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Energy Efficiency Commitment

2002 – 2005

Technical guidance manual Issue 1

Table of contents

Table of contents	2
1. Introduction.....	1
2. Scheme codes	2
3. Energy efficiency measures	4
4. Energy service schemes.....	28
5. Other relevant legislation	30
Appendix 1 BRE Report - 'Energy Efficiency Commitment: BREDEM calculation of energy saving matrix' (October 2001).....	33
Appendix 2 HSE advice on potential risks to safety of combustion appliances from the installation of cavity wall insulation (May 2000).....	56
Appendix 3 Guidance on VAT efficiency	62
Appendix 4 Energy Efficiency Assessment Questionnaire.....	65

1. Introduction

This manual provides technical guidance to obligated suppliers for the installation of energy efficiency measures under the Energy Efficiency Commitment (EEC). Where relevant, specific criteria that must be adhered to when installing measures is noted. These details are provided as guidance only and are not intended to be comprehensive as all schemes can vary in their design. **It is the responsibility of each energy supplier to ensure that they have carried out their projects in accordance with appropriate EEC legislation and general legislation.**

Energy savings values for insulation and heating measures have been derived from the BREDEM model. These savings are displayed in an Excel spreadsheet entitled 'EEC Energy Savings Data' which will be provided to energy suppliers separately to this document. BRE's assumptions for these energy savings values are summarised in the report contained in Appendix 1 of this document.

The administration procedures for EEC are set out in Ofgem's document entitled 'Energy Efficiency Commitment Administration Procedures', dated December 2001. The document can be viewed at the following website address http://www.ofgem.gov.uk/docs2001/82_ee_commitment.pdf.

This Technical Manual will be used as a working document throughout the course of EEC, and will be subject to ongoing review and updates.

2. Scheme codes

When submitting schemes to Ofgem for approval, a code must be displayed to identify the supplier involved, the year and the measures employed. Each scheme will then be numbered consecutively. Scheme codes should be entered on the top of the scheme submission spreadsheet and written pro forma. The format of the code shall be as follows:

Company ID / year / measure / number

For example AMER/02/A/01

The project measure types are as follows.

A Appliances	L Lighting
H Heating (inc. boilers and controls)	M Mix of measure types
I Insulation	O Other

The supplier group codes are as follows.

Supplier group	Scheme ID
Amerada	AMER
British Gas Trading	CENT
Cambridge Gas	CAMB
Dee Valley Group	ESUK
LE Group	LOND
npower	NPOW

Powergen	PGEN
Seeboard	SEEB
Scottish and Southern Energy	SSEN
ScottishPower	SCOT
TXU Energi	TXUE

3. Energy efficiency measures

The following text provides guidance on the installation of energy efficiency measures by EEC schemes. Where appropriate, reference is made to relevant British Standards or guidance notes. An overview of British Standards is available at the BSI website at the following address. Copies of the Standards can also be ordered through this site <http://bsonline.techindex.co.uk/>.

The accredited energy savings associated with insulation, lighting and heating measures are displayed in the 'EEC Scheme Submission Spreadsheet' provided by Ofgem. Energy savings data for insulation measures are also displayed in the Excel spreadsheet entitled 'EEC Energy Savings Data', also provided by Ofgem.

Quality of installation monitoring for both insulation and heating measures must be undertaken on a sample size as specified by Ofgem. The monitoring must be undertaken by a suitably qualified person, and must check that the insulation or heating measure has been installed in line with the relevant standards. Any deficiencies in quality of installation identified must be rectified. Suppliers undertaking DIY schemes should consult the Administration Procedures document or contact Ofgem, as different monitoring requirements may apply. Quality of installation monitoring is not required for lighting or appliances.

3.1 *Insulation measures*

3.1.1 Loft insulation

Loft insulation provided under EEC schemes should ideally be installed to a depth of 250mm. Depths of less than 250mm will only be considered for the

accreditation of energy savings where it is physically impossible or unsafe to install 250mm.

The lifetime of loft insulation is assumed to be 30 years.

There are two British Standards relevant to the installation of loft insulation. These are:

BS 5803 Part 1: 1985 "Thermal insulation for use in pitched roof spaces in dwellings. Specification for man made mineral fibre thermal insulation mats." This specifies the standard loft insulation materials must meet to be eligible for installation under EEC.

BS 5803 Part 5: 1985 "Thermal insulation for use in pitched roof dwellings." Specification for installation of man-made mineral fibre and cellulose fibre insulation. This standard specifies the requirements when installing loft insulation in pitched roof dwellings.

All lofts insulated by an EEC scheme must include, where appropriate, loft boarding in order to provide safe access to the cold water tank. When insulating lofts, the loft hatches must be insulated and draught sealed.

In addition to these requirements, good practice when insulating roof spaces requires the insulation of the cold water tank and associated pipe work. The relevant British Standard is:

BS 5422: 2001 "Method for specifying thermal insulation materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C".

Cases of condensation in newly insulated lofts have been identified in previous EESoP programmes. There are several factors that can lead to condensation in lofts, such as failing to draught seal the loft hatch or the blocking of loft vents with insulation. Energy suppliers must ensure that their installers take care to minimise the risk of condensation when installing loft insulation.

3.1.2 DIY loft insulation

DIY insulation schemes will be eligible under EEC. The most appropriate way of calculating the energy savings arising from such schemes is to base them on a 'per square metre' installed basis. Appropriate energy savings values, on a per square metre basis are provided in the EEC Scheme Submission Spreadsheet. There are two different values given, one for 150mm insulation and one for 100mm insulation.

Suppliers should provide appropriate installation guidelines, appropriate safety guidance and personal protective equipment (such as gloves, face mask and goggles) to customers participating in a DIY scheme.

3.1.3 Cavity wall insulation

The energy savings associated with cavity wall insulation are displayed in the EEC Scheme Submission Spreadsheet, and also in the Excel spreadsheet entitled 'EEC Energy Savings Data'. Note that the energy savings differ considerably between homes constructed pre 1976 and those constructed post 1976. Installers must therefore provide the age of the property insulated when reporting to energy suppliers, to enable suppliers to accurately report on their completed schemes.

The lifetime of cavity wall insulation is assumed to be 40 years.

Insulation materials used must be certified by the British Board of Agreement (BBA) and must conform the following British Standards:

BS 6232 Part 1: 1982 "Thermal insulation of cavity walls by filling with blown man-made mineral fibre. Specification for the performance of installation systems".

BS6232 Part: 2 1982 "Thermal insulation of cavity walls by filling with blown man-made mineral fibre. Code of practice for installation of blown man-made mineral fibre in cavity walls with masonry and/or concrete leaves"

The two Standards above have actually been withdrawn, but work carried out to its specification will still be valid. It is being replaced by the following standard, due to be phased in during 2002:

BS EN 13162: 2001 "Thermal insulation products for buildings. Factory made mineral wool (MW) products. Specification". This standard replaces the current BS6232.

BS 6676 Part 1: 1986 "Thermal insulation of cavity walls using man made mineral fibre batts (slabs). Specification for man made mineral fibre batts". This is the relevant standard for materials if man-made mineral fibre batts are used as the insulating material when insulating a cavity wall.

BS 6676 Part 2: 1986 "Thermal insulation of cavity walls using man-made mineral fibre batts (slabs). Code of practice for installation of batts (slabs) filling the cavity".

BS 8208: 1985 "Guide to the assessment of suitability of external walls for filling with thermal insulants. Existing cavity construction".

A Cavity Insulation Guarantee Agency (CIGA) guarantee must be provided to the customer when the insulation work has been completed.

HSE has prepared a briefing note for installers to follow to ensure adequate precautions are taken for the safe installation of cavity wall insulation in gas-heated properties. This is included as Appendix 2 to this document.

3.1.4 Draught-proofing

When calculating the draught-proofing energy savings, BRE have assumed that only buildings with 'high ventilation rates' should be insulated to merit the accreditation of the energy savings listed in the EEC Submission Spreadsheet. Energy suppliers should therefore only target homes with 'high ventilation rates' when undertaking draught proofing schemes. Typically, this type of home will be in an exposed position, or have ill fitting or sash style windows.

The lifetime for draught proofing measures is assumed to be 10 years.

The British Standard relevant to the materials used for draught proofing is:

BS 7386: 1997 "Specification for draught strips for the draught control of existing doors and windows in housing". This Standard specifies the requirements for products to fit the common types of installed doors and windows in housing not originally designed to incorporate draught stripping.

3.1.5 External and internal solid wall insulation

The Excel spreadsheet entitled 'EEC Energy Savings Data' contains energy savings values for internal and external wall insulation, for installation on solid walled properties. The relevant values should be entered into the 'Other Insulation'

section of the EEC Scheme Submission Spreadsheet. The guidance given in the notes attached to the 'EEC Energy Savings Data' spreadsheet should be followed, to ensure that the appropriate energy savings are claimed. As explained in these notes, external and internal wall insulation, there are two different sets of savings applicable, one set when the U-value of both internal and external walls is improved to $0.45\text{W/m}^2\text{°C}$ and another when improving the U-value of an internal wall to $0.37\text{W/m}^2\text{°C}$.

When improving the U-value to $0.45\text{W/m}^2\text{°C}$, the following insulation systems are suitable:

- External walls:
- 35mm urethane foam and render
 - 45mm extruded polystyrene and render
 - 60mm expanded polystyrene and render
 - 60mm mineral wool slab and render

- Internal walls:
- 30mm phenolic foam and plasterboard
 - 35mm urethane foam and plasterboard
 - 47.5mm extruded polystyrene and plasterboard
 - 80mm mineral wool quilt, timber battens and plasterboard

When improving the U-value of an internal solid wall to $0.37\text{W/m}^2\text{°C}$, the following insulation system is suitable:

- 100mm mineral wool quilt, timber battens

In addition to these systems, some other solid wall insulation products have had their energy saving capacity independently verified. Please contact Ofgem for details of these products.

The lifetime of internal and external wall insulation is assumed to be 30 years.

The following British Standards apply:

BS 5262: 1991 "Code of Practice for External Renderings". This Standard specifies the materials, aspects of design, mixes and methods of application of cement-based renderings to all common types of new and old backgrounds. It also includes advice on the inspection and repair of defective renderings.

