projects

12 Although projects so far have saved energy at an average cost of 1.8 pence per unit (paragraph 7), some types of project have saved energy more cheaply than others. For example, the average cost of saving energy in domestic insulation projects (1.3 pence per unit) has been little more than half that in projects involving domestic electrical appliances, such as refrigerators (2.5 pence per unit). Different types of project have also differed in their effect on customers' bills, according to whether they have saved electricity that would have been paid for at a cheap off peak rate or at a more expensive standard rate (paragraphs 3.2 to 3.3).

13 OFFER have required companies to carry out a variety of different types of project in order to explore as thoroughly as they could the potential for cost-effective projects, to inform the development of future projects and to spread the benefits of the scheme across a range of customer groups. Based on the experience of the projects so far, we estimate that if the companies could now concentrate entirely on particular types of projects the benefits for participating customers could increase as follows:

a) Increasing energy savings and the benefit of warmer homes for customers.

Domestic insulation projects save energy more cheaply than any other type of project. They are also of particular benefit in helping low income customers to keep their homes warm. If companies were encouraged to concentrate the money raised by the charge on customers entirely on such projects, energy savings for customers receiving support in this way could increase by up to around **nine per cent** - equivalent to insulating an extra 8,000 homes a year. In addition, the benefit received by such customers in the form of warmer homes, worth around £20 million a year, could approximately double (paragraphs 3.2 to 3.7 and Figure 17).



OR



57

potential improvement

Or:

b) Maximising financial savings for customers. The energy saved by the domestic insulation projects referred to in (a) above is mainly electricity that customers would have paid for at cheap off-peak rates. Domestic lighting projects (for example, those involving low energy light bulbs) save electricity that customers would have paid for at more expensive standard rates and are more cost-effective at reducing customers' bills. If companies were encouraged to concentrate the money raised by the charge on customers entirely on such projects, the net financial benefit of the scheme for customers could be increased by up to about **57 per cent**, broadly equivalent to some £40 million a year and an average of £3 per customer in the period 1998-2000. In addition, the number of customers benefiting from the scheme would increase by some two million a year and energy savings would increase by two per cent. The benefit received by customers in the form of warmer homes would, however, be eliminated (paragraphs 3.4 to 3.7 and Figure 17).

14 Concentrating effort on one type of project in these ways would, however, require a reduction in effort elsewhere. For example, concentrating completely on either insulation projects or lighting projects would prevent companies from exploring further the scope to save energy cost-effectively using energy efficient appliances. And concentrating completely on insulation projects would require an end to the companies' subsidy for low energy light bulbs. There would also be some change in the make-up of the benefits achieved by the scheme. For example, increasing the financial benefits of the scheme for customers by shifting resources from insulation projects into lighting projects would be offset by a reduction in energy savings and the benefit of warmer homes for customers (paragraph 3.7).

(b) Reducing the cost of projects

15 The cost per unit of saving energy has varied between companies and among apparently similar projects. The variations can partly be accounted for by differences in the type and size of homes insulated, the size of contributions from local authorities and local variations in the prices tendered by contractors. They also reflect a wide range in the type and scope of projects implemented by companies. But they might also indicate that there is scope to reduce the cost of some projects. We estimate that if the cost per unit of energy saved of the more expensive projects could be reduced to the level actually achieved in the most cost-effective 50 per cent of projects, energy savings for customers and the benefit of warmer homes might increase by about 15 per cent, and financial benefits for customers by some £25 million over the period 1998-2000. These increases would



15

potential improvement

be additional to any increase from changing the type of energy efficiency goods and services supplied by projects. The increase in energy savings is equivalent to insulating the homes of an extra 14,000 customers a year (paragraphs 3.3 to 3.6).

Action taken by OFFER

16 During our examination we shared our emerging findings with OFFER, and the objectives they set for companies in March 1998 for the period April 1998 to March 2000 reflect suggestions in two areas to which we had drawn their attention:

- a) OFFER's guidance to companies now takes more account of the opportunities available to each company to undertake different types of project. The guidance classifies projects into three broad types - domestic lighting, domestic insulation, and appliances and other. OFFER have agreed with each company a minimum level of savings that must be made from each of the three types of project, and an overall allocation of savings between the three types that each company will seek to achieve if it can. As a result, each company must make at least 12 per cent of its savings from projects primarily involving domestic appliances, while the companies' estimates indicate that the average proportion could be around 20 per cent (compared with an outturn of 6 per cent between 1994 and 1998). OFFER made these changes because some companies had difficulty in finding electrically heated homes to insulate, and to address a view expressed in consultation with consumer groups that savings from appliances should be increased because appliances account for 56 per cent of domestic electricity consumption. We estimate that these changes will, however, reduce the financial benefit of the scheme for customers by about £3 million over a period of years because projects involving domestic appliances are more expensive in saving energy than other types of project.
- b) OFFER intend to increase their scrutiny of the indirect costs incurred by companies in implementing projects.

Recommendations

17 OFFER and the companies have done well to introduce without serious problems a scheme that is the first of its kind in the United Kingdom. However, were the scheme to concentrate more in the future on certain types of projects, there is scope to achieve even more within current resources. We therefore make the following recommendations:

- a) In projects to date, domestic insulation projects have saved energy more cheaply than any other type of project, while domestic lighting projects have been most effective at reducing customers' bills. Projects involving domestic appliances have been more expensive than both lighting and insulation projects and carrying out such projects reduces the total benefits of the scheme. **We recommend that OFFER should, therefore, review the need for requiring companies to carry out a range of different types of project, and, in particular, review the value of having around 20 per cent of total energy savings coming from projects involving domestic appliances (paragraphs 12 to 13).**
- b) If OFFER relaxed the requirement for companies to carry out a range of different types of project, companies would be able to increase either energy savings from projects, or the reduction in customers' bills, by concentrating resources on either insulation or lighting projects respectively. The objectives currently set by OFFER for companies are expressed in terms of energy savings and will, therefore, encourage companies to focus more on energy savings rather than reductions in bills. But focusing on reductions in bills would provide scope over 1998-2000 to increase substantially the net financial benefit of the scheme for customers, by up to about 57 per cent, equivalent to some £40 million a year, without any reduction in energy savings, although at the cost of the benefit of the scheme in terms of warmer homes for some customers, worth some £20 million a year, and of the exploration by companies of the scope to save energy using energy efficient appliances. **We recommend, therefore, that OFFER should consider giving the electricity companies greater encouragement to focus resources on projects, such as those involving low-energy light bulbs, that are most effective in reducing customers' bills (paragraphs 13 to 14 and Figure 17).**
- c) In view of the variations in the cost of projects, **we recommend that OFFER should consider with the companies how to increase the benefits of the scheme for customers by reducing the cost of the more expensive projects, and by promoting best practice in their implementation (paragraph 15).**

Figure 1 Examples of energy saving projects under the scheme

Lighting



London Electricity provided a free energy saving light bulb to the first 60,000 eligible purchasers of a compatible light fitting at eight specified Bhs stores in London. To be eligible, purchasers had to be franchise customers of London Electricity.

Insulation



Manweb provided cavity wall insulation to 38 bungalows and external wall insulation to 40 flats occupied by elderly tenants at Bala, north Wales. The homes also received loft insulation and a hot water cylinder lagging jacket.

Heating controls



SWALEC paid up to 100 per cent of the cost of heating control equipment for temporary classrooms in over 300 schools. The system provides accurate time, occupancy and temperature control to electric heaters. This ensures that children come into comfortable and warm classrooms on cold winter days.

Insulation



Six hundred homes on Islay, Jura and Colonsay received a range of loft, cavity wall insulation and draught-proofing to suit their needs. The cost was met by Scottish Hydro-Electric, the Home Energy Efficiency Scheme and Argyll and Bute Council. Scottish Hydro-Electric expects the project to reduce the investment needed in the islands' distribution systems and the provision of standby generators.

Source: The local electricity companies

Part 1 The objectives of the scheme

1.1 Figure 1 shows some examples of how customers have benefited from the scheme. This part of the report examines:

- i) why OFFER introduced the scheme;
- ii) how it operates;
- iii) why we examined it; and,
- iv) what customers say about it.

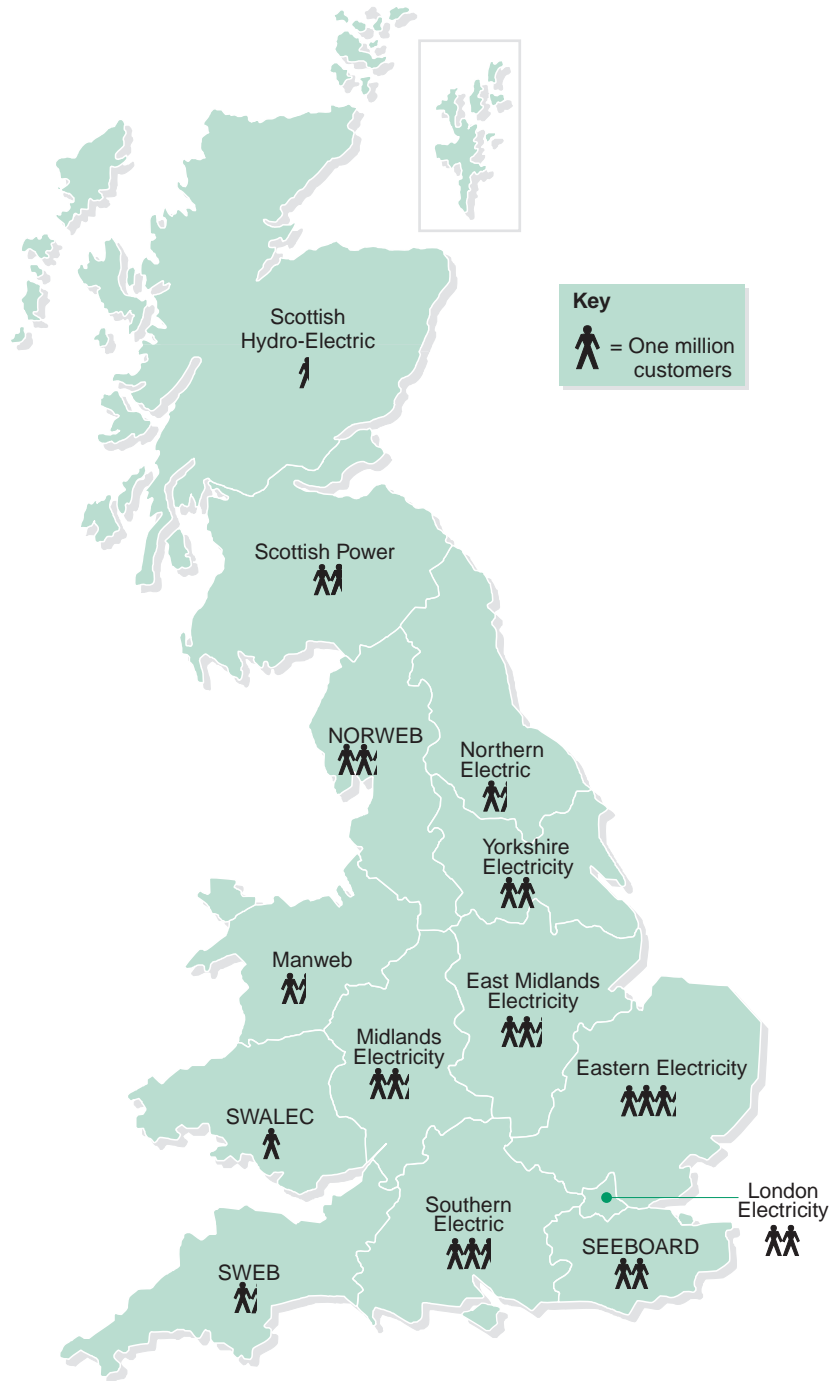
i) Why OFFER introduced the scheme

1.2 There are some 26 million electricity customers in Great Britain. They consume some 300 billion units (kilowatt hours) of electricity a year, at a total annual cost of some £18 billion. Some 24 million customers are domestic customers, who account for approximately 40 per cent of total consumption, and who pay on average around £300 a year each. The remaining two million customers consist mainly of businesses and public bodies. Some non-domestic customers are very large users of electricity - the top 55,000 account for about half of all electricity consumption.

