Domestic energy fact file 2008

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Department of Energy and Climate Change

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Summary

This report updates the Domestic Energy Fact File 2003. It includes data up to 2006 as well as developing some of the themes in the previous report.

Section 1 provides an introduction that discusses domestic energy consumption in the context of overall energy consumption. Energy use in the domestic sector accounts for around 30% of total UK energy consumption and has risen by 23% over the last 35 years. Space heating still accounts for over half of energy use in the housing stock. As central heating systems increase there is an expectation of higher internal temperatures. Over the same period the percentage of energy used by lights and appliances has more than doubled. These rises are off-set to some degree by better fabric insulation of dwellings and higher efficiency of heating appliances.

Section 2 deals with fuel prices and household expenditure on energy. It shows that although the retail price index and fuel price index were very similar for much of the period the fuel price index dropped relative to the retail price index at the end of the 1990s but has recently risen rapidly. The proportion of expenditure spent on fuel has dropped to 3.5% in 2006 although this is higher than in 2005.

Section 3 is concerned with basic statistics on population, households and the characteristics of the housing stock in terms of age, tenure, dwelling type and regional distribution. The rising number of households and the trend towards smaller households has contributed towards the overall rise in energy use. There has been a small rise in the proportion of detached dwellings in the stock which tends to increase the average heat loss per dwelling. This is balanced by an increase in the proportion of flats in the stock which tends to decrease the average heat loss per dwelling.

Section 4 looks at the improvements in fabric insulation of the housing stock. It shows that considerable progress has been made in the past few decades. However, only about 16.3% of the stock is considered to be fully insulated. The two most cost effective insulation measures for which Government grants have been available since 1978 – hot water tank lagging and loft insulation – are nearing saturation point. There is remaining potential to increase the depth of loft insulation.

Section 5 deals with hot water tank insulation and combi boilers. Most hot water tanks are now insulated but the number of hot water tanks is being influenced by the increase in the number of combi boilers which do not require a hot water tank.

Section 6 estimates the effect of energy efficiency improvements on energy consumption. It shows a continuing lowering of the heat loss from the housing stock. 91% of homes now have central heating and 14.8% of those with gas or oil boilers have condensing boilers. This partly accounts for an increase in the average efficiencies for heating systems in the housing stock. Average internal temperatures have risen as people expect increasing levels of comfort. It is estimated that energy efficiency measures have saved 51% of energy relative to what would have been consumed under 1970 insulation and efficiency conditions. SAP values have been recalculated using SAP 2005 and show a continuing improvement with an average SAP value of 52 in 2006.

Section 7 looks at the trends and develops an equation which predicts energy consumption over the period. This works well over most of the period, but suggests that in the last couple of years consumption is being constrained by factors not included, which could be due to an increase in fuel price.

Section 8 looks at the primary as well as the delivered fuel use. It shows that carbon emissions from the domestic sector have reduced but are still 38 million tonnes of carbon a year. Carbon emissions have decreased partly due to changes in fuel type for space heating rather than a decrease in total energy consumption. A final energy balance is shown which includes UK values for primary and delivered energy, GB delivered energy and the incidental gains and losses.

Section 9 gives the main conclusions. The report has demonstrated progress in energy efficiency from 1970 to 2006 and suggests that future progress relies on tackling dwellings which are difficult to insulate and by looking at low and zero carbon technologies to continue the progress in carbon saving.

Contents

1 Introduction – domestic energy use in context

Energy use in the domestic sector accounts for a large proportion of total national energy consumption. In the 1970s it accounted for 24-27% of UK energy consumption but since 1980 it has risen to 28-31% of UK energy consumption.

Energy use in the domestic sector has increased due to higher expectations. The increase in central heating systems leads to an expectation of higher internal temperatures throughout the dwelling. There has also been an increase in energy usage due to an increase in the number and range of electrical appliances. However, increases in the fabric insulation of dwellings, both for new dwellings and as refurbishment measures, and higher efficiency of heating appliances has helped to control this increase in energy use.

Later sections of this report will discuss such trends in detail, presenting information which explains what has happened to domestic energy consumption and the factors that affected this over the last thirty five years. Most of the information is for Great Britain (GB) but some tables also give United Kingdom (UK) values. All tables are clearly labelled as to which geographical area they represent.

1.1 Energy consumption 1970 – 2006

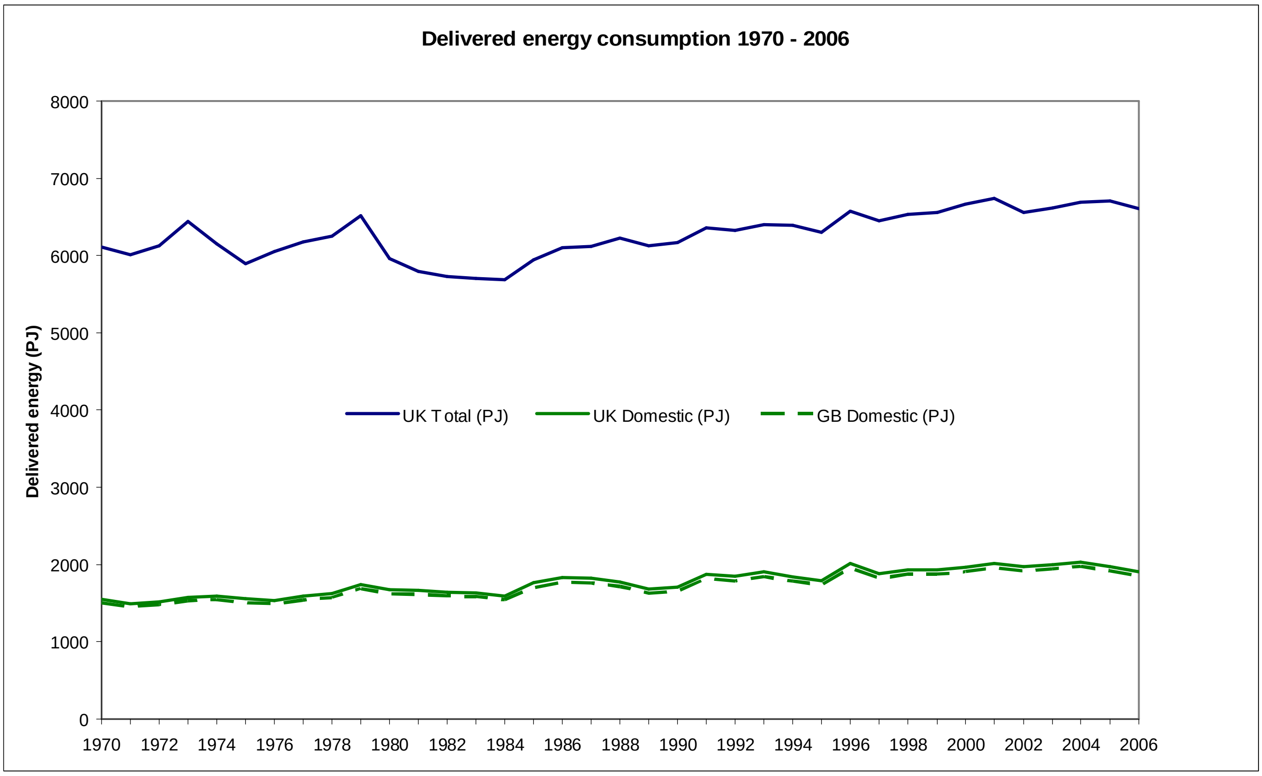

Figure 1 Delivered energy consumption 1970 – 2006

Figure 1 shows the total delivered energy consumption in the United Kingdom from 1970 to 2006.

It also shows the domestic sector energy consumption for Great Britain (GB) and the United Kingdom (UK), the difference between these being the energy consumption in Northern Ireland. Figures for GB have been estimated using UK and regional figures from the *Digest of United Kingdom Energy Statistics* (1)and the *Family Expenditure* (2)or *Expenditure and Food Surveys* (3).