BS 8212: 1995 "Code of practice for dry lining and partitioning using gypsum plasterboard". This Standard contains recommendations for materials, design backgrounds and insulation of dry lining to walls, ceilings and partitioning.

BS 5628 Part 3: 2001 "Code of practice for use of masonry. Materials and components, design and workmanship".

3.1.6 Hot water tank insulation

Details of the assumptions behind the energy savings for tank insulation is provided in the BRE report, contained in Appendix 1 of this document.

A lifetime for tank insulation is assumed to be 10 years. The relevant British Standard for tank insulation is:

BS 5615: 1985 "Specification for insulating jackets for domestic hot water storage cylinders". This Standard specifies the performance, in terms of the maximum

permitted heat loss, the materials, design and marking of jackets for cylinders to BS699 and BS1566.

3.1.7 High efficiency hot water cylinders

Using SoP 3 R&D funds, a comparison was made between the energy required to heat 3 different types of hot water cylinders, namely the 'stock average' cylinder, the British Standard cylinder and the 'high performance' cylinder.

The stock average cylinder was defined by a combination of survey data on insulation and expert opinion on the mixture of tank (i.e. heat exchanger) types in the stock. The British Standard and high performance types are described in 'Central Heating System Specifications', CHeSS (Energy Efficiency Best Practice programme General Information Leaflet 59).

For dwellings where the water is heated from a gas fired boiler the findings were:

- In a property with no primary pipework insulation, the energy saved by replacing a stock average cylinder with a high performance cylinder is **994 kWh/annum**
- In a property with insulated primary pipework, the saving from replacing a stock average cylinder with a high performance cylinder is **533 kWh/annum**
- In a new house, the energy saved by installing a high performance cylinder rather than a British Standard cylinder is **153 kWh/annum**

For dwellings with water heated by electric immersion heater the savings are:

- **181 kWh/annum** for replacing a stock average with a high performance cylinder
- **39 kWh/annum** for installing a high performance rather than a British Standard cylinder

These energy savings values should be entered into the 'other insulation' section of the EEC Scheme Submission Spreadsheet. The cylinders are classed as insulation measures, because the vast majority of the energy savings result from the high levels of insulation in their design.

A lifetime of 20 years should be assumed for this measure.

Installations of hot water cylinders should meet the best practice guidance set out in 'Central Heating System Specifications, CHeSS (Energy Efficiency Best Practice programme General Information Leaflet 59). This document has been distributed by the Energy Saving Trust to energy suppliers previously. Further copies are available from BRECSU, on 01923 664258.

3.1.8 Radiator panels

The energy savings shown below are attributable to radiator panels constructed in a 'louvered' or 'saw toothed' fashion (with raised ridges), which is by far the most common method of design.

The energy savings on a 'per square metre installed basis' are 134kWh/a for both gas and oil heated homes. These savings are attributable to panels installed behind radiators on both external and internal walls.

The above data is based on measurements on a panel with a reflective surface. Panels are available which do not have a reflective surface, in which case its effect on energy saving should be taken as **one half** of the above value.

Radiator panel energy savings should be calculated on a 'per panel' basis. This calculation requires the assessment of the area of the radiator panel, which should

then be applied to the data shown above. For example, a panel with a surface area of 0.3 square metres would achieve energy savings of 40.2 kWh when installed. In submitting such schemes, suppliers should indicate the numbers of panels forecast to be installed, therefore allowing the overall scheme savings to be calculated. Suppliers should include a breakdown of their calculations in their Statement of Method for the scheme. The energy savings values and total area of panel installed should be entered into the 'other insulation' section of the EEC Scheme Submission Spreadsheet.

A measure lifetime of 10 years should be assumed for radiator panels

The energy savings attributable to radiator panels will be revised in the near future, when the results of an energy monitoring exercise currently being undertaken are finalised.

3.1.9 Window glazing

As of April 2002, the Building Regulations will require all new glazing installations to have a minimum specification of double glazed low-emissivity glass. If an energy supplier wishes to undertake a glazing scheme, they should therefore ensure that the glazing installed possesses additional energy savings benefits to that required by the Building Regulations.

Suppliers should discuss with Ofgem any proposed measures and energy savings values prior to submitting a scheme.

3.2 *Lighting measures*

3.2.1 Compact fluorescent lamps (CFLs)

For the purposes of accrediting ex-ante energy savings, all lamps used in EEC schemes must be included on the Energy Saving Trust's list of approved CFLs, and have achieved Energy Efficiency Recommended status, awarded by the Energy Saving Trust's Endorsement Programme. These lamps have been tested in accordance with the requirements of the Trust's lamp specification. The approved CFL list is circulated on an ongoing basis, as and when revisions are necessary. For confirmation of the current version, contact James Russill at the EST on 020 7654 2475. All the lamps currently listed on the EST's approved list have also successfully achieved Energy Efficiency Recommended status.

Energy suppliers are required to enter the numbers and types of lamps installed by their lighting schemes into the relevant place in the EEC Scheme Submission Spreadsheet. The lifetimes of the lamps (in hours) is also required to be entered into the spreadsheet. The lifetime entered should be as displayed on the approved list. Where the life status is shown as 'ongoing' the manufacturer's claimed lifetime (i.e. as shown on the packaging) should be entered into the spreadsheet.

If CFLs not approved by the Trust are used in lighting schemes, additional quality monitoring will be required.

3.2.2 Luminaires

Schemes involving the installation of luminaires must only use lamps that are displayed on the Energy Saving Trust's approved CFL list. These lamps have been tested in accordance with the requirements of the Trust's lamp specification.

The ballast used in conjunction with the approved lamp must meet the requirements of the Energy Saving Trust's Luminaire Specification. Energy efficient luminaires meeting the requirements of this specification are eligible for use of the

'Energy Efficiency Recommended' logo, under the Trust's Endorsement Programme. For details of endorsed luminaires please contact the Trust.

The EEC Scheme Submission Spreadsheet enables the calculation of energy savings arising from the installation of luminaires. The relevant part of the 'CFL' worksheet should be used to input the number and type of luminaires delivered by the scheme.

The lifetime assumed for a luminaire installation is 25 years.

3.3 *Heating measures*

3.3.1 Boilers

Boilers installed by EEC schemes must be a SEDBUK rated 'A' or 'B' model. The SEDBUK database has been set up as part of the Government's Energy Efficiency Best Practice Programme and can be viewed at <http://www.sedbuk.com/>. It indicates the combustion efficiency of all currently available boilers.

When evaluating condensing boiler schemes, the energy savings will be based on the combustion efficiency of the new condensing boiler (as provided by SEDBUK) against the average combustion efficiency of new non-condensing boilers, which is assumed to be 78%. The numbers of boilers installed by a scheme should be entered into the relevant part of the EEC Scheme Submission Spreadsheet (there is a different heating worksheet for each fuel). The worksheets are set to a default combustion efficiency of 88% for condensing boilers. If the energy supplier does not provide the actual combustion efficiency of the boilers provided by a scheme, this is the efficiency that will be used.

The lifetime assumed for boilers is 15 years.

Installations of boilers must meet the best practice guidance set out in 'Central Heating System Specifications, CHeSS (Energy Efficiency Best Practice programme General Information Leaflet 59).

Several British Standards also apply:

BS 5440 Part 1: 2000 "Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd family gases). Specification for installation and maintenance of flues".

BS 5440 Part 2: 2000 "Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd family gases). Specification for installation and maintenance of ventilation for gas appliances".

BS 6798: 2000 "Specification for installation of gas-fired boilers of rated input not exceeding 70kW net".

BS 5449: 1990 "Specification for forced circulation hot water central heating systems for domestic premises".

BS 7671: 2001 "Requirements for electrical installations, IEE wiring regulations, 16th Edition".

Good Practice Guide 284 "Domestic central heating and hot water: systems with gas and oil-fired boilers"; DEFRA, 2000

3.3.2 Heating controls

In general, heating controls must be installed in line with the best practice guidance provided in 'Central Heating System Specifications, CHeSS (Energy Efficiency Best Practice programme General Information Leaflet 59).

The EEC Scheme Submission Spreadsheet enables the calculation of energy savings from heating controls. The savings are calculated by entering the existing controls scenario before installation, and then entering the type of heating controls installed by the EEC scheme. The spreadsheet assumes different 'packages' of controls, as follows:

Package A: No controls, and hot water tank thermostat

Package B: Room thermostat*

Package C: Roomstat & TRV's (thermostatic radiator valves)*

Package D: TRV's without a roomstat*

Package E: Delayed start roomstat and TRV's*

Package F: Intelligent heating controls and TRV's*

* These control options include a hot water tank thermostat. For packages C – F, TRV's are assumed to be fitted on each radiator in the property.

Relevant Standards and guidance documents for heating controls are:

BS 5499: 1990 "Specification for forced circulation hot water central heating systems for domestic purposes".

BS 7671: 1992 "Requirements for electrical installations, IEE wiring regulations, 16th Edition".

Good Practice Guide 302 "Domestic heating Controls"; DEFRA 2001

A lifetime of 15 years is assumed for heating controls.

The EEC Scheme Submission Spreadsheet should be used to calculate the energy savings from heating controls. The spreadsheet contains savings options for either

installing heating controls in tandem with a new boiler or installing controls only. The numbers of each type of control package to be installed should be entered into the spreadsheet. The results are linked automatically to the main worksheets.

3.3.3 Electric heating controls

The energy savings from 6 types of electric storage heater controls have been investigated, and the results expressed as a percentage of the space heating energy for a dwelling. The values are displayed in the 'EEC Energy Savings Data' spreadsheet, on the 'Electric Controls' worksheet. The relevant values should be inserted into the 'Heating Controls' section of the 'Electricity' worksheet.

A lifetime of 15 years is assumed for electric heating controls.

The following British Standard applies to installations of electric heating controls.

BS 7671: 1992 "Requirements for electrical installations, IEE wiring regulations, 16th Edition".

3.3.4 Solar Panels

Solar panels, used for the purposes of domestic hot water heating are an eligible measure for use in EEC schemes. The lifetime is assumed to be 20 years.

The Energy Saving Trust is currently working on evaluation of energy savings from solar panels, both for the 'flat plate collector' and 'evacuated tube' variety. This data should be available shortly.