1.3 At present only the 55,000 largest customers (those whose peak demand is more than 100 kilowatts) are able to choose their electricity supplier from among competing suppliers. All other customers, both domestic and non-domestic, can buy electricity only from their local electricity company. These customers are known as franchise customers. There are 14 such companies, who serve between $\frac{2}{3}$ million and $3\frac{1}{3}$ million customers each (Figure 2). OFFER and the Government are introducing competition for all customers in stages from September 1998.

The 14 local electricity companies

Figure 2



Source: OFFER

OFFER s powers and responsibilities

1.4 Because of the strong market position of the privatised electricity companies, the Electricity Act 1989 (the Act) established OFFER as the industry's economic regulator to protect customers and potential competitors. The Act requires OFFER to seek to ensure that electricity supplies are maintained and that the electricity companies are able to finance the provision of these supplies, and to promote competition (Figure 3). Subject to these primary duties, they must also seek to protect the interests of customers in terms of the price they pay for electricity, to promote efficiency in the use of electricity, and to take into account the effects of the industry on the environment. The Act also requires all companies to be licensed and gives OFFER powers to amend and enforce their licences.

Duties of OFFER

Figure 3

The duties and powers of OFFER are formally vested in the Director General of Electricity Supply, who heads OFFER. The Director General is required to act in the manner he considers best calculated to secure that all reasonable demands for electricity are satisfied, to secure that licence holders are able to finance their activities, and to promote competition in generation and supply. Subject to these duties, he is also required to seek to:

protect consumers' interests in respect of prices charged and other terms of supply (taking particular account of consumers in rural areas), continuity of supply, and the quality of electricity supply services (taking particular account of those who are disabled or of pensionable age);

promote efficiency and economy by those supplying or transmitting electricity and the efficient use of electricity supplied to consumers;

promote research and development and the use of new techniques by or on behalf of those authorised to generate, transmit or supply electricity; and

protect the public from dangers arising from the generation, transmission and supply of electricity.

The Director General has a further duty to take into account the effect on the physical environment of activities connected with the generation, transmission and supply of electricity.

Source: Electricity Act 1989

Note: OFFER employ some 238 staff in Birmingham and in 13 regional offices. Of these, five staff are wholly or partly involved with the scheme.

OFFER s reasons for introducing the scheme

1.5 All of the local electricity companies are subject to controls over the prices charged to franchise customers. Initial controls were set by the then Government at the time of privatisation. OFFER amended the controls, following reviews, with effect from 1994 in England and Wales, from 1995 in Scotland, and again from April 1998 throughout Great Britain.

1.6 At the time of privatisation the companies' licences required them all to produce codes of practice on the efficient use of electricity and to provide advice on the subject to customers. In their 1994 and 1995 price control reviews, OFFER concluded that this did not give the companies, whose primary objective is to sell electricity, sufficient incentive to promote efficiency in its use. They also concluded that there was scope for the companies to do more to help customers.

1.7 OFFER acted on these conclusions in two ways. They amended the price controls so as to reduce substantially the extent to which each company's revenue was determined by the amount of electricity it sold. The aim of this change was to remove any undue incentive for the companies to increase their sales of electricity. And they decided to give the companies an explicit obligation and ability to explore more thoroughly the potential for cost-effective energy efficiency measures.

1.8 To do so, OFFER used powers in the Act to require the companies to carry out projects to promote energy efficiency. The specific objectives they set the companies were, in the period up to 31 March 1998, to:

- carry out projects expected to achieve energy savings over the life of the energy efficiency goods and services supplied totalling 6.1 billion units - broadly equivalent to the total amount of electricity used in Great Britain in one week;
- give priority to projects that put downward pressure on the price per unit customers pay for electricity, and produce benefits for customers exceeding their costs;
- take into account, in selecting projects: the interests of customers who are elderly, disabled, live in rural areas, or have difficulty paying for electricity; the desirability of demonstrating a variety of methods of saving energy; and the effect of projects on the physical environment; (most of these requirements reflect corresponding statutory duties of OFFER); and,
- carry out projects at the best price reasonably available.

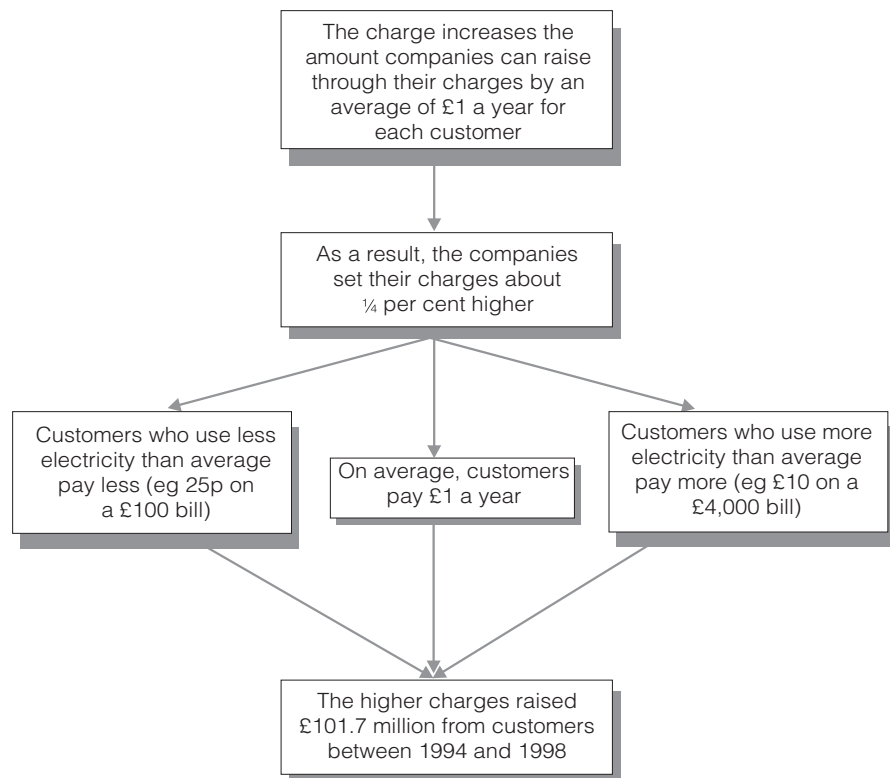
1.9 OFFER wanted companies to demonstrate a variety of methods of saving energy in order to explore as thoroughly as they could the potential for cost-effective projects, to inform the development of future projects, and to spread the benefits of the scheme across a range of customer groups. And to provide scope for companies to do so, OFFER set their energy savings target on the basis that companies would undertake a range of different types of projects and would not concentrate only on the most cost-effective ones.

Customers pay on average 1 per year

1.10 At the same time as requiring companies to carry out projects, OFFER included within the price controls a charge on customers to pay for the projects. The charge is an average of £1 per customer per year, equivalent to an increase in prices of about $\frac{1}{4}$ per cent. The charge has raised £101.7 million over the four years to March 1998. Figure 4 shows how it affects individual customers' bills.

How the charge affects customers' bills

Figure 4



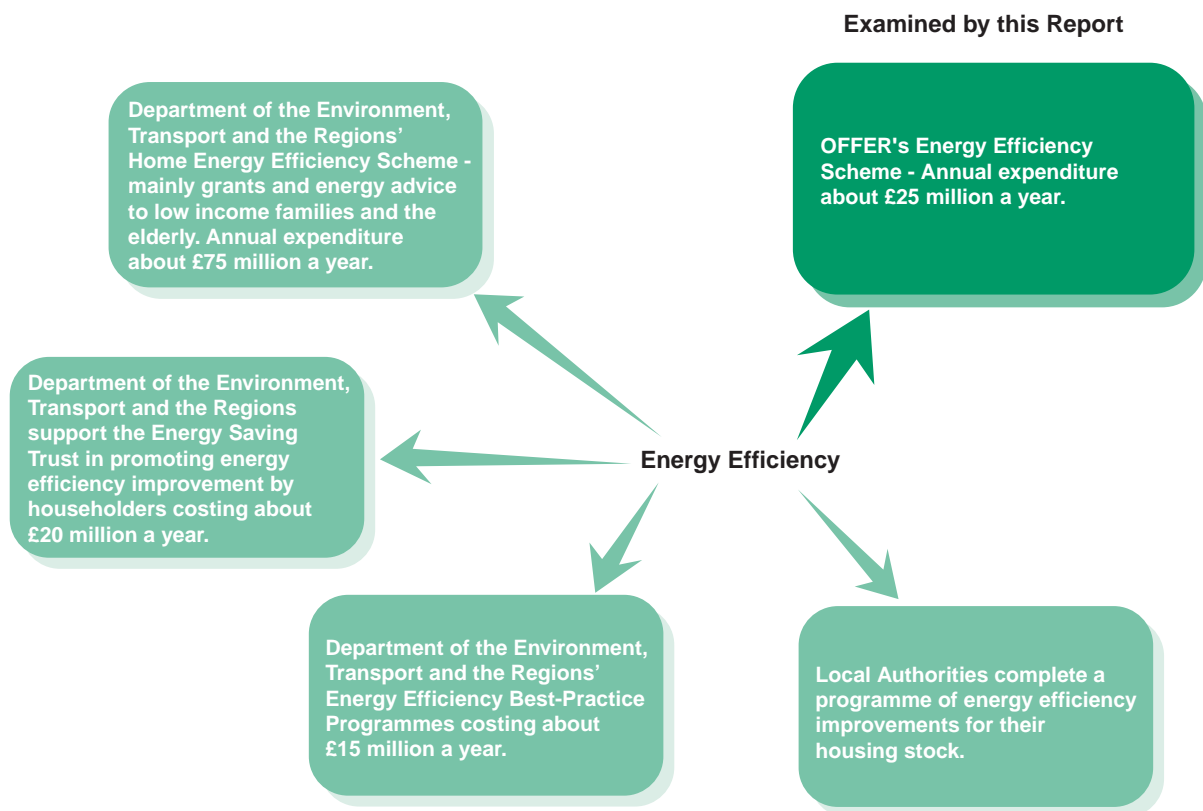
The scheme increases bills by an average of £1 per franchise customer, but the effect on individual bills varies according to the size of the electricity bill.