Domestic sector energy consumption is defined as energy used in dwellings. It excludes petrol and other fuel use for family cars (which are classified under transport) and energy used in residential establishments such as hotels.

Most of the information in the rest of this report relates to GB rather than UK. However, it is evident from Figure 1 that the difference between the energy use of the domestic sectors of GB and the UK is small (between 2% and 4%) and fairly constant. Thus GB figures can generally be assumed to apply to the UK when appropriately scaled up. Note, however, that there are some important differences between the energy use and energy efficiency characteristics of the housing stocks of GB and Northern Ireland. See the *Domestic Energy Fact File – England, Scotland Wales and Northern Ireland* (4) for more details of these.

The figures in Table 1 show domestic sector energy use has risen from 24-27% of UK energy in the 1970s to 29-31% since 1996. The size of this proportion and the fact that it is still growing emphasises the importance of improving energy efficiency in the housing stock. The progress that has been made in this area is shown in this report.

2 Fuel prices, income and energy expenditure

Main trends

The amount of energy which households consume is determined largely by the level of service which they wish to achieve (for example, whole house heating or only partial house heating). This level of service determines the energy consumption through physical factors (the insulation standard of the dwelling, the efficiency of heating, appliances etc). The level of service which is chosen, in turn, depends in part on the cost of achieving that level. Clearly, this depends on the cost of the energy used and the disposable income of the household.

Fuel prices, income and energy expenditure are considered in this section and it is shown that, overall, fuel price variations have not had much direct effect on domestic energy use over the past 35 years or so except possibly in the last couple of years. Rather, physical factors, as discussed in the following sections, offer the best explanation of the observed pattern of domestic energy use.

However, although this is true at an overall level, there can be no doubt that in many individual households this conclusion will not apply. For example, in a household which cannot afford to reach its desired level of service there will be a tendency to spend any extra disposable income in getting closer to that level – particularly where the level is very low.

Domestic fuel prices

The average domestic fuel price has not altered substantially in real terms over the period between 1970 and 1996. Although there have been occasional divergences, the domestic fuel price index has broadly kept pace with the retail price index over these years. It is interesting to note, however, that the real price of gas was falling at the time of both oil crises – most markedly at the time of the first oil crisis. This undoubtedly, was a major factor in the rapid establishment of natural gas as the preferred fuel within the domestic sector.

Since 1996 the retail price index has risen faster than the fuel price index and the cost of fuel has fallen in real terms. However in 2002 the fuel price index started to rise again more rapidly and by 2006 had reached similar levels to the retail price index. This trend for increasing fuel prices would make fuel more expensive in real terms in future leading to a potential increase in fuel poverty.

Average household expenditure

The average household expenditure on fuel, light and power over the period has remained relatively constant until the last ten years. In that period there has been a fall in expenditure followed by a rise as fuel prices dropped and then increased again.

Thus one concludes that average energy consumption must have remained relatively constant. As shown later in this report this conclusion is correct.

Therefore, it would appear that fuel prices have not played a major part in determining total domestic energy consumption throughout most of this period. In general households have changed their expenditure in real terms in line with fuel prices, although this may not be true for the last two years.

Individual household expenditure

However, despite the overall constancy of average expenditure, there are many households which are likely to be achieving a lower level of service than they would wish. Up to a certain income level, households invest a higher proportion of extra income on warmth than households earning above that level.

2.1 Retail price index and the index of fuel prices

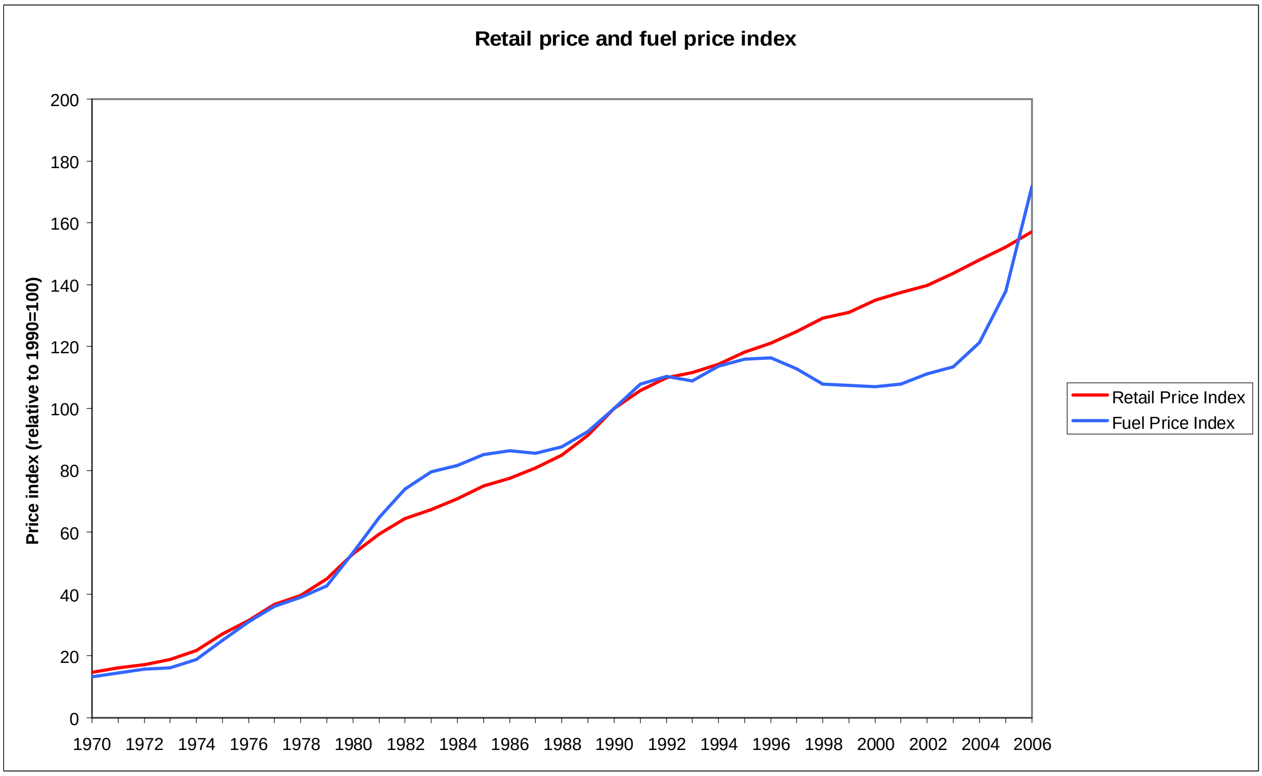

Figure 2 Retail price index and the index of fuel prices

Figure 2 illustrates the change in the index of fuel prices as against the index of retail prices. Between 1970 and 1996 the two indices roughly kept pace with one another. However, since 1996 the fuel price index has fallen with respect to the retail price index and then risen quite dramatically to once again match the retail price index. This indicates an initial fall in fuel prices followed by the more recent increases in fuel prices.

All other things being equal, it might be expected that when fuel prices were falling energy consumption would increase. However, this does not appear to be the case and this report will show later that energy consumption per household has remained fairly constant. This indicates that other factors are at work. This report will present in detail the continuing improvements in energy efficiency which are helping to maintain energy use at its current level.

The figures in Table 2 show the change in retail price index and fuel price index between 1970 and 2006 with 1990 taken as equivalent to 100.