For easy application to EEC schemes, the savings will be presented as with insulation measures, i.e. an energy saving for each different property type. If required, energy savings data on a per square metre installed will also be available.

3.3.5 Combined heat and power (CHP)

A separate spreadsheet will be provided by Ofgem that allows the calculation of the energy savings arising from the installation of CHP systems. This spreadsheet will be accompanied by instructions that explain the methodology.

Opportunities for EEC CHP schemes are likely to arise as a result of the DEFRA / Scottish Executive funded Community Energy Programme. It is possible that a different methodology for calculating and apportioning energy savings will be required when Community Energy projects link up with EEC schemes. Further guidance on the interaction between EEC and the Community Energy Programme will be provided when the details of the Community Energy Programme have been finalised.

3.4 *Energy efficient appliances*

As a general rule, efficient cold and wet appliances provided by EEC schemes must be 'A' rated, and must also have achieved 'Energy Efficiency Recommended' status, awarded by the Energy Saving Trust's Endorsement Programme. A list of Energy Efficiency Recommended products can be viewed on the Trust's website, at the following link: <http://www.saveenergy.co.uk/index.cfm?page=02091900>. Energy Suppliers should contact the Trust if further details of the Endorsement Programme are required or if an appliance they wish to use in a scheme does not appear on the Trust's website. The Energy Efficiency Recommended application process for new appliances is straightforward, and qualifying products that have not yet applied can quickly and easily do so.

3.4.1 Energy saving data used for cold appliance projects

This section explains the methodology for calculating savings for appliance schemes. The two most common scenarios for delivering appliance schemes in SoP3 were:

- an incentive to purchase a more efficient appliance; and
- a trade-in of a working appliance.

The lifetime for freezers or fridge-freezers is **15 years**. For refrigerators/larders it is **12 years**, however, when refrigerators/larders are provided to customers classed as falling within the priority group, a lifetime of **15 years** (rather than 12) should be assumed. This is based on the assumption that these customer groups will retain the appliance for a longer time period prior to replacement.

For 'trade in' schemes, the lifetime of the appliance must be reduced by 1/3.

The matrix below lists the average annual consumption of different refrigeration appliances by label for products currently on sale in the UK, the sales weighted average and the consumption of existing appliances.

Energy consumption data for cold appliances

Average energy consumption (kWh/a) by appliance and energy label	'A' rated	Sales weighted average	Existing appliances
Fridge Freezer (Standard)	259	438	785
Fridge Freezer (Frost Free)	295	516	
Chest Freezer	150	306	559
Upright Freezer	193	353	594
Refrigerator (Icebox)	138	214	390
Refrigerator (Larder)	127	227	

Source: GfK Q4 2001 sales data for the average 'A' rating and sales weighted average; DEFRA Market Transformation Programme website 2002.

Please note that revised energy consumption figures may apply to fridgesavers / priority group appliance schemes, as detailed in section 3.4.2.

DEFRA have stipulated that a multiplying factor of 1.6 is applied to the energy savings arising from appliance schemes. This factor is applied to the savings to account for the market transformation effects of energy efficient appliance schemes, and is automatically incorporated into the EEC Scheme Submission Spreadsheet.

When calculating energy savings for cold appliance schemes, suppliers should follow the following guidelines.

3.4.1.1 Incentive schemes

Customers in the market for a new appliance, normally buy the average product currently sold within the range of energy labels. In this scenario they are incentivised to purchase a more efficient appliance. The savings will be the difference between the sales weighted average consumption and the consumption of the promoted product.

For example:

'A' Rated frost free fridge freezer = 295 kWh/a consumption

Sales weighted average for frost free fridge freezer = 516 kWh/a

Energy Saving = $516 - 295 = 221$ kWh/a over a 15 year lifetime

The savings figure to be entered into the EEC Scheme Submission Spreadsheet will therefore be 221kWh/a. DEFRA's 1.6 factor will automatically be applied to this figure.

3.4.1.2 Trade in schemes

Under trade-in schemes, customers are able to trade in a working appliance for a more efficient appliance. To qualify, the appliance is assumed to be working at the time of trade in and then be destroyed (in an environmentally acceptable manner) to avoid entry into the second hand market. The savings will be the difference between the average consumption of the existing population of that particular product and the more efficient product.

There is a two-fold saving - firstly, by removing the existing, inefficient appliance from the market, the consumption over the remainder of the product life is avoided; and secondly, a more efficient appliance is purchased than would normally be the case. Estimating the remaining lifetime of the existing appliance is subject to considerable uncertainty. On the one hand, it could be argued that only very old appliances will be traded in, so the lifetime will be relatively short. On the other hand, once an appliance enters the second hand market, its lifetime will tend to be longer than the normal average lifetime. This is borne out by data from Fridgesavers.

The Energy Saving Trust has analysed a number of scenarios taking account of the two elements of savings. Their conclusion is that a simple basis for estimating the total savings from trade in schemes is to apply the savings from 'existing appliance' to the promoted product for two thirds of the appliance life.

For example:

An 'A' rated frost free fridge freezer is provided by the scheme = 295 kWh/a consumption

Existing frost free fridge freezer = 785 kWh/a consumption

Energy saving = $785 - 295 = 490$ kWh/a over a 10 year (15 year lifetime for a fridge freezer discounted by 1/3) lifetime.

The savings figure to be entered into the EEC Scheme Submission Spreadsheet will therefore be 490kWh/a. DEFRA's 1.6 factor will automatically be applied to this figure.

3.4.2 Fridgesavers / priority group appliance schemes

Should Suppliers decide to implement a copy of the previously run national Fridgesavers scheme, or run an appliance scheme that targets Priority customer groups, there are some differences in energy savings to other appliance schemes as listed below.

The energy savings for a Fridgesavers / Priority Group customer initiative are slightly different to those for other cold appliance schemes based on detailed energy monitoring that has been carried out on the appropriate customer groups.

First, the appliance being traded in must meet the requirements of the scoring protocol system, as shown below. Secondly to qualify for the revised energy savings, the customers targeted must be in receipt of benefit, as set out in the Statutory Instrument for EEC (entitled 'The Electricity and Gas (Energy Efficiency Obligations) Order 2001).

When calculating the energy saving of the new appliance the scheme will provide, suppliers should first determine its energy consumption by referencing the appliance's energy label. EESoP 1 and 2 energy monitoring showed that this figure should then be multiplied by a factor of 0.71875 to give the revised energy

consumption figure. (The 0.71875 factor was derived from an energy monitoring exercise carried out during SoP1.)

For example: The supplier's scheme provides a fridge freezer with a manufacturers claimed energy consumption of 250 kWh/a. The figure to use when calculating the energy savings from the scheme would be:

$$250 \times 0.71875 = 179.68 \text{ kWh/a}$$

This figure should then be compared to the appliance being traded in. Energy monitoring has shown that the energy consumption for fridges / fridge freezers that meet the scoring protocol requirements below and are owned by a disadvantaged customer are as follows.

Energy consumption for standard fridge freezers = 983 kWh/a

Energy consumption for refrigerators = 603 kWh/a

To qualify, the appliance is assumed be working at the time of trade in and then be disabled to avoid entry into the second hand market.

Fridgesavers scoring protocol system

For appliances to be valid for the revised energy consumption figures detailed above, they must score 3 or more using the following scoring system.

Fridge Freezers	Score
Fridge compartment	
Door	
Minor damage to seal	1
Major damage to seal	2
Door not closing properly	2
Internal damage	1
External damage	1
Body (walls excluding door)	
External damage	1
Internal damage	1
Thermostat not working/missing/damaged	1
Fittings damaged/missing (e.g. shelves/vegetable box)	1
Icing up	1
Freezer compartment	
Door	
Minor damage to seal	1
Major damage to seal	2
Door not closing properly	2
Internal damager	1
External damager	1
Body	
External damage	1
Internal damage	1
Refridgerators	Score
Door	
Minor damage to seal	1
Major damage to seal	2
Door not closing properly	2
Internal damage	1
External damage	1
Body (walls excluding door)	
External damage	1
Internal damage	1
Thermostat not working/missing/damaged	1
Fittings damaged/missing (e.g. shelves / vegetable box)	1
Icing up	1
Icebox	
Icebox door missing	3
Icebox door does not close	2
Icebox door has crack / hole	2

3.4.3 Cold appliance disposal

Due to new European legislation concerning ozone depleting substances and their disposal, appliance retailers or delivery agents will no longer remove the old appliance when delivering the new one. Until such a time as this situation is resolved, the appliance will have to remain with the customer. There is considerable risk of these appliances entering the second hand market, even when collected by a Local Authority. To ensure that this does not happen the appliance must be disabled by the following method:

- the appliance's electricity supply cable must be cut, as close to the body of the appliance as possible, or alternatively pulled out of the appliance;
- the gasket (the seal running around the door) must be removed. As this may mean that the door cannot close, the door should be taped or tied shut.

Despite the new legislation, Local Authorities will still have a responsibility to remove domestic appliances from customer's homes. The energy supplier should provide the customer with the relevant contact details.

3.4.4 Wet appliances

The following energy consumption figures should be used when considering a scheme that will provide a washing machine or dishwasher. Data is provided that illustrates the average energy consumption of 'A' rated washing machines and dishwashers, and the typical energy consumption of the existing appliances that they will replace in a trade-in scenario. If the energy consumption of the appliance provided by the scheme is known, this figure can be used in place of the average 'A' rated consumption. The lifetime for these types of appliance is assumed to be 15 years. In a trade in scenario, as with cold appliances, this would be reduced by 1/3.

Washing Machines: Average 'A' rated energy consumption: 149 kWh/annum
Energy consumption of existing appliances: 237 kWh/annum

Dishwashers: Average 'A' rated energy consumption: 214 kWh/annum
Energy consumption of existing appliances: 415 kWh/annum

Source: Environmental Change Unit, April 2000

3.5 Jug kettles

The energy savings derived from the provision of a jug kettle have been calculated as the result of energy monitoring carried out under EESoP I. The result of this monitoring has shown the saving to be 71.9 kWh per annum, if the following criteria are followed:

- The customers targeted should fall within the Priority group.
- The jug kettle must replace a traditional electric kettle (i.e. a kettle that does not have a water meter on the side)
- Advice on the use of the new kettle should be provided (e.g. that the kettle can be used for boiling just one cup of water)

A lifetime of 8 years should be assumed for kettles.