Source: National Audit Office

1.11 The scheme was introduced initially to operate until 31 March 1998 and the objectives and energy savings targets set for companies by OFFER when it was introduced related only to this period. In 1997 OFFER decided to extend the scheme until 2000 and in March 1998 they set separate objectives and energy savings targets for 1998-2000. This extension of the scheme will increase the total amount raised by the charge on customers since 1994 to some £150 million.

1.12 The scheme complements a number of other initiatives by departments and other public bodies to promote energy efficiency (Figure 5). The largest of these initiatives, the Department of the Environment, Transport and the Regions' Home Energy Efficiency Scheme, was the subject of a National Audit Office report published in February 1998 (HC 556 of Session 1997-98).

Figure 5 Key public initiatives to promote energy efficiency



There are a number of public sector initiatives to promote energy efficiency.

Source: Department of the Environment, Transport and the Regions and OFFER

1.13 In a survey of a representative sample of 1,500 domestic customers (Appendix 2), we found that many customers have not yet made all of the improvements to the energy efficiency of their homes that they could, confirming the scope for both OFFER's scheme and these other initiatives to help improve energy efficiency. For example, nearly six out of ten customers said that they did not have any low energy light bulbs and one out of four customers who used electricity to heat their home did not have loft insulation.

1.14 Most companies have carried out some projects in conjunction with these other initiatives. For example, many companies have worked with Eaga (formerly the Energy Action Grants Agency), who operate the Home Energy Efficiency Scheme on behalf of the Department of the Environment, Transport and the Regions, to provide free low energy light bulbs to pensioners and others receiving insulation from that scheme. The scope for duplication between the scheme and these other initiatives is limited by controls operated by the companies.

The legal basis of the scheme

1.15 The scheme's introduction followed that of a somewhat similar scheme in the gas industry. The gas industry scheme was introduced in 1992 by the then Director General of Gas Supply, and operated until 1997. It permitted British Gas to carry out energy efficiency projects and to pass on their costs to customers by increasing gas prices, subject to the Director General's authorisation of each individual project.

1.16 When the present Director General of Gas Supply was appointed in 1993, she raised two concerns about the gas industry scheme. The first was that it might constitute a form of taxation, which would have required clearer Parliamentary authority than the scheme had. The second was that it might conflict unduly with her statutory duty to protect the interests of gas customers as regards the level of gas prices.

1.17 In response to an enquiry by the House of Commons Environment Select Committee, she obtained a Counsel's opinion on these questions in 1994. The opinion concluded that, although the matter was not free from doubt, any increase in gas prices caused by the gas industry scheme was not, in law, a form of taxation. Therefore, on this account, there was unlikely to be any absolute legal bar on her approving projects under it. But it was also proper for her to be concerned at the effect of projects on prices. She was therefore required to reach a judgement on

each project submitted to her and had discretion to authorise, or not authorise, projects as she judged appropriate, having had regard to the relevant facts of each project and her statutory duties.

1.18 While OFFER also had statutory duties to promote energy efficiency and to protect the interests of customers as regards prices, they had in addition a duty to take into account the effect of their industry on the environment, which did not at the time form part of OFGAS's duties. And they took the view that the benefits of the electricity industry scheme in this respect, and in promoting energy efficiency, justified its introduction. OFFER also took the view that setting the charge at an average of £1 per customer per year struck an appropriate balance between their various duties. But they considered that they should not set the allowance any higher. They expected the scheme to redistribute resources to those customers who benefited from the scheme from those who did not, and they considered that a charge much larger than the average £1 per year per customer proposed would have been more appropriately imposed by Government taxation.

1.19 In the Green Paper "A Fair Deal for Consumers" (Cm 3898), published in March 1998, the Government proposed action to clarify the concerns felt by both OFFER and OFGAS. The Green Paper proposed, subject to consultation, that Ministers should issue guidance to the utility regulators on the environmental objectives that are relevant to their work, and that the regulators should be placed under a duty to have regard to that guidance in the exercise of their statutory functions. It also proposed that where for environmental purposes Government policy calls for interventions with significant financial implications for consumers or regulated companies, the Government would instead seek appropriate new legal provision to implement the policy.

1.20 During 1998, OFFER will begin consulting on the future of the scheme beyond 2000 as part of a review of the prospects for price controls after that date. The introduction of competition in the domestic electricity market planned from September 1998 will, however, make it difficult to extend the scheme without some change. This is because at present only the franchise customers of the 14 local electricity companies pay towards the cost of the scheme through the £1 charge on customers. And unless the scheme were modified, the money available to it would diminish as competition grows.

ii) How the scheme operates

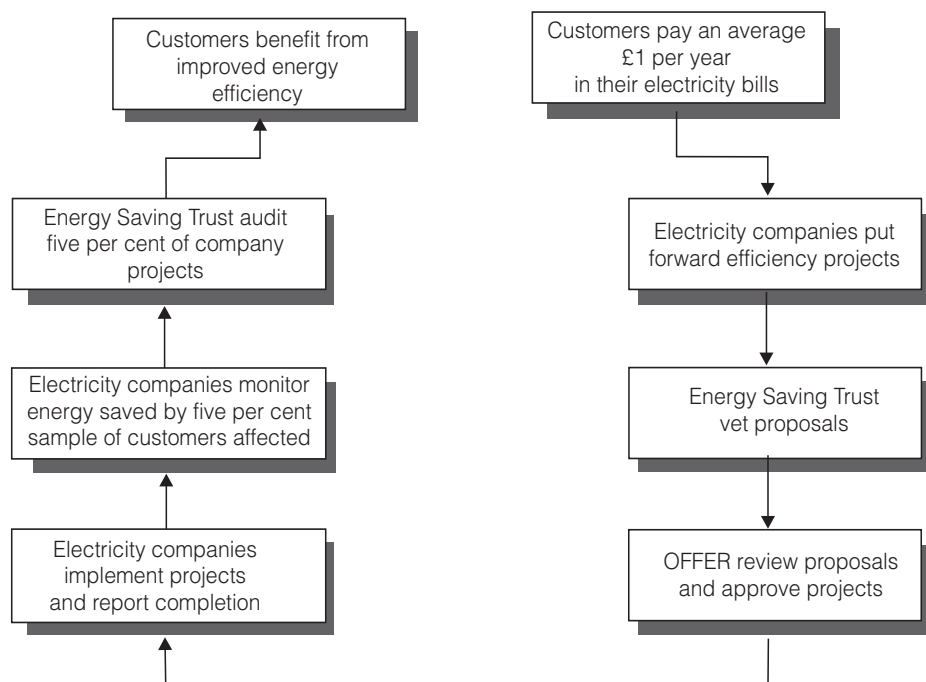
1.21 In regulating the scheme, OFFER work closely with the Energy Saving Trust (the Trust) - an independent body set up at the Government's instigation to help achieve the reductions in carbon dioxide emissions agreed at the 1992 Rio Conference by promoting energy efficiency. The Trust's members are the Government, the privatised gas and electricity companies, and a number of independent gas and electricity companies.

1.22 OFFER and the Trust have established guidance and procedures for developing, approving and monitoring projects. The procedures operate at two main levels:

- Scrutiny by both bodies of every project (Figure 6) to check that it complies with project assessment criteria set out by OFFER, for example as regards its cost and the calculation of expected savings. Companies must have OFFER's approval to count savings from a project towards their energy savings target. The Trust also monitor companies' progress in implementing individual projects, and in monitoring subsequent energy savings.

How the scheme operates

Figure 6



Source: OFFER

- Ongoing review by OFFER across the whole range of each company's programme of projects, to assess the overall progress of the programme, for example towards meeting energy savings targets. OFFER also review reports submitted annually by each company and an annual report prepared by the Trust showing the progress of the scheme as a whole.

iii) Why we examined the scheme

1.23 We examined the scheme for four reasons:

- Although the scheme involves no expenditure voted by Parliament, the charge it places on customers through electricity prices amounts to some £25 million a year.
- The scheme was introduced by OFFER because of the duties given to them by Parliament, and OFFER are responsible for overseeing it to ensure that it operates in an economic, efficient and effective manner.
- The scheme creates a unique partnership between a regulator and private companies to achieve public aims, unlike the Home Energy Efficiency Scheme, which is funded from general taxation. There may be lessons to be learnt if similar partnerships between the public and private sectors are considered in the future.

Energy efficiency, climate change and the 1997 Kyoto conference

In recent years successive Governments have been concerned that man-made emissions of certain gases, known as greenhouse gases, might change the global climate. The predicted changes include higher average temperatures, changing patterns of rainfall, and rising sea levels.

The most important man-made greenhouse gas is carbon dioxide, produced mainly by burning coal, oil and natural gas. In 1990 carbon dioxide accounted for 81 per cent of the man-made greenhouse gases emitted by the United Kingdom and power stations accounted for 32 per cent of these carbon dioxide emissions. Improving the efficiency with which electricity is used therefore provides one way of reducing greenhouse gas emissions.

Under the United Nations Framework Convention on Climate Change signed at Rio de Janeiro in 1992 the United Kingdom undertook to reduce United Kingdom emissions of greenhouse gases to 1990 levels by the year 2000. A reduction of the European Union's greenhouse gas emissions to eight per cent below 1990 levels by 2010 was agreed at the third conference of the Parties to the Climate Change Convention, held in Kyoto in December 1997. The United Kingdom has agreed to reduce its own emissions to 12¹/₂ per cent below the 1990 level by 2010 to contribute to this goal. It also has a separate objective to reduce carbon dioxide emissions by 20 per cent below 1990 levels by the same date.

- As well as helping many customers to reduce their electricity bills, the scheme has important environmental consequences. There may also be lessons to be learnt that will be of value in achieving the reductions in greenhouse gas emissions agreed at the 1997 Kyoto conference.

1.24 We examined:

- what customers say about the scheme (paragraphs 1.26 to 1.27);
- what it is achieving for customers (Part 2); and,
- the scope for it to achieve more for customers (Part 3).

1.25 Appendix 1 describes in detail the methodology we used. In brief, we:

- reviewed the documentation held by OFFER and the Energy Saving Trust;
- examined a sample of 45 approved energy efficiency projects;
- commissioned a market research company, Research Services Limited, to carry out a survey to establish public awareness of the scheme and provide information on related matters (Appendix 2);
- held a meeting of the company managers responsible for projects funded by the scheme, to hear their views on the scheme and its implementation (Appendix 3);
- commissioned AEA Technology to review practice overseas (Appendix 4); and,
- assembled a panel of experts (Appendix 1) to assist and advise us.

iv) What customers say about the scheme

1.26 In the survey carried out for us by Research Services Limited (Appendix 2), we asked a sample of 1,500 domestic electricity customers (representative of the adult population in Great Britain) if they knew of the scheme and what they thought about it. One in five respondents were aware of the scheme, and of these over half said they knew it was funded out of the price they paid for their electricity. Only one fifth said that they were not happy at having to pay an average of £1 a year into the scheme, while nearly half said they were happy.