2.2 Domestic fuel prices

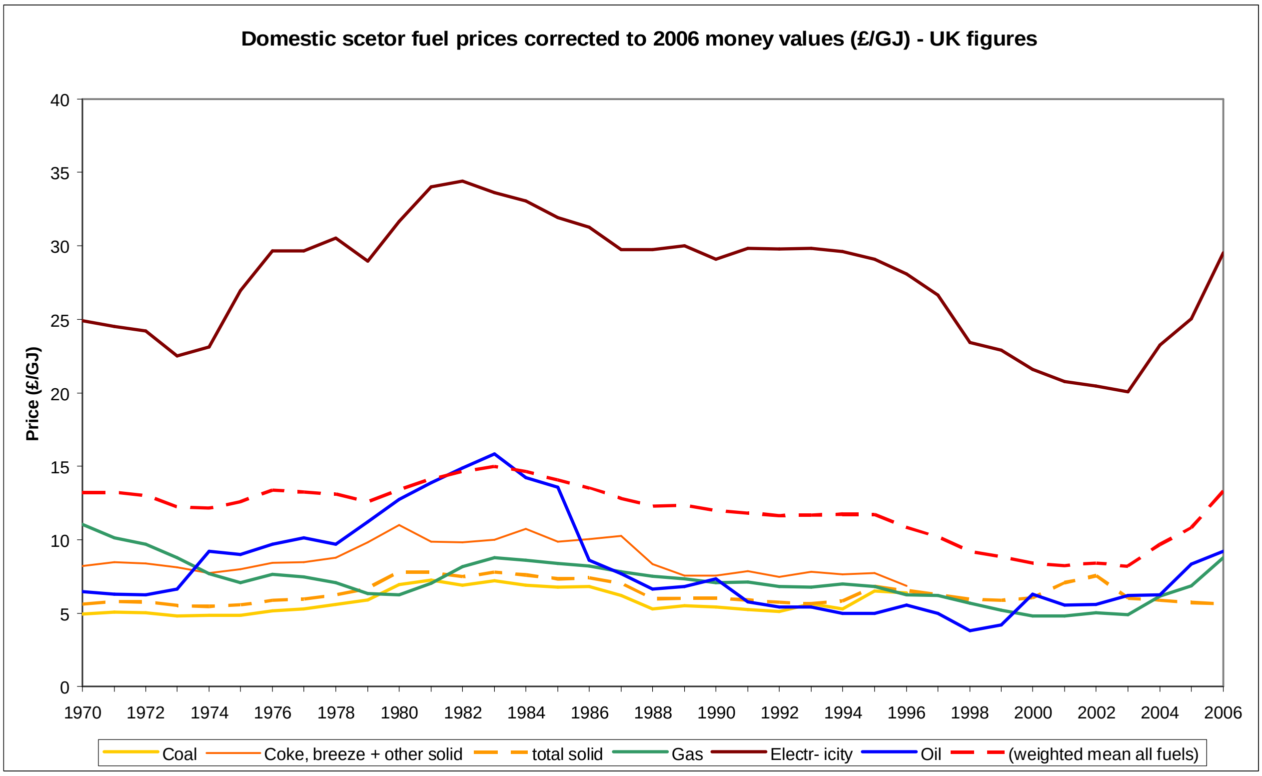

Figure 3 Domestic sector fuel prices corrected to 2006 money values (£/GJ)

Figure 3 shows the average domestic fuel prices corrected to 2006 money values by using the retail price index shown in Table 2. These prices encompass all relevant tariffs and are inclusive of any standing charges and Value Added Tax when appropriate.

The weighted mean shows relatively little variation between 1970 and 1980 but then rises slightly for a few years before falling in the years between 1984 and 2003. Only in the last few years has it started to rise again. This is in line with the pattern seen for the fuel price index.

Individual prices have varied more than the general trend. Oil prices in particular rose sharply in the 70s and early 80s before falling in the mid 80s and remaining at a similar level until about 1999 when they started to rise again. Electricity prices rose in the early 70s and didn't start to drop again until the late 90s. However in 2004 they started to rise again quite steeply returning to the same level as in the 90s. Solid fuel and gas prices have generally been more stable throughout the period. Gas prices fell in the early 70s and started rising again after 2003 but have not yet returned to their 1970 value.

Separate values are available for coal and other solid fuel for the years up to and including 1997. However, domestic consumption of solid fuel has decreased to the point where it is no longer possible to provide disaggregated values on current sample sizes.

2.3 Household expenditure on fuel, light and power

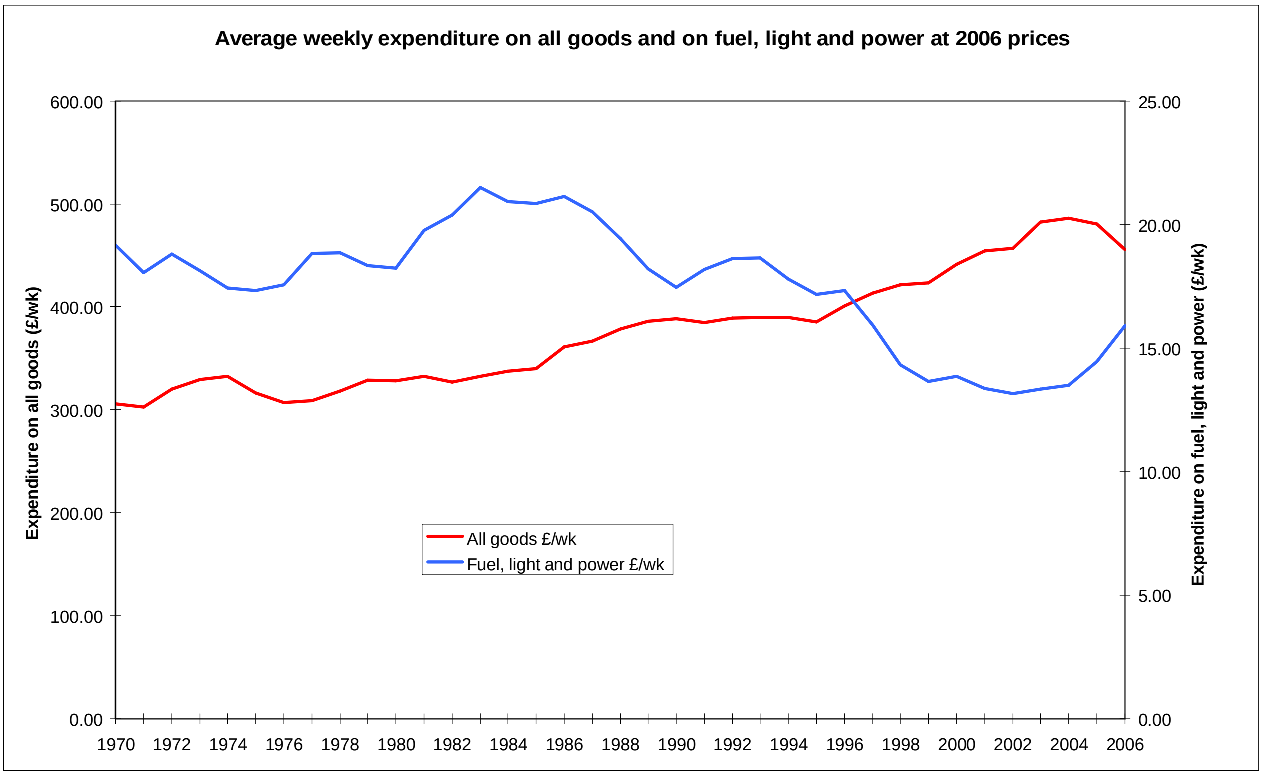

Figure 4 Average weekly expenditure on all goods and on fuel, light and power at 2006 prices

Figure 4 shows the average weekly expenditure on all goods and that on fuel, light and power corrected to 2006 values. Expenditure on all goods shows a steady increase from 1970 to 2005 with a slight drop in 2006. Expenditure on fuel, light and power is more volatile. It increased quite steeply between 1980 and 1983 but then fell back to previous levels. From 1996 it fell quite sharply for a few years before once again levelling out, but in 2005 it started to rise again.

Table 4 shows the proportion of expenditure on fuel light and power has fallen from 6.3% in 1970 to 3.5% in 2006, this is an increase on 2005 where the proportion was 3.0%.