The DEFRA factor of 1.6 as used for cold and wet appliances does not apply to jug kettles.

4. Energy service schemes

DEFRA's Statutory Instrument for EEC refers to 'energy services action' as one way of delivering energy efficiency measures to customers. Energy services action is defined as an action that:

- a) includes at least two activities that are qualifying action under EEC, of which one:
 - (i) may reasonably be expected to improve the insulation of the walls or loft of the domestic premises concerned; or
 - (ii) may reasonably be expected to improve the efficiency of the principal system for heating those premises; or
 - (iii) consists of the supply to those premises of electricity, heat, gas or liquid in circumstances such as from CHP; and

- b) is undertaken in pursuance of an agreement between the supplier or a person acting on its behalf, and a domestic consumer, the terms of which also require the supplier:
 - (i) to undertake an assessment of the energy efficiency of those premises;
 - (ii) to provide advice to the consumer as to the means by which the energy efficiency of those premises may be improved, taking into account his circumstances and any other occupant of the premises; and
 - (iii) to offer the consumer the option of making an arrangement with the supplier for deferring the whole or any part of the cost to the consumer of the activities for which the agreement provides.

Energy efficiency measures that are delivered under the terms laid out above are eligible for an uplift in energy savings amounting to an extra 50% of that normally

expected to be achieved. The uplift from qualifying energy service action will apply to no more than 10% of a supplier's target.

If a supplier wished to submit an energy services scheme to Ofgem, they must ensure that the 'switch' located in cell L5 of the electricity, gas, coal, oil and LPG worksheets contained within the EEC Scheme Submission Spreadsheet is set to display the letter 'e'.

Point b(i) above states that suppliers must undertake an assessment of the energy efficiency of the premises. An example of the kind of questionnaire that could be used is shown in Appendix 4 of this document.

5. Other relevant legislation

The following legislation may or may not apply to works carried out during an EEC scheme. The legislation can be reviewed at the following website <http://www.hms0.gov.uk/>.

As stated earlier, **it is the responsibility of each energy supplier to ensure that they have carried out their projects in accordance with appropriate legislation.**

Construction (Health Safety & Welfare) Regulations 1996

These regulations are aimed at protecting the health, safety and welfare of everyone who carries out construction work. They also give protection to other people who may be affected by the work.

Health and Safety at Work Act 1974

(HASAWA) provides a wide, embracing, enabling framework for health, safety and welfare in the UK.

Construction Design and Management (CDM) Regulations 1994

These regulations have been produced to ensure that Health , Safety and Environmental issues are addressed during the life-cycle of a building or plant.

Control of Substances Hazardous to Health 1994 (COSHH)

This legislation prohibits work involving exposure to hazardous materials (chemicals, microorganisms, gases, etc.) unless a "suitable and sufficient" assessment of these exposures has been carried out.

Noise at Work Regulations 1989

These regulations aim to protect workers from the risk of hearing damage due to excessive noise.

Electricity at Work Regulations 1989

The purpose of these regulations is to ensure precautions are taken against the risk of death or personal injury from electricity in work activities

Environmental Protection Act 1990

The aim of this Act is to ensure that any potential polluting process has an authorisation from either the Environment Agency or Local Authority and that control measures are in place to prevent, minimise or render harmless emissions into the surrounding environment.

Building Regulations 2000

The main purpose of these regulations is to ensure the health and safety of people in or about buildings. They are also concerned with energy conservation and with making buildings more convenient and accessible for people with disabilities.

Ozone depleting substances (ODS) regulation 2000

This regulation affects users, producers, suppliers, maintenance and servicing engineers, and those involved in the disposal of all ODS. These include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, 1,1,1 trichloroethane, carbon tetrachloride and bromochloromethane (CBM). These substances are mainly used in refrigeration, air-conditioning, foam blowing, as solvents and in fire fighting.

Appendix 1 BRE Report - 'Energy Efficiency Commitment: BREDEM calculation of energy saving matrix' (October 2001)

Executive Summary

The 'Energy Efficiency Commitment' scheme (EEC), to be introduced in 2002, will build on the achievements of the present 'Standards of Performance Energy Efficiency 2000-2002' scheme for promoting and funding energy efficiency in domestic dwellings. As for the Standards of Performance 2000-2002 scheme, the Energy Supply Licence obligations for EEC will allow electricity and gas energy efficiency measures, and also energy efficiency improvements for oil and coal heated dwellings.

- For the purposes of advising DEFRA in setting target energy savings, the Energy Saving Trust requires information about the energy savings resulting from a range of energy efficiency measures, for a variety of dwelling types.
- BRE has provided and updated this information for past schemes using the BRE Domestic Energy Model (BREDEM), which is uniquely suited to this type of application. The energy savings for various measures and house types have been tabulated and presented in the form of a matrix.
- This report describes background information to the calculations, and the various assumptions that have been made. The energy savings are given for eight typical dwelling types. Each dwelling type is tabulated for a number of different floor areas, notionally related to the number of bedrooms. The 'base parameters' for the calculations (e.g. amount of insulation, heating controls,

etc.) are for a typical existing dwelling, and are drawn from extensive survey data which BRE has access to.

- The results are consistent with the previous matrix (Feb 2000), and incorporate three recent developments: (1) Cavity wall insulation savings are calculated for a cavity width of 65mm (previously 50mm). (2) Loft insulation saving results have been extended to include an additional depth category, 250mm. (3) The boiler efficiency used for gas central heating is an estimate of the average of the current stock, which recent work has indicated as 69%. (The BREDEM calculations include a penalty for a proportion of the stock not having a boiler interlock, and use a value of 67%). In the previous Standards of Performance scheme the efficiency assumed was that predicted for 2010 of 75%.
- The matrix of these energy savings is presented in Annexe 3. Many parameters affect energy savings, so, in general, the parameters selected for tabulation are among those which have the most significant effect on the energy saved, given the assumptions made.
- These various assumptions, about the dwelling type, size, level of insulation, heating type, and other parameters used in the BREDEM calculation, must be kept in mind when using the values in the matrix. The savings in the matrix are typical for the situations described, but may be very different for situations which differ significantly from the assumptions made.

1. Introduction

The 'Standards of Performance for Energy Efficiency' scheme in the UK, now called the 'Energy Efficiency Commitment' (EEC), requires Energy Suppliers to fund energy efficiency schemes. To enable targets to be set, and individual projects to be evaluated, information about typical energy savings from a range of energy efficiency measures, for a variety of domestic dwelling types and constructions is required. This is provided in this report.

BRE has provided and updated this information for previous Standards of Performance schemes, most recently in February 2000 for 'Standards of Performance 2000-2002'. The BRE Domestic Energy Model, BREDEM, was used to calculate the energy consumption, and hence savings. A matrix was developed which tabulated the savings resulting from a range of energy efficiency measures, for a variety of typical domestic dwellings.

BREDEM is a well established and thoroughly verified model which has been developed and tested by BRE over the past 16 years, and is uniquely suited to this type of requirement. The new 'Energy Efficiency Commitment' requires similar information to that provided for the previous schemes. As for 'Standards of Performance 2000-2002', 'Energy Efficiency Commitment' obligations will allow electricity and gas energy efficiency measures to be implemented, and also energy efficiency improvements for oil and coal heated dwellings. As a result, the information in the matrix shows the savings resulting from energy efficiency measures related to electric, gas, oil and coal heated dwellings.

The results in the matrix for gas and electrically heated homes are consistent with those for 'Standards of Performance 2000-2002', and incorporate the following three developments.

- (1) Recent data indicates 65mm as an appropriate value for a typical cavity width in these calculations. Cavity wall insulation energy savings have therefore been calculated using 65mm cavity width. (This replaces the calculations based on 50mm in the previous report)
- (2) A loft insulation depth of 250mm is gaining acceptance in terms of cost effectiveness; for example, this depth will be necessary to meet the proposed Elemental Method U-values in the draft Part L of the Building Regulations. Following this development, loft insulation results now include savings for installations to 250mm.
- (3) Calculations for gas central heating are based on a boiler efficiency which is an estimate of the average of the existing stock, of 69%. (The BREDEM calculations include a penalty for the proportion of the stock which do not have a boiler interlock, and as a result, a value of 67% is used in the calculations). In the previous Standards of Performance scheme an efficiency of 75% was used, representing the estimated efficiency in 2010.

2. Description of the project

2.1 Aim

The aim of this work is to indicate the delivered energy savings associated with a range of typical energy efficiency measures for various typical dwelling types and sizes.

The energy savings are presented as a matrix of measures, dwelling types and sizes, taking account of factors which have a significant effect on the energy saved.

Factors which have smaller effects on the amount of the delivered energy saved are generally not tabulated in the matrix.

2.2 Base Parameters

2.2.1 Dwelling Types

The energy savings are based on the following eight dwelling types. These cover the main dwelling types found in Great Britain, which is the area relevant to the Energy Efficiency Commitment scheme.

Flat with 3 external walls	Semi-detached bungalow
Flat with 2 external walls	Detached bungalow
Mid-terrace house	Semi-detached house
End-terrace house	Detached house

BRE has developed drawings of typical dwellings of these types, and the dimensions of the external walls, roof, floor, windows and doors are used in the BREDEM calculations. For each dwelling type, the energy savings are calculated for the 'base case' floor areas from the drawings. These are then adjusted in the ratio of the floor areas to give savings for other dwelling sizes. The effect of top, mid and ground-floor flats has also been considered, and this is discussed in Annex 1.

The base parameters for the calculations are those for a typical existing dwelling, unless otherwise stated or required by the calculation. These parameters include the following, and were chosen on the basis of extensive survey data which BRE has access to.