1.27 As part of their statutory duty to review matters affecting the interests of consumers, each of the 14 Electricity Consumer Committees are kept informed by their local electricity company of how the scheme is developing, and the Committees regularly comment on progress. We consulted all the Committees and they told us that they were content with the companies' achievements and impressed with their enthusiasm in meeting their targets.

Some key terms

■ **Energy efficiency.** Customers use energy for a purpose, such as to provide heat or light or to operate appliances. Improving energy efficiency helps to reduce the amount of energy that customers need to use to provide the heat, light etc, that they are seeking to achieve. It can have one of three possible results:

- a) Customers use less energy to achieve the same benefit as before
- b) Customers use the same amount of energy to obtain increased comfort
- c) Customers may do something of both

The way in which the benefits of improvement in energy efficiency are divided between these three possible outcomes depends on a range of factors, including the nature of the energy efficiency improvements concerned and the income of the customer.

■ **Energy saving.** If customers use an improvement in energy efficiency to reduce the amount of energy they use then they will use less energy than they would have done if the improvement had not been made, even if they also take some of the benefits of the improvement in the form of increased comfort. This reduction in consumption represents the energy saving made by the improvement.

■ **Energy consumption.** The efficiency with which energy is used is only one of the factors affecting the total amount of energy used by a customer. Energy consumption can also be affected by, for example, changes in the number of people in the customer's household, the number and nature of electrical appliances, the household's income, and the weather. Energy savings made as a result of improvements in energy efficiency may not, therefore, always be followed by a reduction in energy consumption.

Part 2 What the scheme has achieved for customers

2.1 This part examines:

- i) the energy savings achieved by the scheme for customers;
- ii) the financial savings achieved for customers;
- iii) the effect of the scheme on customers' comfort; and,
- iv) the wider effects of the scheme, including its effect on the environment.

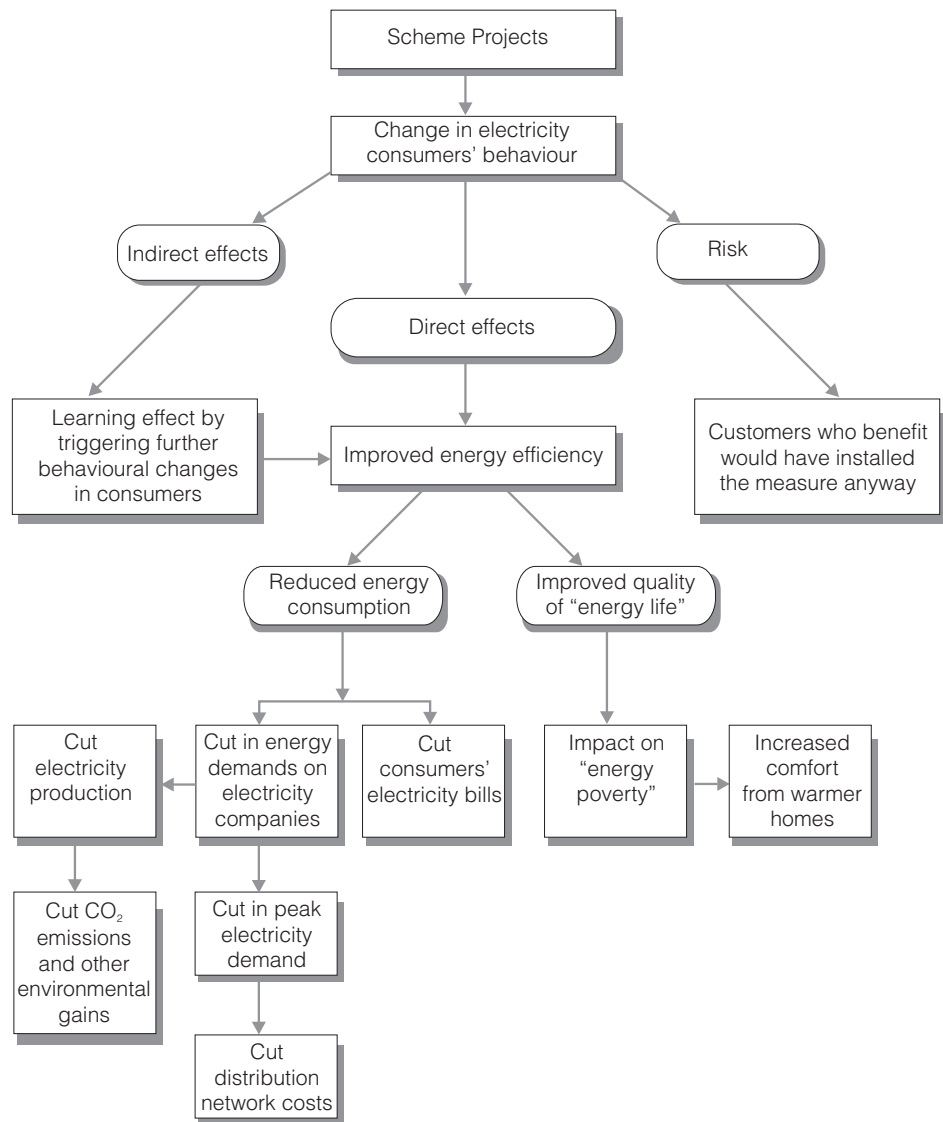
i) The energy savings achieved for customers

2.2 Projects funded by the scheme can save energy for customers through both direct and indirect effects (Figure 7):

- **Direct effects**, as a result of the goods and services supplied to customers improving the efficiency with which they use electricity. This improvement allows customers either to save electricity, to increase the benefits they gain from using electricity (for example, to keep their home warmer), or to do something of both. In so far as customers take the benefits of projects in the form of electricity savings, these savings will reduce customers' bills, electricity production and distribution costs, the consumption of fuel in power stations, and emissions of carbon dioxide and other pollutants.
- **Indirect effects**, either by affecting customers' behaviour or by influencing the market for energy efficiency goods and services. For example, customers receiving an energy efficient light bulb from the scheme may then buy another at their own expense. And the market for energy efficient goods and services may be strengthened if support through the scheme helps new products become established commercially.

Effects of Energy Efficiency Projects

Figure 7



Source: National Audit Office

Energy efficiency projects can have a range of direct and indirect effects.

2.3 The value for money of energy efficiency projects in producing these benefits is affected by how well projects deal with the risk that some customers benefiting from them would have installed the efficiency goods and services supplied by the projects anyway, without support from them.

2.4 To assess the energy savings achieved for customers through these effects, we:

- a) examined how well companies were designing projects to deal with the risk that some customers benefiting from projects would have installed the energy efficiency goods and services supplied by them without support;
- b) examined how companies, the Trust, and OFFER were assessing the energy saved by projects; and,
- c) used our findings, and information held by the Trust on the costs and savings of all projects, to assess the progress achieved by the scheme so far.

a) Dealing with the risk that some customers benefiting from projects would have installed the energy efficiency goods and services supplied without support

2.5 Since the aim of the scheme is to make energy efficiency improvements that will benefit customers, there is a significant risk that some customers benefiting from projects would have installed the energy efficiency goods and services supplied without support. Experience in the United States, where there have been many utility funded energy efficiency schemes, suggests that it is not possible to ensure that all customers taking part in projects would not have installed the relevant energy efficiency measures on their own initiative (Appendix 4). OFFER therefore follow good practice in the United States, and require the companies to minimise this risk in projects so far as they reasonably can, and to take account of it when assessing energy savings.

2.6 Companies can minimise this risk by designing projects to address the reasons why people do not install more energy efficiency measures themselves. These include:

- **Cost.** Customers may not have the money to make large energy efficiency improvements, or be able to borrow it on reasonable terms.
- **Tenure.** Tenants are often reluctant to spend money on improving their landlord's property. In our customer survey this was the most common reason given by people for not making energy efficiency improvements (Appendix 2).
- **Lack of knowledge of what is worthwhile.** Customers are often simply unaware of the savings that can be made.

- **Inconvenience and household movement.** Customers may not want the disruption involved in making improvements. Owner occupiers thinking of moving may also be concerned that the price they could get for their home will not fully reflect the cost of energy efficiency improvements they have made.

2.7 The companies have sought to respond to these in a variety of ways.

2.8 A number of the companies' projects are expected to secure energy savings indirectly by affecting customers' behaviour. But in most cases any additional

How companies minimise the risk that the scheme finances energy efficiency improvements that the customers would have made anyway

Projects aimed at low income households. Because low income households are unlikely to be able to afford the energy efficiency measures involved, special measures are not normally needed. Such projects have represented half of all scheme expenditure to the end of March 1998.

Projects aimed at housing associations and local authorities. When dealing with housing associations and local authorities, companies can seek written confirmation that the measures would not have been installed without scheme funding.

Projects aimed at the general public. The most common method used by companies is to market projects intensively in a succession of small geographical areas for short periods, so that customers intending to make improvements at their own cost have little opportunity to join a project.

Subsidising the price of energy efficient products to the general public. In the projects arranged by the Trust to subsidise the sale of energy efficient appliances, such as refrigerators, or energy efficient light bulbs, only increases achieved above the normal level of sales were counted as having been brought about by the projects.

savings are likely to be small, because the companies have a separate obligation to provide advice and guidance on energy efficiency and OFFER have told companies that it would not be appropriate for scheme funds to be used for projects with a large educational or publicity element.

2.9 There is also scope for the scheme to help new energy efficiency products become established commercially. For example, the Electricity Consumers Committee Chairmen told us that when OFFER were consulting on the setting of the new objectives for companies for the period 1998 to 2000, they had urged OFFER to encourage the companies to seek a greater proportion of their savings from electrical appliances. They told us that the Energy Saving Trust had estimated that electrical appliances account for 56 per cent of domestic electricity

consumption, and that progress in improving the efficiency of appliances was needed to help achieve the reductions in carbon dioxide emissions agreed at the 1997 Kyoto conference (paragraph 1.23).