2.4 Household income and weekly expenditure

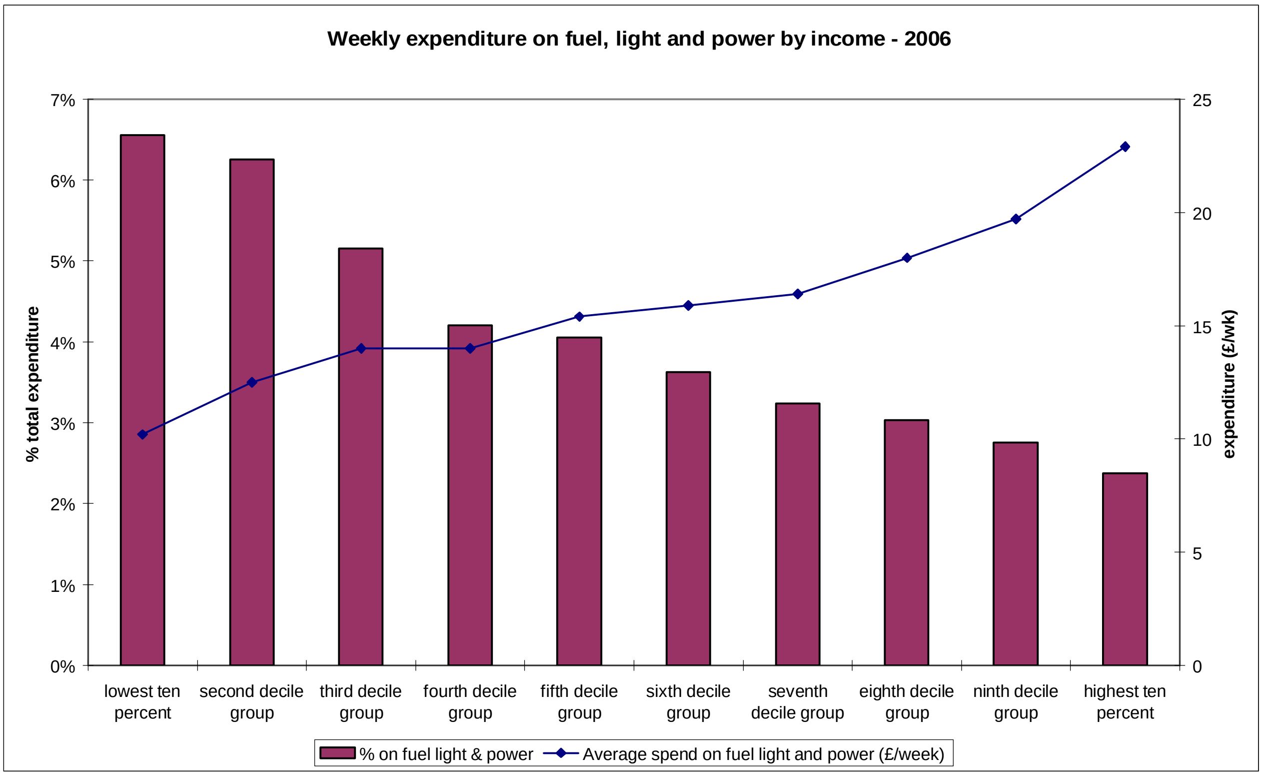

Figure 5 Weekly expenditure and percentage expenditure on fuel, light and power

Figure 5 shows the average weekly expenditure on fuel, light and power related to income for 2006. The percentage of weekly expenditure spent on fuel, light and power increases as income falls.

In 1996 households in the lowest ten per cent income group were spending 9.9% of weekly expenditure on fuel, light and power; by 2001 this had fallen to 6.0% but by 2006 it had risen again to 6.6% . Households in the top ten per cent income group were spending 2.8% in 1996 and 1.9% in 2001, again by 2006 this had risen to 2.4%. The increase in the percentage spent on fuel, light and power is related to the recent increase in fuel prices.

Reductions in earlier years can be attributed to energy efficiency improvements discussed later in this report. In 2001 the government published the UK Fuel Poverty Strategy and the 5th Annual Progress Report for this strategy for 2007 can be accessed at www.berr.gov.uk/files/file42720.pdf This shows that although the numbers in fuel poverty had been falling there was a rise of around 0.5 million households in 2005. Those who are in fuel poverty spend more than 10% of their income on fuel, light and power and have been targeted by government schemes to raise the energy efficiency of their houses using government grants. However any increase in fuel prices will bring more people into fuel poverty.

3 Population, households and the housing stock

Main trends

National domestic energy use is affected by the size of the population and the number of households. It is also affected by the composition of the building stock in terms of age, type, tenure and regional distribution.

Number and size of households

The number of households has increased while the number of occupants per household has decreased. The trend to smaller households would result, all other things being equal, in a higher consumption per capita.

Age of stock

The growth of the housing stock has been subject to increasingly strict thermal requirements from the Building Regulations. Demolition tends to be of older, less well insulated dwellings. Thus, this tends to improve the efficiency of the stock over time.

Effect of tenure

Owner occupation has become an increasingly popular form of tenure. This makes more occupiers directly responsible for the thermal performance of their own dwelling.

Dwelling types

There has been a small growth in the proportion of detached dwellings in the stock which tends to increase the average heat loss per dwelling. However, there has also been an increase in the proportion of flats in the stock which tends to decrease the average heat loss per dwelling. These increases in proportion are balanced by a slight decrease in the proportion of terraced and semi detached dwellings.

Geographical location

Climatic variations have a large effect on heating requirements. Regional distribution of the housing stock is biased towards the warmer south east of Britain. The regional distribution has changed very little over the years.