2.2.2 Insulation levels

- Roof insulation U-value 0.25 (150mm insulation depth)
- Wall insulation U-value 1.5 (unfilled cavity wall pre-1976)

- Single glazed wooden frame windows with draught-stripping on all external doors and windows

2.2.3 Heating systems (see Annexe 2 for further detail)

(a) Gas and oil central heating

- Hot water heated from the boiler in a separate tank.
- Boiler efficiency of 69% assumed for gas central heating. For the BREDEM calculations a penalty for a proportion of the stock not having boiler interlock is included, and a value of 67% is used.
- Boiler efficiency of 77% assumed for oil central heating, with a penalty for no interlock reducing this to 76%.
- Boiler with radiators, room thermostat control and boiler interlock. (Boiler interlock turns the boiler off when there is no demand for heat).
- Cylinder thermostat present, primary pipework not insulated.

In addition to the calculations for gas central heating, one set of calculations estimates savings from replacing a gas room heater; details for this are given later.

(b) Electric storage heating

- Hot water heated in a tank by electric immersion heater.
- Modern (slim) storage heaters with manual charge control.
- 10% of the space heating is supplied by on-peak electric.

(c) Solid fuel central heating

Note that estimated efficiency is approximate and varies greatly with type (see annexe 2)

- Assumes an open coal fire with back boiler (efficiency 55%) and radiators and whole house heating.
- Hot water heated from the back boiler in a separate tank.

2.2.4 Heating pattern

The calculated savings are for a standard heating pattern (morning and evening during the week, all day at the weekend), and whole house heating (except for gas room heater savings, for which details are given later).

2.3 Savings Matrices

2.3.1 Loft insulation

- The effect of the different wall types (solid or cavity) is small; less than 2%.
- The effect of the number of external walls (e.g. a flat with 2 external walls compared with 3 external walls, a mid-terrace compared with end-terrace) is also small; less than 5%.
- The matrix shows savings for the different dwelling types (with the 2 flat types described above - but note that only a top-floor flat is appropriate) and sizes.
- The savings for loft insulation improvement to 150mm, 200mm and 250mm depth include insulation of, and draught-sealing, the loft hatch. (Even where there is draught-sealing before installation, it is likely to be in need of replacement). The U-values used take account of thermal bridging by the joists, and represent laying between the joists at all depths (this allows for safe access to the loft). This is a conservative assumption, which can be considered to take account of the effect of compacting and/or dislodging, for example due to boarding the loft, on the insulation performance.

2.3.2 Cavity wall insulation

Cavity wall savings are clearly affected by both the U-value of the cavity wall filled, and the number of external walls.

A pre-'76 U-value of 1.45 W/m²K was calculated for a wall with a brick outer leaf, 65mm cavity, and brick inner leaf finished with a dense plaster, thought to be typical of post-war construction. This gives a U-value of 0.466 W/m²K when the cavity is filled with blown mineral fibre.

Post-'76 Building Regulations required U-values of 1.0 W/m²K; such a 65mm cavity wall gives a U-value of 0.407 W/m²K when filled with blown mineral fibre.

- The matrix shows savings for the different dwelling types and sizes. The results for flats may be applied to top-floor, mid-floor, and ground-floor flats, since the difference in results is less than 1%.

2.3.3 Solid wall insulation

As with cavity walls, savings are affected by the before and after U-value and the number of external walls.

A solid wall is assumed to have a U-value of 2.1 W/m²K before it is insulated. Internal or external insulation can be applied to decrease the U-value. Two values were used for insulated walls, 0.45 and 0.37 W/m²K. Using mineral wool, thicknesses of 80 and 100mm respectively would be needed to achieve these reductions in heat loss. Using other insulants this thickness could be significantly less (see notes to the matrix for details).

- The matrix shows savings for the different dwelling types and sizes. The results for flats may be applied to top-floor, mid-floor, and ground-floor flats, since the difference in results is less than 1%.

2.3.4 Draught-stripping

These are obviously affected by the dwelling type and size. Draught-stripping of windows and external doors is calculated. Draught-sealing the hatch gives savings from BREDEM which are 15% of the saving in the matrix for draught-stripping windows and external doors.

BREDEM takes account of draught-stripping by modifying the amount of air infiltration, by an amount based on work carried out in the 1980's. This work found that there are a large range of air infiltration routes (such as dry lining on dabs or battens, cracks, gaps and joints in the structure, joist penetrations of external walls, timber floors, internal stud walls, electrical components and service ducts, and areas of unplastered masonry).

Openable doors and windows are therefore only one of many routes. Results were obtained for good quality draught-stripping of openable doors and windows (excluding the kitchen and bathroom, as is normal practice), for a representative range of dwellings. The BREDEM calculations for the matrix are consistent with these results.

Because of the nature of air infiltration measurements, it is impossible to be precise about what should be taken as a baseline, that is, the air infiltration before draught-stripping. For this work it was agreed that the savings should be based on initial ventilation rates at the higher end of the range, consistent with the data available. This reflects the principle that Energy Efficiency Commitment should be targeting draught-stripping at such properties. In addition, the BREDEM ventilation algorithm

assumes that if air infiltration is low, occupants will open windows. Because of this, draught-stripping savings become small if too low an air infiltration baseline is used.

A higher baseline is readily achieved by selection of a number of options in the 'ventilation' and 'location' BREDEM inputs. Under the 'ventilation' inputs, two extract fans and one unrestricted chimney were assumed for all cases. For the 'location' inputs, 'sheltered on 1 side', and 'above average site exposure' was selected in all cases; although it may not be realistic for a mid-terrace house or a flat with two outside walls, it may be taken as a proxy for a number of other contributing factors, such as a leakier-than-average structure.

- The matrix shows savings for the different dwelling types and sizes. The results for flats may be applied to top-floor, mid-floor, and ground-floor flats.

2.3.5 Hot water tank insulation

Different types and sizes of dwellings have little effect. Less than 3% differences were obtained. For all dwelling types, the energy savings are as follows, using boiler efficiency values given in Annexe 2.

(a) Gas centrally heated dwellings

None to 75mm jacket	2370 kWh/yr.
25mm to 75mm jacket	1010 kWh/yr.
50mm to 75mm jacket	260 kWh/yr.

Taking account of the relative numbers of dwellings in the building stock with 50mm, 25mm, and no tank jacket (Domestic Energy Fact File, 1998) gives a weighted average of

- 800 kWh/yr (this is tabulated in the matrix at Annexe 3).

(b) Electric storage heated dwellings:

None to 75mm jacket 1310 kWh/yr.

25mm to 75mm jacket 580 kWh/yr.

50mm to 75mm jacket 140 kWh/yr.

Taking account of the relative numbers of dwellings in the building stock with 50mm, 25mm, and no tank jacket (Domestic Energy Fact File, 1998) gives a weighted average of

- 450 kWh/yr (this is tabulated in the matrix at Annexe 3).

(c) Oil centrally heated dwellings:

None to 75mm jacket 2090 kWh/yr.

25mm to 75mm jacket 890 kWh/yr.

50mm to 75mm jacket 230 kWh/yr.

Taking account of the relative numbers of dwellings in the building stock with 50mm, 25mm, and no tank jacket (Domestic Energy Fact File, 1998) gives a weighted average of

- 700 kWh/yr (this is tabulated in the matrix at Annexe 3).

(d) Solid fuel heated dwellings:

For an open fire with back boiler when heating water with an efficiency of 55%, the following results were obtained

None to 75mm jacket 2620 kWh/yr.

25mm to 75mm jacket 1120 kWh/yr.

50mm to 75mm jacket 270 kWh/yr.

Taking account of the relative numbers of dwellings in the building stock with 50mm, 25mm, and no tank jacket (Domestic Energy Fact File, 1998) gives a weighted average of

- 880 kWh/yr (this is tabulated in the matrix at Annexe 3).

2.3.6 Floor insulation

Calculations are for 100mm depth of insulation (mineral fibre 0.04 W/m²C). This is often the maximum practicable depth, and insulating to this depth is considered worthwhile considering the disruption and labour cost associated with installing this measure. Different wall types have a small effect, less than 7%. However, house size and type have a significant effect.

- The matrix shows savings for the different dwelling types (note: only a ground-floor flat is appropriate) and sizes.

2.3.7 Block skirting gaps and seal floorboards

Different wall types have a small effect, less than 8%. However, dwelling size and type have a significant effect.

- The matrix shows savings for the different dwelling types and sizes. The results for flats may be applied to top-floor, mid-floor, and ground-floor flats.

2.4 Gas and Oil Matrices

2.4.1 Hot water tank thermostat and primary pipe insulation

Different types and sizes of dwellings have little effect. Boiler efficiencies used are described in Annexe 2.

Modelling a boiler of 69% efficiency, reduced to 67% for gas and 77%, reduced to 76% for oil to allow for a proportion of boilers in the existing stock with no boiler interlock (see Annexe 2), gives the following results.

Gas:

If there is no tank thermostat or primary pipe insulation,

- the saving from one of these measures is 560 kWh/yr
- the saving from both of these measures is 800 kWh/yr

If one measure is installed, the saving from the other measure is 240 kWh/yr.

Oil:

If there is no tank thermostat or primary pipe insulation,

- the saving from one of these measures is 490 kWh/yr
- the saving from both of these measures is 700 kWh/yr

If one measure is installed, the saving from the other measure is 210 kWh/yr.

2.4.2 Boiler replacement, efficiency and controls

A generalised calculation method is given for flexibility, which enables estimated savings to be calculated using appropriate boiler efficiencies and heating system controls. Either an average seasonal efficiency, or a seasonal efficiency of an

individual boiler, may be used. Both of these are now available as a result of the new SEDBUK (Seasonal Efficiency of Domestic Boilers in the UK) method, which is described in Annexe 2.

- The matrix shows the 'heat required', given a particular set of heating controls, for each dwelling type and size (see Annexe 1 regarding flat types). The 'heat required' divided by the boiler efficiency value will give the delivered fuel consumption. The difference of two such calculations, firstly for the initial heating controls and efficiency value, secondly for the new heating controls and efficiency value gives the energy saving.

The energy saving from changing either the heating controls alone, or the boiler alone, may of course be calculated by keeping the other the same. Note that the 'heat required' includes energy for hot water as well as heating, since this is also affected by the boiler efficiency.

For an initial boiler efficiency value E1, and a new boiler efficiency value E2, the energy saving is then as follows.

$$([\textit{heat required with initial controls}] / E1) - ([\textit{heat required with new controls}] / E2)$$

Note that if the boiler has no interlock (that is it continues to run when there is no demand for heat), the efficiency value must be reduced by 5 percentage points.