2.10 The companies' energy efficiency managers told us that they thought that the scheme had helped to develop the market for low energy light bulbs, and that as a result their price had fallen, and sales increased (Appendix 3). But they also considered that they were required to give undue attention to the risk of projects financing measures that customers would have installed anyway. We concluded, however, that adequate precautions are required to minimise this risk to ensure that the scheme has brought about additional improvements, and that the steps taken by OFFER to achieve this have been justified.

b) How energy savings are assessed

2.11 Improving energy efficiency normally requires expenditure of an initial lump sum which then produces energy savings over many years - 10 to 20 years, for example, for many forms of insulation. To allow costs and savings to be compared on an equal basis, OFFER, advised by the Trust, have therefore established a method of assessing savings (summarised in Appendix 5) requiring that:

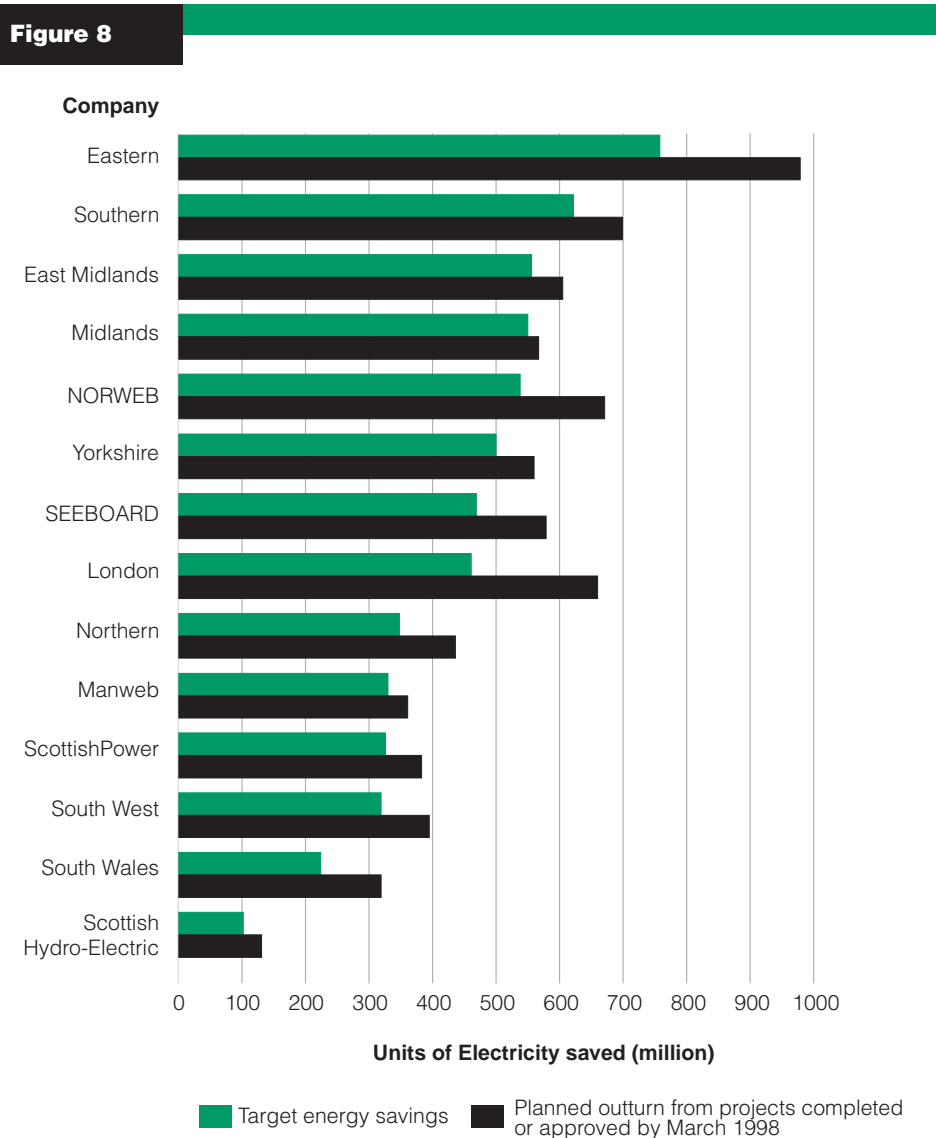
- the expected annual savings from each project are converted to a single amount; this is done by adding together the savings expected over the life of the measures supplied by it and discounting them to a single net present value;
- the savings are counted as having been achieved in the year in which projects are completed rather than in the year or years in which energy is expected actually to be saved; and,
- savings are assessed when projects are implemented, and are not revised in the light of later monitoring; later monitoring is carried out, however, to inform future assessments of energy savings.

2.12 Our sample examination of 45 projects (Appendix 1) found good compliance with the method of calculating savings required by OFFER.

c) The energy savings achieved so far

2.13 By March 1998 the companies had completed, or obtained OFFER’s approval to, a total of 509 projects (the 45 projects we examined in detail included examples of both types). The energy savings they expected from these projects, i.e. the actual savings achieved by completed projects, plus the savings planned from those not yet completed, exceeded the companies’ energy savings targets, both in total and for each individual company (Figure 8).

**Companies’ plans at
March 1998 to meet
their energy savings
targets**



Source: Energy Saving Trust

By March 1998, all the companies had plans to achieve energy savings exceeding their targets.

2.14 The total energy savings actually achieved by these projects could not be established precisely at the time of our examination, for two reasons. First, the companies were not committed to completing all of these projects, although they had undertaken to OFFER to complete enough projects both to achieve their individual targets and to spend on the scheme all of the £101.7 million raised by the charge on customers. And second, implementation of some projects had not been completed, and, because of on-going monitoring, was not expected to be completed until 2000.

2.15 We therefore used the experience of those projects that had been completed to estimate the energy savings that the companies were likely to achieve as a result of spending the remainder of the £101.7 million. We found that in the projects completed by the end of March 1998 (230 of the 509) both actual costs and actual savings were, on average, lower on completion than was estimated when the projects were approved: costs were on average 5.1 per cent lower, and savings 9.1 per cent lower.

2.16 On the assumption that the same differences between initial estimates and actual costs and savings would occur in uncompleted projects, we estimate that completing the companies' approved programmes of projects up to the point at which they had spent all of the £101.7 million raised by the charge on customers would result in energy savings totalling some 6.8 billion units (Figure 9). This amount exceeds the total of the targets set by OFFER for the companies of 6.1 billion units by 12 per cent.

**Estimated total savings
from projects for
customers by
31 March 1998**

Figure 9

	Billion units of electricity
Total savings from projects completed to March 1998	3.3
Projected savings from projects approved but not completed	3.5
Total estimated savings from all projects to 31 March 1998	<u>6.8</u>

Source: National Audit Office

Projects are likely to achieve energy savings for customers of around seven billion units

ii) The financial savings for customers

2.17 To assess the financial savings achieved for customers we:

- a) examined the effect of the scheme on the price per unit paid by customers for electricity (which is principally the result of the £1 charge on customers);
- b) examined how the energy savings expected to be made by customers benefiting from projects are likely to reduce their electricity bills;
- c) used our findings to assess the overall impact of the scheme on customers' bills; and,
- d) examined the cost of achieving these benefits for customers.

a) The effect on the price per unit paid by customers

2.18 By imposing the £1 a year charge on franchise customers, the scheme directly increases the price per unit of electricity paid by them by about $\frac{1}{4}$ per cent. There is also some scope for it to increase prices indirectly, although OFFER believe that any such increase is likely to be small. To help offset the effect on customers of any increase in prices, OFFER have required the companies to give priority to projects that exert a downward pressure on the price per unit of electricity paid by customers.

2.19 In practice, projects are unlikely to exert such pressure unless a substantial part of the energy savings they make are made at times of peak demand. Most lighting projects will help to exert such a pressure because peaks of demand often occur at times, such as early evening on winter weekdays, when lighting is an important component of total demand. Insulation projects can also help in rural areas where domestic heating can be an important component of local peak demand.

Project designed to reduce electricity distribution costs	Cost:
£393,000	

Eastern Electricity's North East Suffolk management of customers' demand for electricity project was a pilot for a number of similar projects. Based in and around the town of Bungay, the project targeted electrically heated homes - either owner occupier or private rented - on the Economy 7 tariff, which caused peaks in the demand for electricity due to the method of control used for the switching of the night storage heating circuits. These peaks exceeded the maximum capability of the electricity distribution network.

The project affected 800 properties. Work included a package of two energy efficient light bulbs, cavity wall insulation, draught proofing, a hot water tank jacket, loft insulation, pipe lagging and energy advice. The measures have reduced electricity demand for heating, releasing capacity for new customers and deferring the need to reinforce the network.

2.20 OFFER have not assessed either the overall effect of the scheme on the price per unit paid by customers, or how well companies have performed in meeting the requirement to exert downward pressure on it. And our examination of 45 projects found only four projects in which companies stated that one of their specific aims was to help reduce electricity prices, indicating that the reduction of costs was rarely an important factor in project design. This observation was confirmed by the companies' energy efficiency managers during our focus group discussion (Appendix 3).

b) The effect of energy savings on customers electricity bills

2.21 If a company shares the cost of a project with another body, or the customers affected contribute to the project's cost, only a share of the savings achieved are counted for the purposes of the scheme as having been achieved by the project. As a result, the 6.8 billion units that we estimate will be achieved from projects to March 1998 (paragraph 2.16) represent only the companies' share of a total of 7.5 billion units in energy savings from the projects concerned. We estimated the gross financial value of these savings to the customers affected to be £384 million (Figure 10).

**Estimated gross financial
value to customers of
energy savings from
projects**

Figure 1

Type of project	Forecast number of units of electricity saved (million units)	Average price of each unit of electricity (pence per unit)	Gross value (£ million)
Domestic (insulation)	3,379	3.14 ¹	106
Domestic (other)	3,408	7.13	243
Non-domestic	<u>677</u>	5.10	<u>35</u>
Total gross savings	7,464		384

Note: 1. Savings valued on the basis that 90 per cent of electricity saved would have been paid for at the cheap off-peak rate of an off-peak tariff and 10 per cent at the higher rate charged at other times. Recent monitoring suggests that the proportion of electricity paid for at the cheaper rate can be nearer 80 per cent.

Source: National Audit Office

The gross financial value to customers of energy savings from projects is some £384 million.

c) The overall effect of the scheme on customers bills

2.22 The total cost of achieving the gross financial value of savings to customers of £384 million was £134 million. This total was made up of £101.7 million met by the charge on customers, £25 million paid for by contributions from the customers directly affected by projects, and £7 million paid for by other contributors, such as local authority landlords, appliance manufacturers and retailers and the companies themselves. The net financial benefit of the scheme as a whole was therefore some £250 million (Figure 11) and the net financial benefit for customers alone was £257 million. Total benefits exceeded total costs in a ratio of 2.9:1.

2.23 These financial savings have not been evenly distributed between customers. We estimated that approximately three million customers had benefited from the scheme by the end of March 1998, by an average of about £120 each over the life of the energy efficiency goods and services supplied, while 23 million customers had been net contributors. The extension of the scheme to 2000 will increase the number of beneficiaries, and reduce the number of net contributors, but the former will continue to be substantially outnumbered by the latter.

Estimated net financial
benefit of projects

Figure 11

	£ million	£ million
1. Gross value of expected savings (Figure 10)		384 (a)
2. Costs of the scheme		
Companies' costs met from the charge on customers included in electricity prices	102	
Costs met from contributions to projects by customers taking part in projects	<u>25</u>	
Total costs met by customers		<u>127 (b)</u>
Net financial benefit to customers (a) - (b)		<u>257</u>
Costs met by contributors other than customers		7
Net financial benefit of the scheme as a whole		<u>250</u>

Source: National Audit Office

The net financial benefit of projects has been some £250 million.