3.1 Population and the number of households

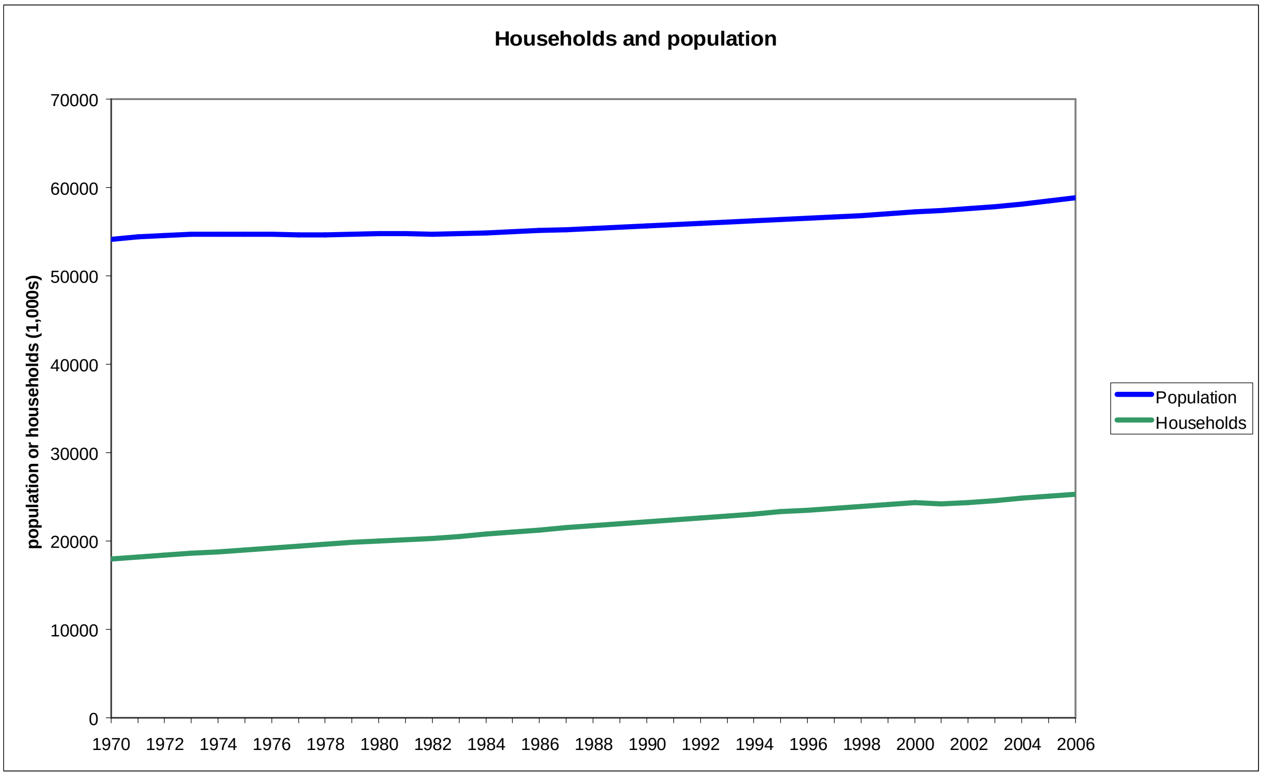

Figure 6 Households and population

Figure 6 shows the total population and the number of households in Great Britain. Since 1970 the population has increased by 4.7 million while the number of households has increased by 7.3 million implying that the mean household size has decreased. Table 6 shows that the mean household size has decreased from 2.9 in 1970 to 2.3 in 2005 (the last year for which data is available).

The decrease in the household size is due to the trend towards smaller families and a larger number of single people living alone. Energy consumption relates to the number of people in the household but there is a minimum level of consumption related to the running of the house which is independent of household size. The trend towards smaller households will lead to a higher per capita energy consumption, all other things being equal.

Table 6 shows both the mean household size taken from the General Household Survey (5) and the household size defined as population divided by households. Mean household size is a more appropriate measure for assessing energy consumption as it excludes residents of institutions, members of the armed forces and others not living in dwellings.

3.2 Age of the housing stock

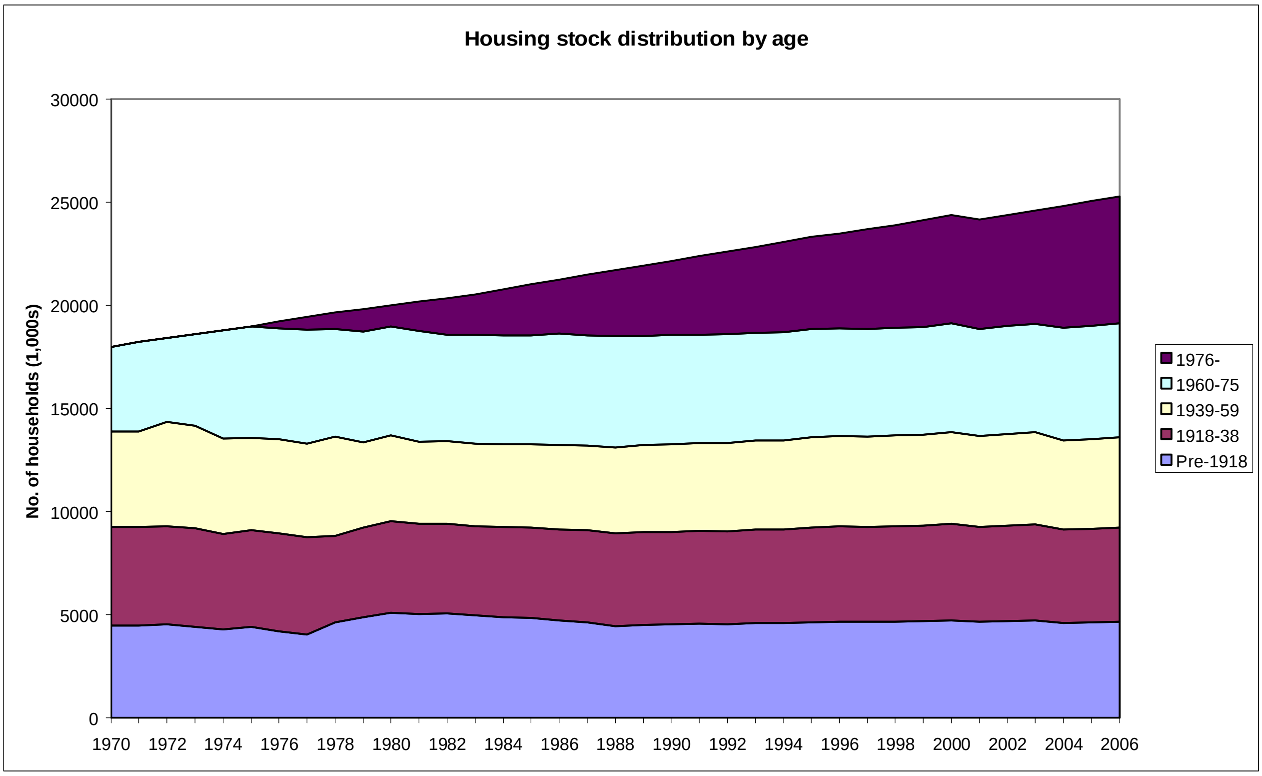

Figure 7 Housing stock distribution by age

There are a number of age related factors which influence the energy consumption of a building. The increase in number of dwellings each year comes from newly built dwellings and conversion of older buildings into multiple dwellings. At the same time dwellings are being demolished. These are generally older properties built to lower thermal standards.

New dwellings are built to more stringent Building Regulations which control the thermal characteristics of the dwelling. Building Regulations changes in 1965, 1976, 1982 and 1990 improved the U-values of roofs and walls while the 1990 Building Regulations also introduced a U-value requirement of 0.45 W/m^{2} ^{o}C for ground floors.

More recent changes in 2002 mean that the majority of dwellings will be built with filled cavity walls and have double glazing. There has been a move away from specifying individual element U-values and towards a target for carbon emissions. Consequently under the 2006 Building Regulations a condensing boiler is generally required in order to meet the standard.

A goal for zero carbon emissions from all houses built in 2016 onwards has been set by the government.