Thus for a boiler efficiency of 69% with no boiler interlock, an efficiency of 64% must be used in the above calculation.

For example, the delivered energy saving resulting from replacing

- a gas boiler with no controls or programmer only (efficiency 69% reduced by 5 percentage points because there is no boiler interlock),

- by a new boiler with efficiency 80% and new controls (with a boiler interlock, i.e. there is no 5 percentage point penalty) is then as follows.

$$([\textit{heat required with no controls}] / 0.64) - ([\textit{heat required with new controls}] / 0.8)$$

Recent work suggests that the average seasonal efficiency of gas boilers in the existing housing stock is around 69%. (The penalty for no boiler interlock must be applied to this if appropriate). Existing oil boilers are likely to be more efficient, the average seasonal efficiency in the housing stock being currently around 77%. As regards new boilers currently being installed in the UK, information from the SEDBUK project (Annexe 2) has shown that a typical efficiency is 88% for condensing gas boilers, and 78% for non-condensing boilers. For oil, typical condensing boiler efficiency is 92% and non-condensing, 85%. These efficiencies, and/or the seasonal efficiency of an individual boiler from the SEDBUK internet site (www.sedbuk.com), can be used in the equation above as required.

'Heat required' is tabulated in the matrix for the following control options. Note that all controls packages may or may not have a programmer (no energy savings are attributed to this).

- None: No controls, *and no hot water tank thermostat*
- Package A: Only hot water thermostat
- Package B: Roomstat *
- Package C: Roomstat and TRVs *
- Package D: TRVs without a roomstat (note that boiler interlock is not possible unless a flowswitch is present)*
- Package E: Delayed start roomstat and TRVs *
- Package F: Intelligent heating controls and TRVs *

**these control options include a hot water tank thermostat
TRVs are assumed to be fitted on all radiators in the property*

For 'Commitment' target setting purposes, it is necessary to assume a basis from which gas and oil heating controls are upgraded. A situation of 'Limited Controls' has therefore been defined. Central heating systems in existing dwellings have the following controls.

- 16% have no thermostatic control.
- 53% have a wall thermostat (no TRVs)
- 14% have TRVs (no wall thermostat)
- 15% have a wall thermostat and TRVs

The 'Limited Controls' case (Package L) was defined by taking an average, weighted by the above values of 16 and 53%, of the 'heat required' for (a) 'no controls' and (b) 'Programmer and roomstat'.

2.4.3 Renewing gas room heaters

Different dwelling types and sizes (see annex 1 regarding flat types) have a significant effect on the savings from replacing an old gas fire, efficiency 50%, with a new gas fire with an open flue, efficiency 60%. A dwelling with typical insulation was assumed.

The aim is to estimate savings for replacing one gas fire; hence whole house heating is not appropriate. Savings were calculated for two situations.

- (a) Only the living area is heated by the gas room heater.
- (b) The dwelling is heated by gas central heating, with a gas room heater providing 50% of the heat to the living area. This is a common configuration where a gas room heater is present.

2.4.4 Radiator foil

An assessment of the savings has been undertaken by BRE which is based on test data, and which provides a best estimate of savings at present. This has been used to inform the savings credited to this measure in the present Standards of Performance. However, at present the savings credited go beyond the results of the BRE assessment, to allow further installation and monitoring to take place. Depending on the results from this monitoring, the assessment of savings by BRE will be revised if appropriate for use in the evaluation of individual EEC schemes.

2.5 Electricity Matrix Only

2.5.1 Storage heater controls

The energy savings from 6 types of electric storage heater controls have been investigated, and the results expressed as a percentage of the space heating energy for a dwelling. The values in the matrix are derived by applying these percentages to the space-heating requirement for each dwelling type, as calculated using BREDEM.

The savings that result from storage heater controls are therefore directly related to the delivered energy required to heat the dwelling. Dwelling type, size, and the level of insulation will affect the savings (see Annexe 1 regarding flat types). Savings in the matrix are calculated for three wall types with different U-values, solid wall, cavity wall pre-76 and cavity wall post-'76, for a dwelling with a typical level of loft insulation (150mm).

2.6 Solid Fuel Matrix

By their nature, most solid fuel heating systems are not controllable other than manually; therefore no attempt to attribute savings to controls is made.

3. Conclusion and recommendations

A matrix has been developed which tabulates the estimated energy savings for a large range of energy measures, and typical dwelling types and sizes. In general, factors which have a significant effect on the savings have been tabulated. In an exercise of this kind, assumptions have to be made about various parameters (for example, the heating pattern), and typical values have been used, the most important of which have been stated at the start of this report.

These assumptions need to be kept in mind when using the values in the matrix. The savings given are typical for the situations described, but may be very different for situations which differ significantly from the assumptions made.

4. References

The Government's Standard Assessment Procedure for Energy Rating of Dwellings. SAP 1998. Published on behalf of DETR by BRECSU, BRE.

Domestic Energy Fact File, 1998. L D Shorrocks and G A Walters. BRE Report 354.

SEDBUK (Seasonal Efficiency of Domestic Boilers in the UK). www.sedbuk.com

Annexe 1 - Effect of flat type on savings

A flat of a given size and shape can be top-floor, mid-floor, or ground-floor, with different numbers of external walls. Each combination of these parameters will result in a different energy consumption.

Moreover the savings from different energy saving measures are affected by different parameters. For example, the number of walls affects the savings resulting from cavity wall insulation, floor insulation and draught-stripping, but does not significantly affect savings resulting from the other insulation measures considered.

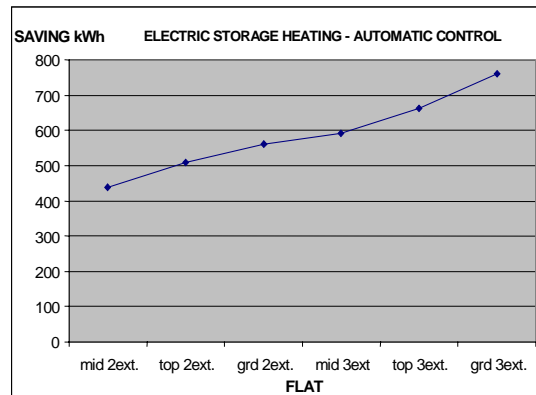
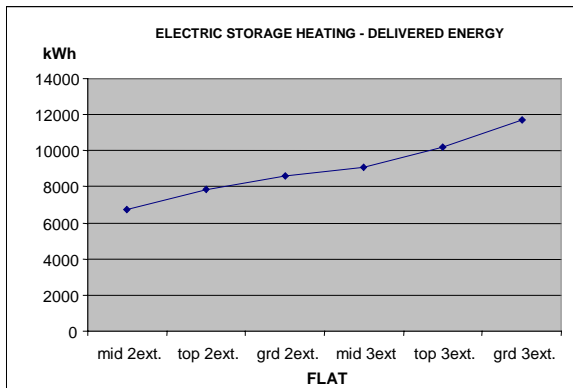
Energy Efficiency Measure	Top/Mid/Ground Floor Flat	Number of External Walls
Loft insulation	Top-floor flats only	Insignificant effect
Floor insulation	Ground-floor flats only	Significant effect
Cavity wall insulation	Insignificant effect	Significant effect
Draught stripping	Insignificant effect	Significant effect
Double glazing	Insignificant effect	Insignificant effect
Seal skirting and floorboards	Insignificant effect	Insignificant effect
Boiler replacement, efficiency & controls	See below	
Renewing gas room heaters		
Storage heater controls		

The energy savings resulting from the last three measures in this table, that is

- boiler replacement, efficiencies and controls
- renewing gas room heaters
- electric storage heater controls

are dependent on the space heating energy consumption of the flat. The savings will therefore be affected both by the number of external walls, and whether it is a top, mid, or ground floor flat.

The following graphs show, for an electric storage heating system, the effect of both of these factors on (a) the space heating energy consumption, and (b) the saving achieved by automatic controls.



- It can be seen that the number of external walls has a significant effect on energy consumption and savings. The effect of whether it is top, mid or ground floor is less significant. Therefore, in the matrix, separate results have been calculated for flats with two, and three external walls.
- It can also be seen that the top-floor flat is intermediate in energy consumption between the ground-floor and mid-floor flat, and the difference is relatively small (especially in relation to the effect of the amount of loft and wall insulation). For the matrix, calculations have therefore been undertaken for top-floor flats only. Savings for mid-floor and ground-floor flats will be similar.

(It could be argued that mid-floor flats should be used on the basis that these are the most common type, however, while this is true in high rise buildings, there are a large number of blocks which are three or fewer storeys high for which this is not true.)

Graphs of energy consumption and savings relating to the replacement of boilers, boiler controls, and gas room heaters show the same results, and the same conclusions can be drawn. For this reason, the energy savings resulting from the measures:

- boiler replacement, efficiencies and controls
- renewing gas room heaters

- electric storage heater controls

have been calculated for the two cases:

- top-floor flat with 2 external walls
- top-floor flat with 3 external walls

It should be appreciated that the savings resulting from these three measures are significantly dependent on the heat required and therefore the level of insulation in the dwelling (as well as other factors such as the heating pattern). This contrasts with insulation measures (for example, loft insulation) where savings are not strongly dependent on the level of insulation in the rest of the dwelling, except for very poor, or very good, insulation levels.

The savings for the three measures above have been calculated using the base parameters specified on page 2 of this report.

Annexe 2 - Boiler efficiencies and SEDBUK

Gas and oil boilers

A method for estimating a realistic 'seasonal' domestic boiler efficiency, representing an average efficiency in domestic conditions over a seasonal cycle in the UK, has been incorporated into the calculation of SAP energy ratings (Appendix D of SAP 1998). The method involves a number of equations that use the measured full load and part load efficiency of a boiler to estimate its seasonal efficiency in typical UK conditions.

The method results from a research project supported by DETR, BRECSU, British Gas Research & Technology, and manufacturers of boilers and other products for the heating industry. The method has been agreed by all those involved, and is referred to as 'SEDBUK' (Seasonal Efficiency of Domestic Boilers in the UK).