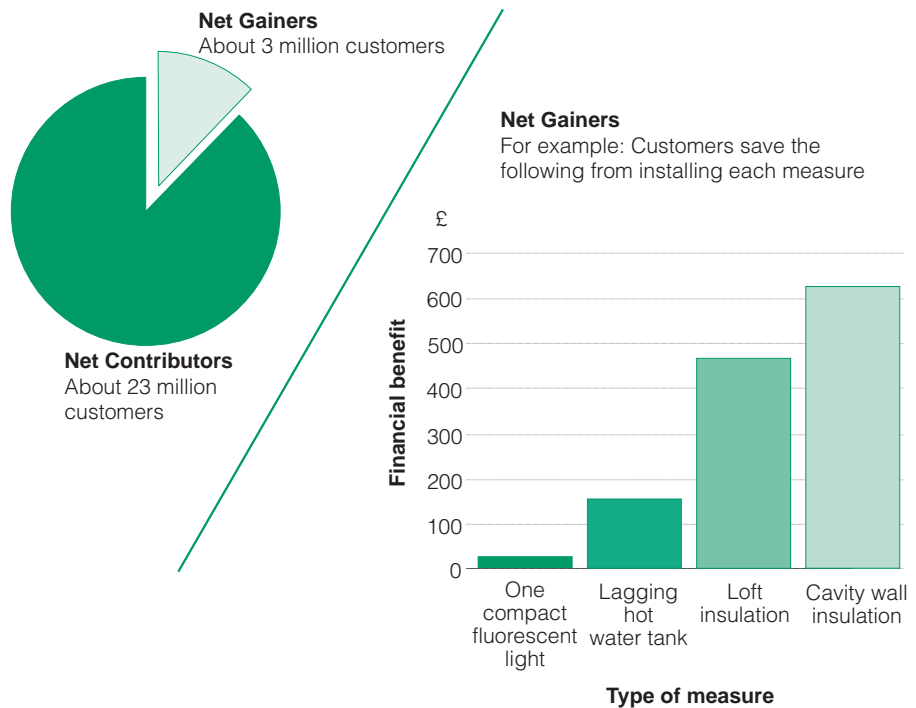
2.24 Where customers have benefited from the scheme, the amount by which they will have benefited varies considerably, depending on the energy efficiency measure they have received (Figure 12). The biggest beneficiaries of the scheme have been customers who use electricity as their main source of heating. For customers who installed cavity wall insulation (which OFFER only allow companies to install as part of the scheme in electrically heated homes), for example, the net gain totals about £600 over 15 years.

d) The costs of achieving the benefits for customers

2.25 The £134 million cost of achieving the energy savings of 7.5 billion units (paragraph 2.21) equates to an average cost of saving electricity of around 1.8 pence per unit. This is less than the average price paid for off-peak electricity by customers using an off-peak tariff (an average in the period to March 1998 of around 2.7 pence per unit), which is the lowest price domestic customers can pay for electricity, and much less than the average price paid for electricity used for other purposes (over 7 pence per unit). It is also lower than the cost typically found in comparable schemes in the United States (2.4 to 3.6 pence per unit - Appendix 4), and shows that, on average, projects within the scheme have provided a net financial benefit for customers.

Net gainers and contributors to the scheme

Figure 12



Source: Energy Saving Trust
About 13 per cent of customers have benefited from the scheme. The value of the benefit has varied widely depending on the measure installed.

2.26 Individual projects have also normally provided a net financial benefit. We examined the 509 projects approved or completed to the end of March 1998 and found that 28 were expected to save energy at a cost greater than the amount of 2.7 pence per unit referred to above. Only four of these projects, however, cost more than 3.2 pence per unit, which is the benchmark used by the Trust for assessing projects, and is based on a mixture of the prices of cheap off-peak electricity and of standard rate electricity. This is a more realistic standard against which to assess the cost effectiveness of projects because customers using off-peak rate electricity tariff normally have to use some standard rate electricity during the day to top up the cheaper heat stored at off-peak periods. Two of these four projects were very small and in the other two special circumstances appeared to make the projects seem reasonable value for money. We did, however, find one project - Budget Heating - which appeared to be a questionable use of scheme money to install electrical heating, when gas heating appeared to offer better value for money.

Budget Heating**Total cost: £320,000**

This project was developed by the Energy Saving Trust in conjunction with all the companies. It involves the replacement of solid fuel, open-grate, fires in low income households with electric storage heaters. An appraisal by the Trust showed that this was cheaper for the customer than continuing with the open-grate fire or replacing it with gas heating, which made it acceptable under the rules of the scheme.

The installation of electric heating was, however, only cheaper for the customer than gas because the scheme was meeting the cost of installing it. Without the money contributed by the scheme, the option offering best value for money for the customer would have been a switch to gas heating (where it is available), which would also provide a greater reduction in energy use. But this option was not permitted by the rules of the scheme, which restricts projects to promoting the efficient use of electricity - projects promoting the efficient use of other fuels are not permitted.

Initially approved with a budget of £3,009,000, the final cost of this project is now expected to be around £320,000 as a result of lower than expected take-up.

iii) The effect on customers comfort

2.27 In addition to saving energy, and thereby benefiting customers financially, some energy efficiency improvements can improve the comfort of the customers affected. The extent to which they can do so varies depending on the type of project and the type of customer. Improvements to insulation provide the main scope for improving comfort and customers who have previously had difficulty in affording adequate heating are particularly likely to take some of the benefit of improvements in this way. The significance of this factor was shown by our survey of 1,500 domestic customers, in which nine per cent of customers who used electricity as their main source of heating said that they were cold the previous winter. The most common reason given for this was that they could not afford to spend more on heating.

2.28 When customers take the benefits of improved insulation in the form of comfort rather than energy savings, the scope for them to save energy and reduce their energy bills is correspondingly reduced. Monitoring by the Department of the Environment, Transport and the Regions of their Home Energy Efficiency Scheme, for example, indicates that recipients of help under that scheme, which is available only to people on certain benefits, the disabled and people over 60, can take up to 80 per cent of the theoretical benefits of improvements in the form of comfort rather than energy savings.

2.29 When OFFER introduced the scheme they set targets for companies in terms of the amount of energy saved by projects. They were therefore concerned there was a risk that companies would try to maximise energy savings by concentrating household insulation improvements on better-off customers, in the expectation that they would take only a small proportion of the benefit of improvements in the form of comfort. This was of concern to OFFER because they have statutory duties to take into account in their work the interests of elderly, disabled and rural customers, while the companies have obligations to customers who have difficulty in paying for electricity.

2.30 Accordingly, companies have not been permitted to take household income into account when calculating energy savings, so as to remove any incentive to concentrate on better-off customers. And while OFFER have not set targets for the extent to which low income customers should benefit from the scheme, they have told the companies that they should devote a reasonable proportion of projects to customers in the special groups to whom OFFER have statutory duties. They also told the companies that they had set the companies' targets on the basis that a third of expenditure would be on projects to help households on low incomes and in the special groups, whom the Trust advised them constituted about a third of households in Britain.

2.31 Our focus group of energy efficiency managers (Appendix 3) indicated that not all companies felt they fully understood what was required of them in terms of the amount of effort they should devote to helping these customers. Nonetheless, they have all sought to assist them. Companies have been helped in doing so by the fact that electrically heated homes (which offer the largest opportunities for saving electricity cost-effectively) are more common in many rural areas than in urban areas. In addition, there are benefits for companies in working with local authorities and housing associations, whose tenants tend to include a larger than average proportion of people who are on low incomes, are elderly or are disabled. These benefits chiefly involve economies of scale in undertaking projects.

2.32 As a result, whereas only 24 per cent of households nationally are tenants of local authorities or housing associations, the companies estimate that 39 per cent of scheme expenditure to date has gone towards such households. And 50 per cent of all scheme expenditure has gone to projects to help customers on low incomes, in either owner-occupied or rented housing. Full information is not available for the other special groups, mainly because it is difficult to establish how they are affected by projects aimed at the general public, but at least 20 per cent of scheme expenditure has been on projects aimed specifically at these groups.

2.33 The help provided to customers in keeping their homes warm will be worth some £80 million to them in the sense that this is what it would cost in electricity to keep their homes as warm over the life of the energy efficiency goods and services supplied. By helping some customers to keep their homes warmer, the scheme is likely to have benefited their health and comfort. It will also have helped to address fuel poverty - the problem faced by households who cannot afford adequate heating because of the poor energy efficiency of their homes.

iv) The wider effects of the scheme, including its effect on the environment

2.34 The main environmental impact of the scheme has been on the amount of carbon dioxide emitted by power stations. We estimate that the energy savings expected to be achieved by projects implemented to the end of March 1998 will reduce emissions of carbon dioxide by around six million tonnes over the life of the measures supplied through these projects. At current emission rates, this is equivalent to around $\frac{1}{4}$ per cent of total United Kingdom carbon dioxide emissions in the four years to March 1998 and around one per cent of total emissions from power stations.

2.35 The companies' energy efficiency managers told us that a number of other benefits were being achieved (Appendix 3), and our examination of the sample of 45 projects confirmed this. Benefits included reductions in water consumption from installing showers, and the recovery from old refrigerators of environmentally harmful coolants. The Trust have also claimed benefits for the scheme in job creation and from reduced emissions from power stations of sulphur dioxide and nitrogen oxides, which contribute to acid rain.

Part 3 The scope to increase benefits and improve the scheme's operation

3.1 This part examines:

- i) the scope to increase the scheme's benefits; and,
- ii) the scope to improve its operation.

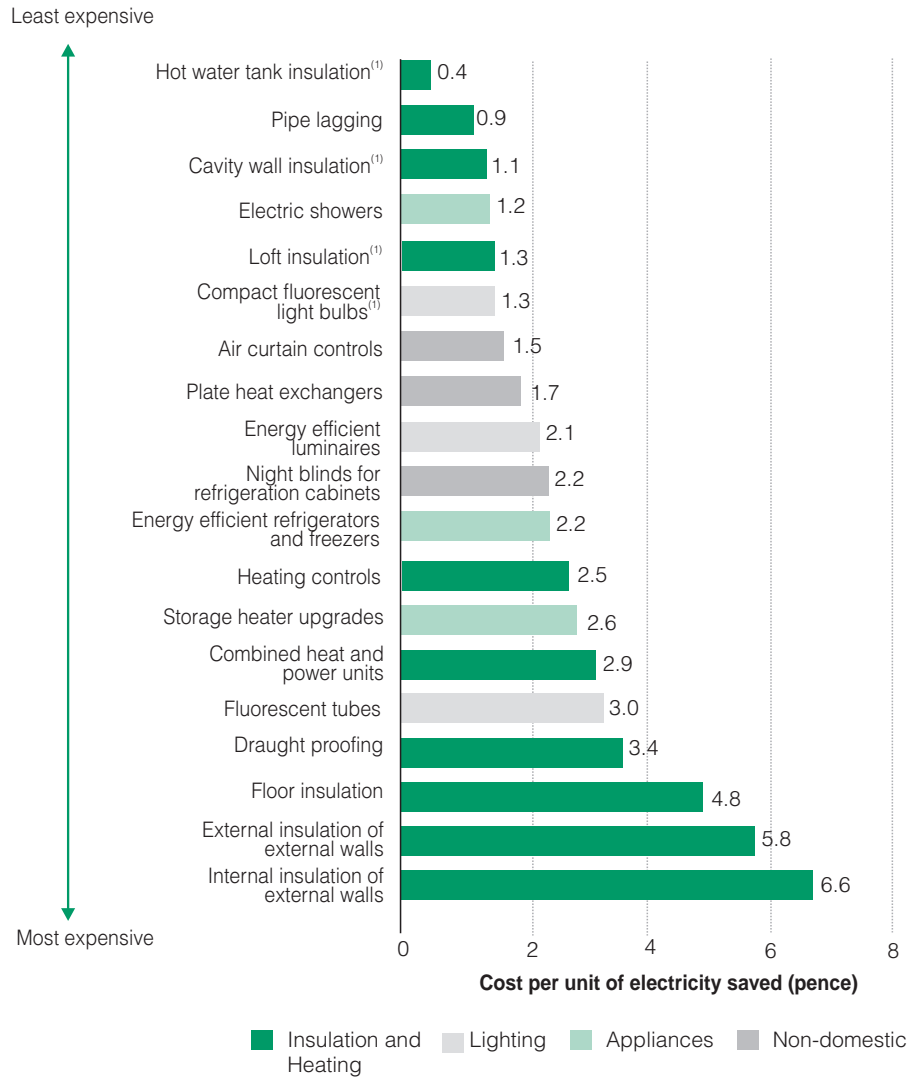
i) The scope to increase the scheme's benefits