3.3 Housing stock distribution by tenure

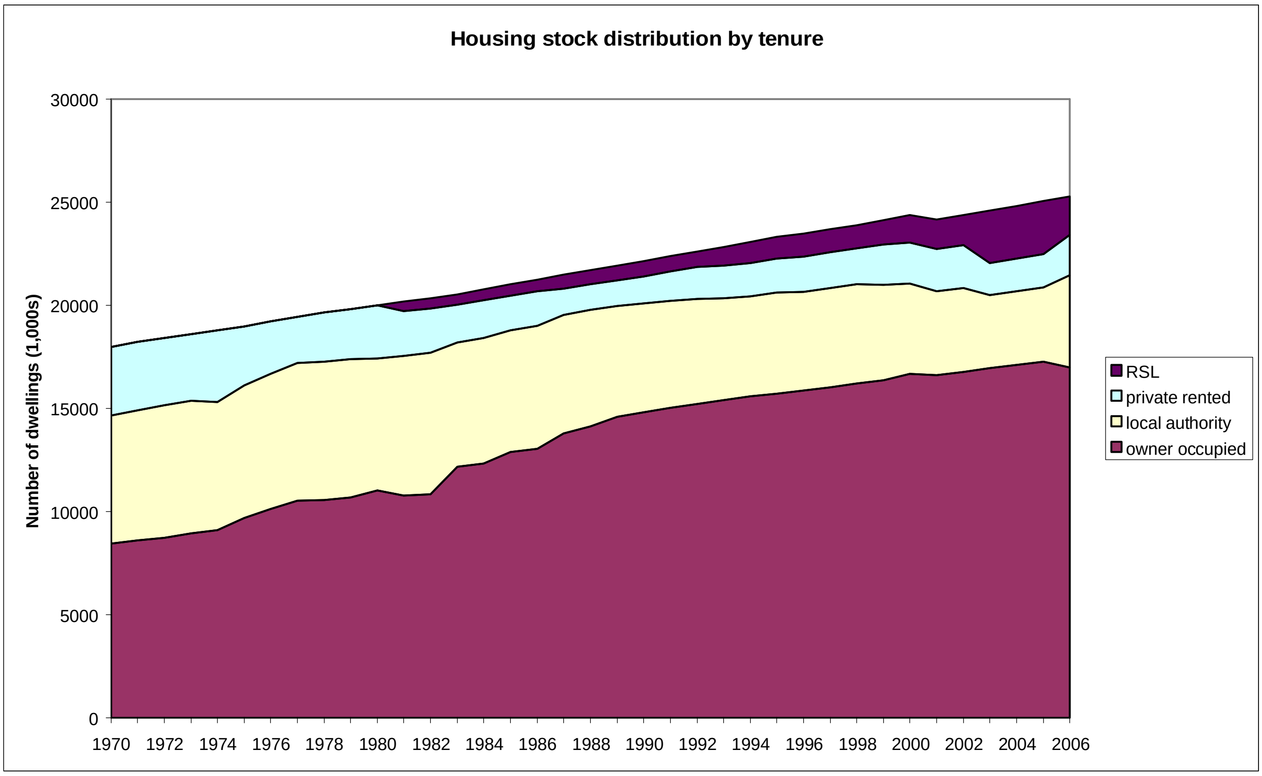

Figure 8 Housing stock distribution by tenure

Figure 8 shows the distribution of the housing stock by tenure. The proportion of owner occupied dwellings has increased from 46% in 1970 to 67% in 2006.

During this period the percentage of privately rented dwellings has dropped from 19% to 8%. Local authority stock has also fallen from 35% to 18% largely due to Right to Buy and Stock Transfer policies.

Registered social landlords now account for 7% of stock. These are mainly housing associations.

Owner occupiers are more likely to invest in energy saving measures than those in private rented accommodation. For example in 2004 95.5% of dwellings with accessible lofts that were owner occupied had loft insulation while only 79.1% of those that were privately rented had loft insulation.

Local authorities and registered social landlords have, in recent years, made efforts to improve their stock and in 2004 93.7% of local authority stock and 94.1% of registered social landlord stock had loft insulation. (see *Domestic Energy Fact File (2006): Owner occupied, Local authority, Private rented and Registered social landlord homes* (6))

3.4 House types

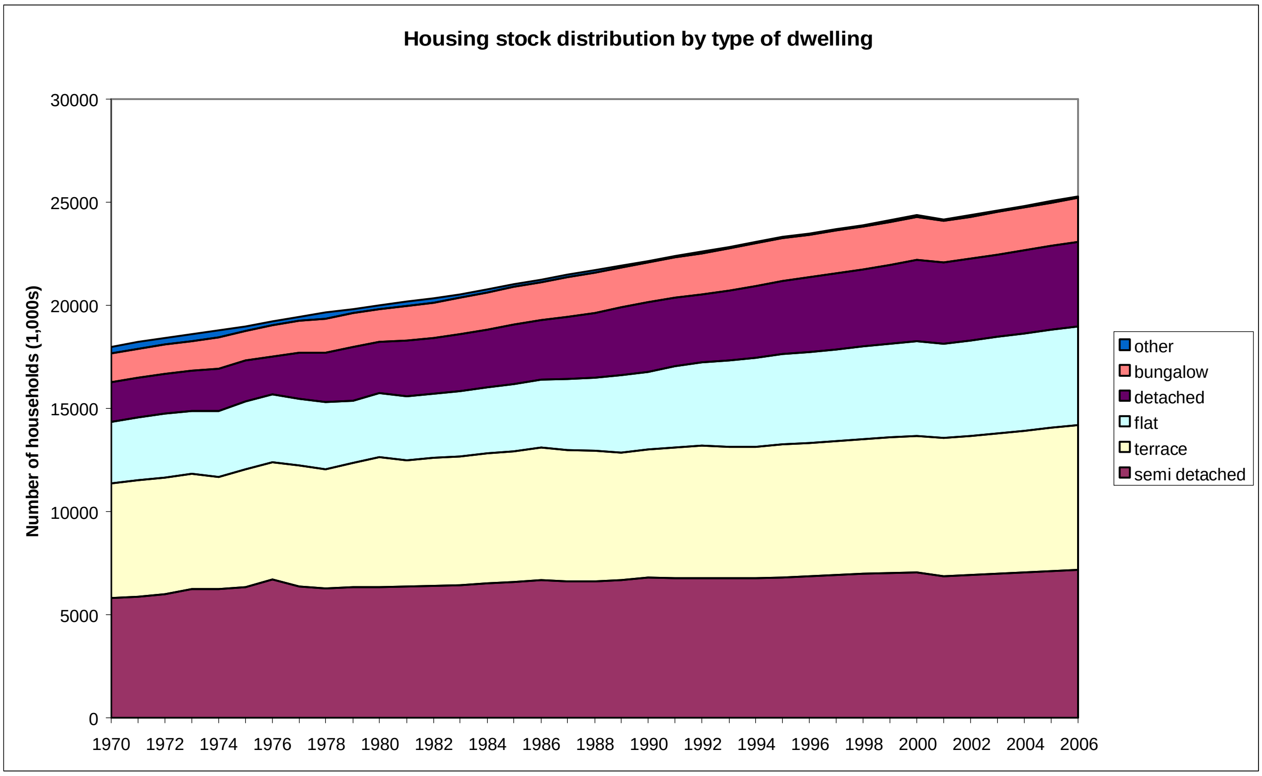

Figure 9 Housing stock distribution by type of dwelling

The proportion of different dwelling types has changed slightly since 1970. Detached houses have increased by 5% and flats by 2% while terraced and semi detached houses have decreased by 3% and 2%.

A detached house will have a greater surface to volume ratio and hence will have a greater heat loss than any other dwelling built to the same standard using the same materials. Detached houses are also likely to have a greater floor area than other types of dwelling. Flats have a smaller surface to volume ratio and hence a lower heat loss. They are also likely to have a smaller floor area.

Such considerations mean that the characteristic heat losses of different dwelling types are appreciably different. For example, typical average heat loss of existing dwellings would be as follows:

Detached	342 W/^{o}C
Semi detached	264 W/^{o}C
Terrace	235 W/^{o}C
Bungalow	225 W/^{o}C
Flat	167 W/^{o}C

The overall average heat loss for all dwellings currently in the housing stock would be about 247 W/^{o}C.

The increase in the proportion of detached houses will tend to increase the average heat loss of the stock while the increase in the proportion of flats will tend to decrease it. As heat loss is also being affected by changes to insulation it is not possible to say if this change in proportions will give an overall increase or an overall decrease in the average dwelling heat loss.