SEDBUK values for many boilers currently available have been published on an internet web site www.sedbuk.com. In addition, from real product data that BRECSU holds, it

has been possible to use SEDBUK to estimate typical UK seasonal efficiency values of different types of boilers.

Typical values for gas boilers that will be being sold and installed are as follows.

Non-condensing gas boiler - 78%

Condensing gas boiler - 88%

For oil fired boilers typical values are:

Non-condensing oil boiler - 85%

Condensing oil boiler - 92%

The energy savings calculated in Annexe 3 of this report use estimates of the average seasonal efficiency of gas and oil boilers in the existing UK stock. BRE's UK National Boiler Energy Model indicates this being 69.2% for gas and 77.4%. For BREDEM calculations, a penalty of 5 percentage points is deducted where there is no boiler interlock. There is very little data on the proportion of the existing stock that do not have interlocks. However, about 30% of boiler systems do not have a room thermostat, and this indicates that at least 30% do not have any interlock. Estimating that about 50% of boiler systems do not have an interlock indicates an average penalty of 2.5 percentage points for gas. This results in a rounded value of 67%, which is used in the BREDEM calculations. For oil, it is estimated that a higher percentage of systems have and interlock, around three quarters. This indicates a suitable reduction of 1.25%, giving a rounded value of 76%.

Values used in this matrix are therefore

- Gas 69%, reduced by 2% to 67%
- Oil 77%, reduced by 1% to 76%

Solid fuel heating

There are many different configurations for solid fuel heating. For example, an open or closed fire may have a back boiler, in which case this may supply radiators, or alternatively an independent solid fuel boiler may supply a central heating system. Estimated efficiency values are approximate and vary depending on the configuration, from 32% for an open fire with no throat restrictor and no back boiler, to 65% for a closed fire with a back boiler, or an independent boiler with an autofeed system.

In addition BREDEM calculations take account of 'responsiveness' on a scale of 0 (unresponsive) to 1 (responsive). Open and closed solid fuel fires are attributed a responsiveness of 0.5, while independent boilers are attributed a responsiveness of 0.75.

Note that this variability in evaluating energy for solid fuel systems is exacerbated when considering cost and energy CO₂ emissions (these are not calculated in this report). Open fires may use house coal, or smokeless fuel if required, which have different costs and CO₂ emission values (£4.25/GJ and £7.11/GJ, and 81 kg CO₂/GJ and 109 kg CO₂/GJ respectively; SAP 1998 values).

The most common solid fuel heating system is an open fire with a back boiler and radiators, though closed fires with back boiler and radiators are also common, and also open and closed fires of all other configurations. There are a smaller, but still significant, number of independent boilers supplying central heating systems.

For the calculations in this matrix, approximate typical values of efficiency and responsiveness have been used. That is,

- a responsiveness of 0.5 and an efficiency of 55%, which corresponds to an open coal fire with a back boiler

Appendix 2 HSE advice on potential risks to safety of combustion appliances from the installation of cavity wall insulation (May 2000)

What is the purpose of this advice?

This advice:

- highlights the potential hazard of cavity wall insulation work adversely affecting the safety of combustion appliances and the importance of ensuring air supply vents and flues are always checked by a competent person after this work
- gives general guidance on the action required, further details of which are given in the Cavity Insulation Guarantee Agency (CIGA) guide 'Flues, Chimneys and Combustion Air Ventilators'
- is addressed to all concerned with the management, control and installation of cavity wall insulation under energy efficiency schemes
- is targeted both at those involved with the installation of cavity wall insulation and the running of specific schemes such as DEFRA's Home Energy Efficiency Scheme (HEES), those run by Energy Suppliers and Transco (Affordable Warmth), as well as initiatives run by local authorities
- updates and replaces an earlier HSE advice sheet on this subject.

What is the hazard?

This guidance is about the way in which incorrect installation of cavity wall insulation can adversely affect the safety of gas, oil and solid fuel appliances. The main concerns are:

- (a) possible blockage of air supply vents with insulation material if the vents are not ducted across the cavity, and

(b) possible flue damage (eg by accidental drilling) or blockage (ie by insulating material entering a flue through the damaged area).

Either, or both of these could cause appliances to operate unsafely, and produce amounts of carbon monoxide (CO) that could cause death of occupants.

These are not just theoretical risks. Although the industry safety record is accepted to be generally very good, a few residents recently had their ventilation/flues completely blocked by insulation material, as a result of cavity wall insulation work, and this was not detected in the normal way by the installer because the established industry safety procedures were not followed. This presented a major potential risk of CO poisoning to these tenants, and it was fortunate that the problem was otherwise noticed, as death or serious injury might have resulted.

What action is required?

In view of the above, there is an urgent need for all parties involved to give early consideration to the possible effects that the insulation work might have for the safety of appliances in the houses they are working on, however they are fuelled. Any guidance and contract conditions should call for safety management systems that include thorough checks before work starts, eg on whether air vents are sleeved through the cavity wall, and the type/location of appliances and run of flues provided for them. This is essential to identify appliances and flues 'at risk' and for planning work to minimise the risk of damage or blockage.

It is particularly important that landlords such as local authorities are forewarned of any work to be carried out, so that they are given the opportunity to carry out their own checks on work to discharge their own legal responsibilities to their tenants.

What precautions are necessary?

The following is a summary of the main areas to be addressed. Detailed guidance is given in the Cavity Installation Guarantee Agency (CIGA) Best Practice Guidance document and relevant British Standards on cavity wall insulation. Further information

regarding safety checks on gas appliances may be obtained from the Council for Registered Gas Installers (CORGI).

(a) **safety management.**

All cavity wall insulation work must be properly managed and controlled to ensure safe systems of work are used, which effectively address the risks involved. Suitable guidance and training should be given to all concerned that stresses the possible effects of the work for the safety of occupants from interference with ventilation and flueing, and the action required to address these risks (see below).

(b) **safety checks after installation of cavity wall insulation.**

Before combustion appliances are recommissioned/retaken into use, the following checks for safety should be carried out:

(i) Air supply vents

A visual examination should be carried out of all air vent openings, whether for supply of combustion air to appliances or for cooling air of compartments housing appliances, to ensure there is no blockage or interference by insulating material. This applies to air vents serving all types of combustion appliance, whether flueless, open-flued or room sealed. Further information on air supply requirements is given in Approved Document J 'Heat Producing Appliances' under the current Building Regulations (and Technical Standards in Scotland). Further information in respect of air supply requirements for gas appliances is contained in British Standard 5440 Part 2: 2000.

(ii) Flue examination/testing

The following examinations and tests should be carried after installation of cavity wall insulation, except for those flues **known** not to be at risk of damage or blockage from cavity wall insulation work (eg where no part of a flue is run along or adjacent to a cavity wall). A decision on this should be made by a competent person after inspecting the flue run. In **any** case of doubt, it should be assumed that flue damage/blockage is possible, and that examinations/tests need to be carried out. These are identified below.

Appliances other than room sealed appliances

The flue should be visually examined for any damage or blockage caused by the cavity wall insulation work, which would prevent safe transfer of combustion products to the open air. This will involve external visual examination of the flue along its whole length, including loft spaces.

After the visual examination, further assessment should be made to establish whether there is any indication of possible flue damage or blockage. This will involve a smoke spillage test (to check that combustion products are being safely removed with the appliance connected) and visual inspection for any signs of incomplete combustion (eg yellowing of burner flame and soot deposits). Further investigation, including a flue flow test (to establish whether combustion products are capable of being safely transferred to the open air) **must** be carried out if there is **any** doubt or suggestion of flue damage or interference.

Further information on flue requirements, including examination/testing, is given in Approved Document J 'Heat Producing Appliances' under current Building Regulations (and Technical Standards in Scotland). Further information on flues for gas appliances is contained in British Standard 5440 Part 1: 1990¹.

Room sealed appliances

No flue flow or spillage test is required for room sealed appliances, however, a visual external examination of the flue path (eg to ensure there is no flue damage) and checks as in (i) earlier, on air vents providing cooling air for any compartment housing such an appliance are still required. Further information is given in the CIGA guide.

(iii) Examination of appliance safe functioning.

After any 'work' on an appliance, including 'disconnection' and 'reconnection', it should be checked that the appliance functions safely. Examinations for gas appliances

¹Under revision when this advice was prepared. Revised standard expected to be published later this year (2000).

are specified in regulation 26(9) of the Gas Safety (Installation and Use) Regulations 1998 (GSIUR).

Action in case of a 'dangerous appliance'

Where there is any doubt about safety, arrangements should be made for the appliance to be disconnected (with the owner's consent, as necessary) and a warning notice attached, pending further investigation and remedial work. If the owner does not agree to disconnection of a dangerous gas appliance, Gas Emergency Freephone 0800 111 999, or in the case of LPG the gas supplier, should be contacted for further action to make safe.

Who may carry out safety examinations?

The examinations described earlier must only be carried out by a person who has been adequately trained and possesses the required competence, eg for proper conduct and interpretation of safety checks. The smoke spillage test is appliance specific and specialist training is essential to perform this correctly, in accordance with manufacturers instructions.

In the case of gas, any disconnection of appliances (eg as normally required for the flue flow test) constitutes 'work on a gas fitting'² and may only be carried out by a CORGI registered installer, holding a current certificate under the 'ACoPS' or Accredited Certification Scheme (ACS), covering the work involved. Further advice may be obtained from CORGI (tel: 01256 372200).

May carbon monoxide detectors be used?

If carbon monoxide detectors/alarms are used, they must never be regarded as a substitute for primary safeguards, eg safe installation and maintenance of gas appliances. Similarly, use of CO detectors must not be regarded as a substitute for flue/combustion

²'work in relation to a gas fitting' as defined in GSIUR covers a wide range of activities including (but not limited to) installing; disconnecting; removing; re-connecting; or (where a fitting is not readily movable), changing its position. However, it does not cover separate activities which might affect gas safety but are not directly associated with a gas fitting/appliance, such as installation of cavity wall insulation.

air checks by a competent person, after completion of cavity wall insulation (as earlier). If detectors are used as part of a safety check regime, they must only be used to **indicate or confirm a hazardous situation**; they must never be relied upon to prove safety or to contradict evidence of a possible problem, where a flue spillage test is inconclusive or suggests flue blockage.