3.2 OFFER have regarded it as important that companies carry out a variety of different types of project, for the reasons set out in paragraph 1.9. There are substantial variations in the cost of saving energy in different projects, however, and in their effect on customers' bills. The variations occur between different types of energy efficiency measures (Figure 13), between projects of the same type (Figure 14), and between companies (Figure 15), even for apparently similar projects. Some variations can be accounted for by differences in, for example, the size of houses insulated, the size of contributions from local authorities to the cost of joint projects, and local variations in the prices tendered by contractors. They also reflect a wide range in the type and scope of projects implemented by companies. But they might also indicate that there is scope to reduce the cost of projects.

3.3 The cost effectiveness of projects also varies according to whether they are assessed in terms of their effectiveness in saving energy or in reducing customers' bills. This is because the financial value of savings varies according to whether the electricity saved by projects is predominantly electricity that would have been paid for at cheap off-peak rates or electricity that would have been paid for at the more expensive standard rates. During the period 1994-98, the average price of electricity supplied during the cheapest period of off-peak tariffs was 2.7 pence per unit, little more than a third of the average price of electricity on standard tariffs (7.1 pence per unit).

The cost of saving energy using different efficiency measures

Figure 13

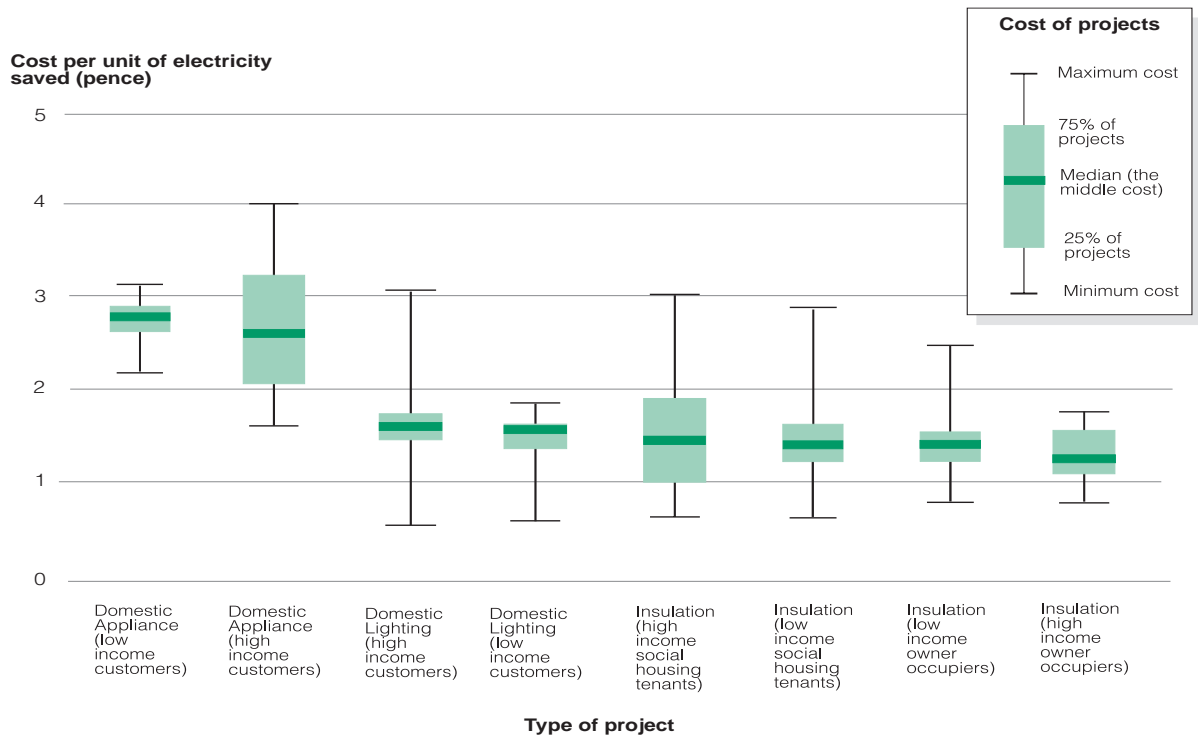


Note: 1. These four measures have provided 85 per cent of the energy savings made by the scheme to date.

Source: National Audit Office

There are wide variations in the cost-effectiveness of individual energy efficiency measures.

Figure 14 Variations in cost-effectiveness by type of project



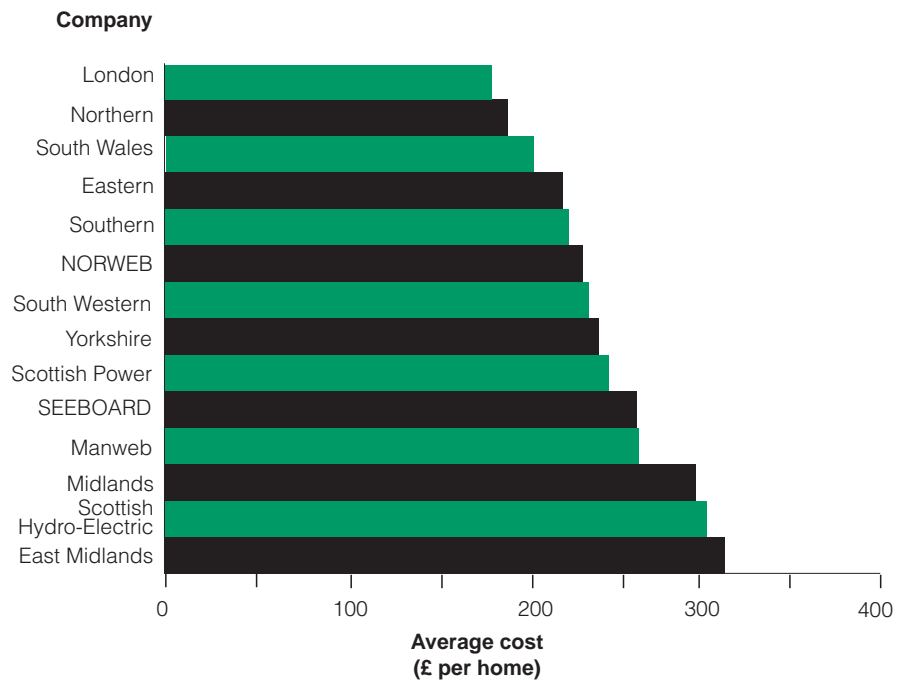
This figure shows that not only are there differences in the cost-effectiveness of projects of different types but also variations within the same project type.

Source: National Audit Office

3.4 Against this background, we examined the scope for the scheme to achieve more for customers by changing the type of energy efficiency goods and services supplied by projects and by reducing their cost. To illustrate the scale of any additional benefits, we estimated the additional savings that might have been achieved for customers if all the money raised by the charge on customers were to be spent in the ways suggested from April 1994 to the end of March 1998. Appendix 6 describes how we made these estimates. Specifically, we looked at:

Variations in companies' costs in installing cavity wall insulation for owner-occupiers

Figure 15



Note: The costs shown are those incurred or planned in projects completed or approved up to the end of March 1998.

Source: National Audit Office

Companies' average costs in implementing measures have varied even for identical measures.

- a) **Changing the type of energy efficiency goods and services supplied by projects**, either to maximise the energy savings achieved by customers by concentrating resources entirely on domestic insulation projects, which save energy more cheaply than any other type of project, or to maximise financial savings for customers by concentrating resources entirely on domestic lighting projects, which are the most effective in reducing bills.
- b) **Reducing the cost of projects.** We estimated what additional energy savings the companies might achieve if the cost per unit of saving energy in all projects was as low as that actually achieved in the 50 per cent most cost-effective projects of each project's type. For this option we assumed no change in the mix of measures implemented by the companies.

3.5 We found (Figure 16):

- a)** If the companies concentrated entirely on insulation projects, energy savings could be increased by around nine per cent. This is equivalent to an extra 0.25 billion units of electricity over the life of the goods and services supplied by projects between 1998 and 2000, and to the energy saved by insulating the homes of an additional 8,000 customers a year.
- b)** If the companies concentrated entirely on lighting projects, the net financial benefit for customers could be increased by about 57 per cent (equivalent to an extra £80 million in the period between 1998 and 2000 - ie. £40 million a year - and to an average of £3 per customer in this period). In addition, the number of customers benefiting from the scheme would increase by some two million a year.
- c)** If an across the board reduction in the cost of projects could be achieved, then over the period 1998 to 2000 it could increase the energy savings achieved by the scheme by about 15 per cent, equivalent to some 0.4 billion units of electricity, and financial benefits for customers by some £25 million. These increases would be additional to any increase made from changing the type of energy efficiency goods and services supplied by projects. The increase in energy savings is equivalent to the energy saved by insulating the homes of a further 14,000 customers a year.

3.6 Reducing the cost of projects (option (c)) would unambiguously improve the scheme's achievements because all the benefits achieved by the scheme would increase in proportion to the increase in energy savings. With options (a) and (b), seeking to maximise the scheme's benefits in terms of either saving energy or reducing customers' bills would involve some trade-off between these benefits.

3.7 For example, changing the mix of measures would have the following consequences (Figure 17):

- Concentrating more on the types of project that save energy cheaply would increase energy savings by nine per cent, but would reduce financial benefits to customers by 33 per cent because the extra energy saved would be mainly cheaper off-peak electricity used for heating. The number of customers benefiting from the scheme would be reduced, although those who did benefit would, on average, benefit by more.