3.5 Regional distribution of the housing stock

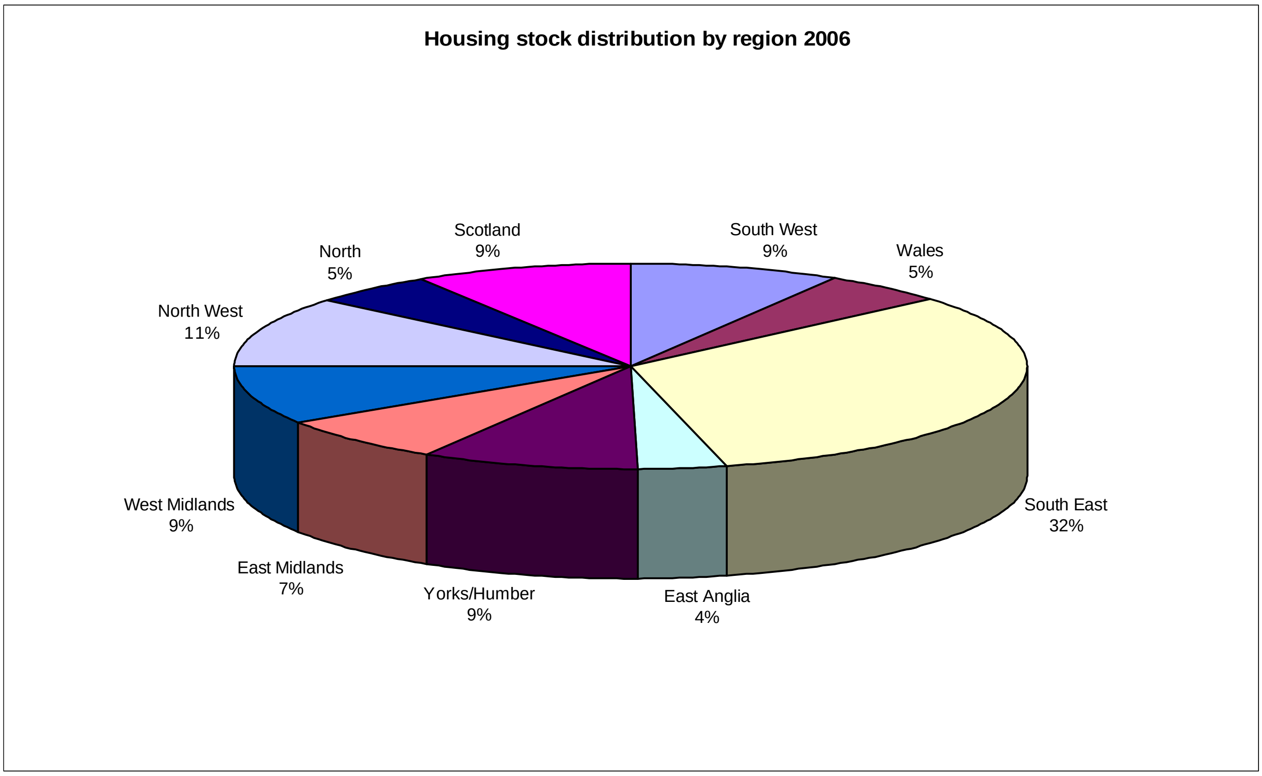

Figure 10 Housing stock distribution by region

Energy consumption will differ for identical houses in different regions because of climatic differences. A house in Scotland, in an average year, will require nearly 45% more energy to maintain a given temperature than the same house in the South West.

Figure 10 shows that in 2006 nearly one third of households were in the South East. The percentages in each region change very little with time.

4 Fabric insulation

Main trends

Figures on the acquisition and ownership of insulation measures have been gathered since 1974 by the market research organisation GfK Marketing Services Ltd (formerly G & A Marketing Services Ltd) as part of the GfK Home Audit. Figures from this source have been adjusted pro rata to those elsewhere in this report for total number of households.

Take up of insulation

The measures covered have been loft insulation, cavity wall insulation, double glazing, draught proofing and hot water tank lagging (the last of these being discussed in the next section, section 5).

There has been an increase in the proportion of houses in which insulation measures have been installed and a saturation level appears to have been reached for the two most obviously cost effective – hot water tank lagging and loft insulation. These are also the two measures for which grants were made available under the Homes Insulation Scheme. This scheme ran from 1978 to 1990. Current schemes, such as Warm Front and the Energy Efficiency Commitment (in future to be known as CERT, the Carbon Emissions Reduction Target) include these and other measures. These schemes are aimed, either wholly or partly, at the fuel poor and other priority groups. In particular they include cavity wall insulation which potentially can save more energy than loft and tank insulation but has a longer payback period for the initial capital cost.

Potential for take-up

The tables covering insulation measures include a column labelled 'potential'. For loft insulation this is the number of houses with accessible lofts. For cavity wall insulation the 'potential' is the number of houses with cavity walls. However, in this case it is recognised that in some situations it will not be possible to fill these walls. This is the case where there are likely to be problems with rain penetration or where the cavities are unsuitable due to size or obstructions within the cavity. Not all houses have hot water cylinders so the 'potential' is only those homes with cylinders. Other measures, such as double glazing, are not limited to a particular type of home and the 'potential' is the whole housing stock.

Influences on up-take

Owner occupied homes are the least likely to have no insulation. There is evidence of higher proportions of insulated dwellings where the householder is in a better position to pay for the insulation or where consumption levels are high so that the incentive to save is greater. RSL dwellings are amongst those with the greatest up-take of full insulation measures.

4.1 Loft insulation

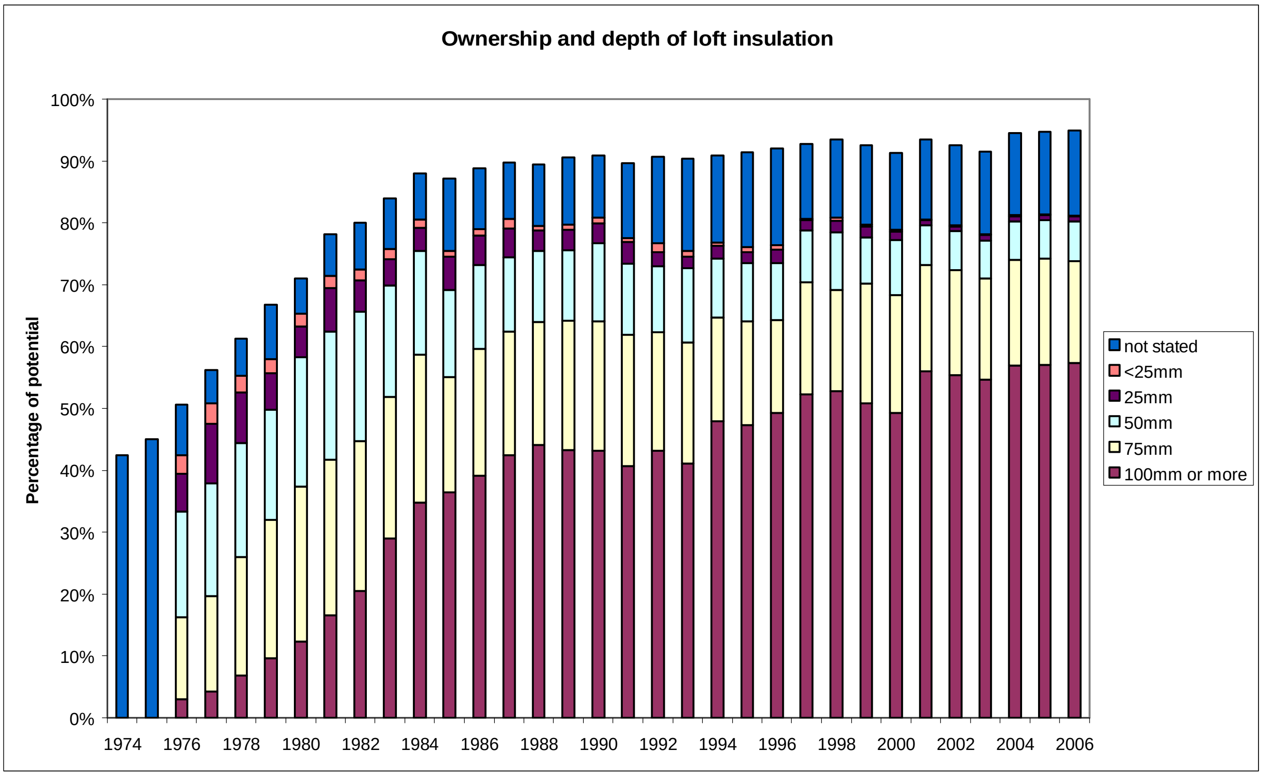

Figure 11 Ownership and depth of loft insulation

GfK data is supplied in depths measured in inches. Figures here are presented in mm as this is the unit more generally used. 4 inches is taken to be equivalent to 100mm.