What are the relevant legal requirements?

The main legal requirements for protection of the general public and employees in these situations are the general provisions of the Health and Safety at Work etc 1974 (HSWA), and related legislation, including the Management of Health and Safety at Work Regulations 1999, which require a 'risk assessment' and plan of protective measures to be drawn up, as well as appointment of competent persons to ensure that safety requirements are effectively met.

In the case of gas, specific requirements also apply under the Gas Safety (Installation and Use) Regulations 1998. In particular, regulation 8(1) effectively prohibits any person from making an alteration to premises³ (including cavity wall insulation) which would adversely effect the safety of a gas fitting installed at those premises and cause it no longer to comply with the Regulations, eg because combustion air supply or fluing is no longer adequate.

These duties for ensuring safety of combustion appliances extend beyond installers themselves to include managing contractors and others involved in planning heat efficiency schemes. Further information on controls and responsibilities under GSIUR is given in the Health and Safety Commission (HSC) Approved Code of Practice 'Safety in the installation and use of gas fittings and appliances', (ISBN: 0-7176-1635-5) available from HSE Books (tel 01787 881165)

³The prohibition extends to a wide range of activities which might affect the safety of a gas appliance (or gas storage vessel) on the premises, including installation of double glazing, building extension, modifications to chimneys etc.

Appendix 3 Guidance on VAT efficiency

Energy Suppliers should be aware of the specific VAT rules applying to energy efficiency measures. The following is a copy of a guidance note issued by HM Customs and Excise on 21st March 2000:

BN 39/00 VAT: New reduced rate for the installation of energy saving materials in all homes.

Who is likely to be affected?

People having energy saving materials installed in their home and the builders doing the work.

Builders and other businesses installing central heating and home security goods in the homes of less well off pensioners and heating system measures in the homes of the less well off under grant funded schemes.

General description of the measure:

1. VAT at 5% has applied to the grant funded installation of energy saving materials since 1998. This measure extends the reduced rate to include:
 - the installation of energy saving materials in all homes;
 - the grant funded installation, maintenance and repair of central heating systems and home security goods in the homes of qualifying pensioners;
 - the grant funded installation of heating system measures in the homes of the less well off.

2. Energy saving materials which may be installed in all homes at the reduced rate are:
 - insulation for walls, floors, ceilings, roofs or lofts, or for water tanks, pipes of other plumbing fittings;
 - draught stripping for windows and doors;

- central heating controls, including TRV's
 - electric dual immersion water heaters with foam insulated water tanks;
 - hot water system controls;
 - solar panels
3. The reduced rate will apply to energy saving materials installed in:
- owner occupied homes;
 - homes rented from private landlords;
 - homes rented from local authorities and housing associations;
 - caravans
 - residential boats
 - residential buildings such as old people's homes, children's homes and nursing homes;
 - non-business charity buildings.
4. The reduced rate for the grant funded installation, maintenance and repair of central heating systems in the homes of qualifying pensioners includes:
- installation of a gas fired boiler plus radiators and pipe work;
 - maintenance and repair of grant funded central heating systems;
 - maintenance and repair of central heating systems installed by the qualifying pensioner.
5. The reduced rate will apply to heating system measures fitted in the homes of the less well off under government funded grant schemes. 'Heating system measures' are:
- gas room heaters with thermostatic controls;
 - electric storage heaters
 - closed solid fuel fire cassettes
 - electric dual immersion water heaters with foam insulated tanks
 - gas fired boilers
 - oil fired boilers
 - radiators

6. Finally, the reduced rate will apply to qualifying security goods that are installed, in the homes of qualifying pensioners, at the same time as energy saving materials or central heating systems. 'Qualifying security goods' are:

- locks and bolts for windows
- locks, bolts and chains for doors
- spy holes
- smoke alarms.

7. The reduced rate does not apply to d.i.y. installations.

Operative date:

8. The changes apply to supplies made on or after April 2000.

Current and proposed revisions:

9. The reduced rate for energy saving materials is in Schedule A1 to the Value Added Tax Act 1994. This will be amended to reflect the changes.

Appendix 4 Energy Efficiency Assessment Questionnaire

A. CUSTOMER DETAILS

A1. Title: Mr Mrs Ms Miss

Other

A2. First Name / Initial:

A3. Surname:

A4. Address:

A5. Postcode:

A6. Contact tel. no:

● A7. In what year was your house built? (Mark one.)

Before 1900 1966 – 1975

1900 – 1918 1976

1919 – 1929 1977 – 1980

1930 – 1944 1981

1945 – 1949 1982 – 1990

1950 – 1964 1991 – 1995

1965 1996 or later

● A8. Property type? (Mark one.)

Detached Mid terrace with passage

Semi-detached Top floor flat

End terrace Middle floor flat

Mid terrace Ground floor flat

● A9. Do you own your home or do you rent?

Own / buying on mortgage

Renting from council

Renting from housing association

Renting privately

Tied house / other

B. PROPERTY DETAILS

IF YOU LIVE IN A FLAT

B1a. What type of building is it in?

Tower block (six or more storeys)

Custom block (five or less storeys)

Above shop or office

Divided house

B1b. Is there a roof directly above your flat?

Yes, sloping (pitched)

Yes, flat

Yes, part sloping (pitched) and part flat

Only part of the flat has a roof

No

FOR ALL TYPES OF HOME

● B2. Does your home have a loft?

Yes No

B3. If yes, is there a heated room that's in regular use within the loft?

Yes No

B4. How many floors does your home / flat have? (Excluding loft rooms or cellars.)

One (e.g. bungalow) Four

Two Five

Three More

B5. How many bedrooms do you have?

One Three Five

Two Four Six

More

B6. How many living or dining rooms do you have? (Include study / playrooms etc.)

None Two Four

One Three More

B7. Is your building listed or in a conservation area?*

Yes, listed Yes, conservation area

No

C. INSULATION DETAILS

● C1. How much loft insulation do you have?*

(If this is going to prove difficult, please take an educated guess. You can use the ruler provided to help you visualise the depth of insulation.)

None 150mm (6 inches)

25mm (1 inch) 200mm (8 inches)

50mm (2 inches) No Loft

75mm (3 inches) Don't know

100mm (4 inches)

C2. Does your loft have any flooring?*

Yes No

● C3. What type of outside walls do you have?*

- Solid brick
- Solid concrete
- Solid stone
- Cavity – insulated
- Cavity – uninsulated
- Mixed
- Modern timber framed
- Don't know

C4. Which type of windows do you have?

- All single glazed
- Some double or secondary glazed
- Most double or secondary glazed
- All double or secondary glazed

● C5. Is there any draught proofing on windows and external doors? (Assume sealed double glazed windows to be draught proofed.)

- None draught proofed
- Some draught proofed
- Most draught proofed
- All draught proofed

D. HEATING AND HOT WATER

● D1. What is your main heating system?

- Boiler and radiators
- Electric storage heaters
- Warm air system
- Room heaters or fires
- Other

● D2. What is your main heating fuel?

- Mains gas Solid fuel
- Electricity Bottled gas
- Oil L.P.G. (bulk)

D3. Do you have a separate fire that you use regularly?

- Yes, electric No
- Yes, solid fuel Yes, gas

● D4. What heating controls do you have?*

(Mark all that apply.)

- None
- Programmer / timer
- Room thermostat
- Thermostatic radiator valves
- Storage heater dials

● D5. If you have a boiler, how old is it?

- Less than five years old
- Five to ten years old
- Eleven to fifteen years old
- Over fifteen years old

D6. Which of your radiators have foil behind them?*

None All Some

D7. Do you have a condensing boiler?*

(If you are not sure, please mark 'no'.)

Yes No

● D8. How is your hot water usually provided?*

- From central heating system
- Gas instantaneous / combi boiler
- Electric instantaneous
- Electric immersion (on peak)
- Electric immersion (off peak)
- Dual electric immersion
- Gas, oil or coal range (e.g. AGA-Rayburn)
- Back boiler
- Other

D9. How would you describe your hot water tank insulation?

- No tank
- Solid foam insulation
- Jacket (no gaps around jacket)
- Jacket (with gaps around jacket)
- No insulation

D10. If you have a hot water tank, is there insulation on the pipes between the boiler and the tank?

- Yes Can't see pipes
- No Don't know

D11. What hot water controls do you have?*
(Mark all that apply.)

- None
- On / off switch
- Programmer / timer
- Hot water tank thermostat

E. LIGHTS AND APPLIANCES

● **E1. How many of your lights have low energy light bulbs fitted?**

- None Most
- One All
- Some Don't know

E2. What type of cooker do you have?

- Gas cooker
- Electric cooker
- Gas hob / electric oven
- Oil or coal range

E3. Which of the following household appliances do you have? If possible, could you also tell us how old the appliance is?

Please Mark	Age in years			
	0 - 5	6 - 10	11+	
Fridge / freezer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fridge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Freezer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Washing machine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dishwasher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tumble dryer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

F. HOUSEHOLD DETAILS

The following questions will be used to help us to evaluate whether or not you may be eligible for a grant.

● **F1. Is a member of your household over 60?**

- Yes No

● **F2. Is a member of your household in receipt of benefits?***

- Yes No

F3. How many people live in your home?

- One Four
- Two Five
- Three More

F4. How many of the people in your home are under 16 years old?

- None Three
- One Four
- Two Five
- More

F5. Where did you hear about us?

It would help us to bring Energy Efficiency to more people's attention if you could say where you heard about us.

Thank you for completing this questionnaire, please return it to the address below.

Or: Home Energy Check, Freepost,
Bristol BS38 7PS.

If you have any questions or would simply like more information, please call free on **0800 512 012**. Lines are open between 9am – 5pm Monday to Friday.

All products displayed are for reference only. They are not an endorsement.

This leaflet is targeted at householders to help you keep your energy costs down. The information will be kept by the Energy Saving Trust for the purpose of carrying out research into energy efficiency. The Energy Saving Trust may in future wish to send you further relevant information on energy efficiency or other products or services. The Energy Saving Trust may also disclose your details, if relevant, to other organisations who may wish to provide you with relevant information on improving energy efficiency or related products. If you do not wish to receive information from the Energy Saving Trust or to have your details disclosed to these organisations please tick here.