Different ways in which the scheme might be changed to increase energy savings and the financial benefits which customers receive

Figure 16

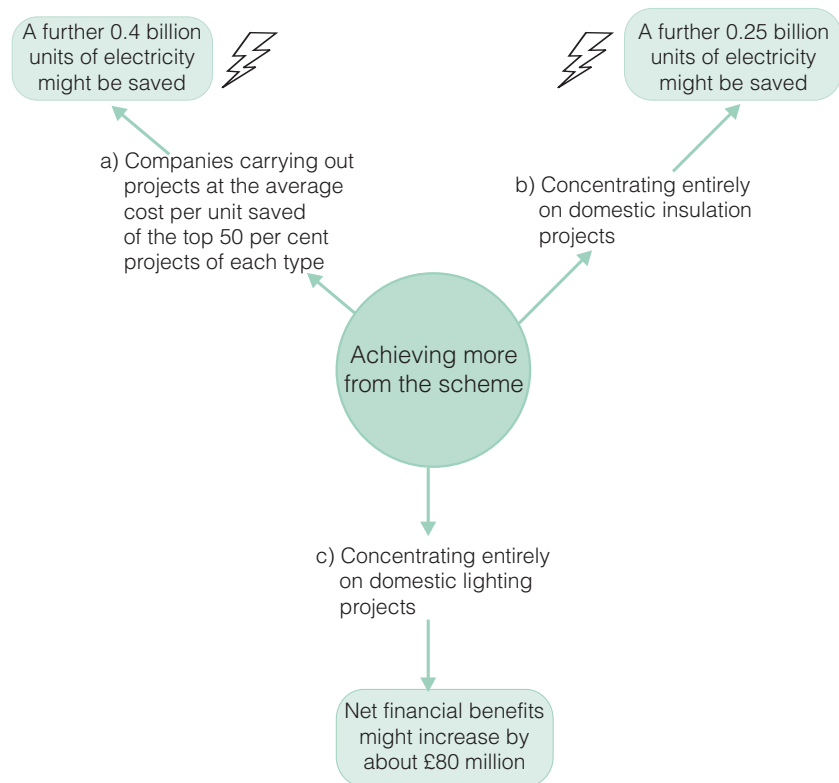


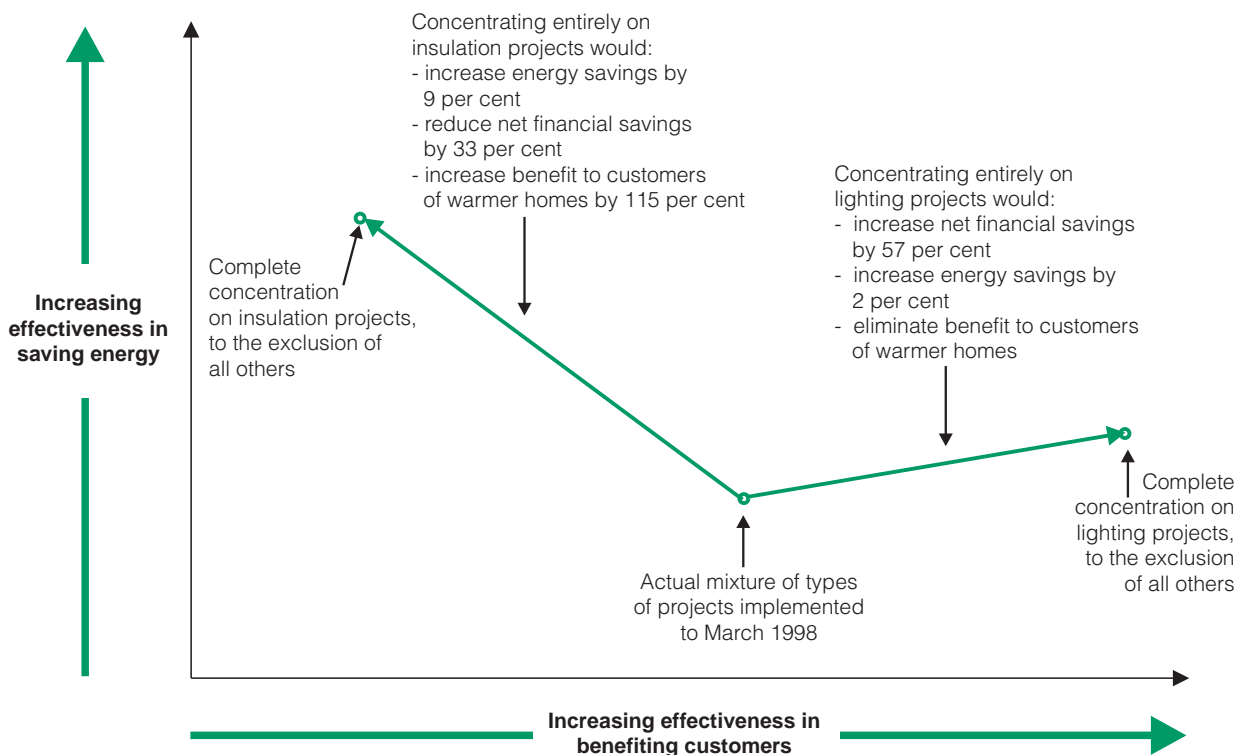
Figure 16 shows the potential impact of changes in the cost of projects and the mix of energy efficiency measures on energy savings and on financial benefits for customers.

Source: National Audit Office

- Concentrating more on lighting projects, which are most cost-effective at reducing bills, would also increase the amount of energy saved, but by less than concentrating entirely on insulation projects. The environmental benefits of concentrating on lighting projects would not greatly differ from those of concentrating on insulation, however, because the production of electricity used for lighting results in greater emissions of carbon dioxide than does that of electricity used for off-peak heating. The extent to which the scheme helped some customers, who have been predominantly on low incomes, to have warmer homes would, however, be reduced. But conversely, many more customers would benefit from the scheme.

Figure 17

Trading off energy savings and benefits for customers



Changing the balance between lighting and insulation projects would change the balance between energy savings and benefits for customers achieved by the scheme.

Source: National Audit Office analysis

The effect on carbon dioxide emissions of different types of electricity consumption

Three main fuels are used to generate electricity in Great Britain: coal, natural gas and nuclear energy. The balance between these fuels varies during the day and during the year. Nuclear and gas-fired power stations generally seek to run as far as possible all day, every day. And an increasingly large proportion of the electricity generated by coal-fired power stations is concentrated at times of high demand, such as during working hours and in the winter.

These three fuels differ in the amount of carbon dioxide they produce per unit of electricity generated, coal producing most and nuclear energy least. As a result, the amount of carbon dioxide produced in generating a unit of electricity used at off-peak times is less than that produced by a unit used at other times.

Modelling for the Environmental Change Unit at the University of Oxford indicates that in 1995 the average amount of carbon dioxide produced in generating electricity for heating paid for on an off-peak tariff was some 18 per cent less than that produced in generating electricity for domestic lighting. Due to changes in the balance of fuels used in generation, the modelling projected that this difference will rise to some 30 per cent in 2010.

3.8 Several of the company managers commented in our focus group that they were having difficulty in finding electrically heated properties suitable for the installation of insulation measures, which might prevent them from focusing entirely on such projects. However, our survey of customers (Appendix 2) indicated that there were several million electrically heated homes with scope for installing further cost-effective insulation measures - many more than can be insulated using the funds currently available in the scheme. It also found that nearly 60 per cent of households have no energy efficient light bulbs, showing ample scope for increased use of lighting measures in the event that reducing customers' bills became the priority.

3.9 The scope for companies to concentrate resources on the most cost-effective projects is also affected by OFFER's requirement that they demonstrate a variety of methods of saving electricity. This requirement is not explicitly required by OFFER's statutory duties. But OFFER require companies to do it to help explore as thoroughly as they can the potential for cost-effective projects; to inform the development of future projects, for example by the use of new methods for improving the efficiency with which electricity is used, and the use of new ways of organising, managing and marketing projects; and to spread the benefits of the scheme across a range of customer groups. However, while the electricity companies had developed a number of innovative ways of marketing existing energy efficiency methods, the difficulty of demonstrating the savings available from unproven technology to the satisfaction of OFFER and the Trust has discouraged them from using it in their projects.

ii) The scope to improve the scheme s operation

3.10 We examined the procedures established by OFFER and the Trust for monitoring projects and for validating the savings achieved. We found that for the most part they were satisfactory, but there appeared to be scope for some improvement.

3.11 Each company is required to monitor all of their projects to verify the accuracy of the assumptions and techniques used to appraise them, in line with best practice in the United States (Appendix 4). Because of the widespread use of proven technologies, monitoring focuses mainly on how much of the benefit of energy efficiency improvements, especially insulation, is taken by customers in the form of improved comfort (for example, warmer homes) and how much in reduced energy consumption.

3.12 The Energy Saving Trust have taken the lead in developing post-implementation monitoring, for both individual projects and the scheme as a whole. For individual projects, monitoring has been based on a combination of statistical techniques and analysis of bills. For insulation and other heating measures, companies have also had to report actual changes in electricity consumption from the electricity bills of a representative sample of at least five per cent of the customers affected.

3.13 The requirement to monitor electricity consumption creates some problems. Our focus group of company managers told us that most companies aim to read meters four times a year (Appendix 3). But a few companies read meters less frequently, and all must rely to a certain extent on estimated meter readings or on readings by customers, which makes monitoring based on bills less reliable. In addition, changes in consumption can occur for a number of reasons, such as the occupier of a property moving, which masks any effect of projects. In our survey of customers, for example, 16 per cent of customers living in electrically heated homes said that they had moved home in the previous six months.

3.14 The effect of these other factors on electricity consumption could be more accurately assessed if there was concurrent monitoring of the consumption of a group of customers who had not benefited from the projects but who were otherwise identical to those being monitored. Our consultants AEA Technology confirmed that this is considered best practice in the United States (Appendix 4). The use of such a group increases the cost of monitoring, however. In addition, extensive research by the Building Research Establishment on the thermal performance of buildings allows more reliable estimates to be made of the benefits of insulation improvements than are normally available in the United States. OFFER and the Trust therefore do not insist on the use of such groups when proven technologies are used, and we found that such groups were rarely used.

3.15 The research of the Building Research Establishment does not, however, show how much of the benefit of improvements to insulation customers have taken in the form of warmer houses, and how much in reduced energy consumption. But at the time of our examination the Trust accepted that, for insulation measures, monitoring of individual projects was not normally sufficient to give reliable information on this issue, and, therefore, on actual energy savings. And they were developing plans to:

- aggregate the electricity consumption data collected in all insulation and heating projects, so as to provide data from approximately 6,000 households; they expected this sample to be large enough to eliminate any significant random variations; and,

- compare changes in the consumption of this group with those estimated in project appraisals, using published national statistics on domestic electricity consumption to correct for other factors, such as trends in the ownership of electrical appliances.

3.16 We noted, however, that the customers monitored by companies were not representative of all domestic customers and that there was therefore a risk that the Trust's approach would not provide reliable information on the effect of the scheme. The customers benefiting from projects include a larger number of low income households, for example, for whom trends in appliance ownership are likely to differ from higher income households. Further refinement of the Trust's monitoring proposals is needed, therefore, before they can be considered to be wholly reliable.