In 1974 there was some loft insulation in 42.5% of accessible lofts. This had increased to 94.9% by 2006 and has been above 90% since 1986.

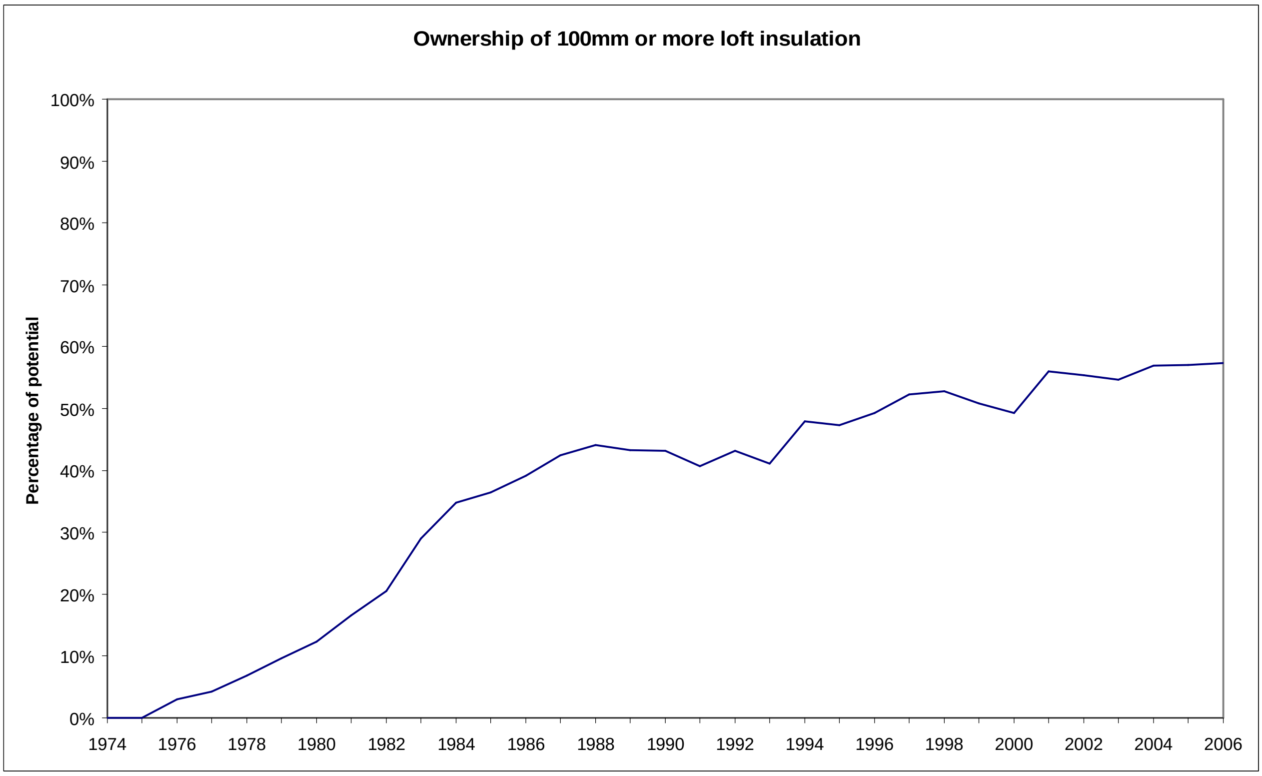

Figure 12 Ownership of loft insulation of depth 100mm or more

The ownership of loft insulation has saturated at 90-95% of potential, however, the depth of loft insulation has been increasing. Figure 12 shows the increase in ownership of loft insulation to a depth of 100mm or more. Loft insulation up to 100mm in depth can generally be placed between the roof joists, but with increasing depth it is necessary to place a second layer of insulation across the joists. In 2006 57.3% of lofts had 100mm or more of insulation and 20.5% had 150mm or more of insulation.

4.2 Cavity wall insulation

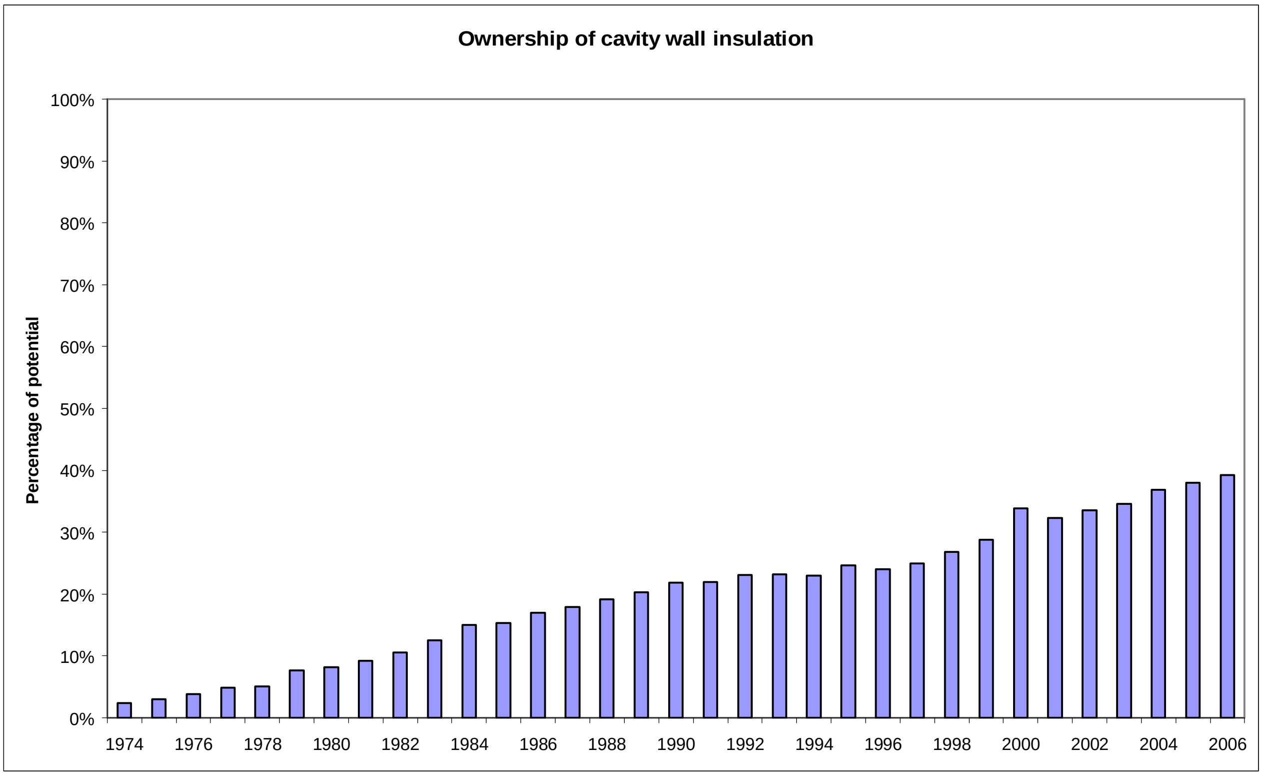

Figure 13 Ownership of cavity wall insulation

In 1974 2.4% of cavity walled houses had cavity wall insulation. By 2006 this had risen to 39.3%. Tightening of the Building Regulations has effectively meant that in recent years all cavity walls are built with insulation thus increasing the percentage which are insulated. Grants too have increased the up-take of cavity wall insulation.

Table 12 shows that a high proportion of those with cavity walls do not know if the walls are insulated. This means that the percentage with cavity wall insulation may be as high as 81% if all those who do not know if they have insulation do have it. However, this is unlikely. The latest figures from the English House Condition Survey show 41% of those with cavity walls have insulation, so it is reasonable to assume that those who don't know if they have cavity wall insulation probably do not have it.

As previously mentioned there are also a small number of cavities which are unsuitable for filling thus reducing the potential slightly.

4.3 Double glazing ownership

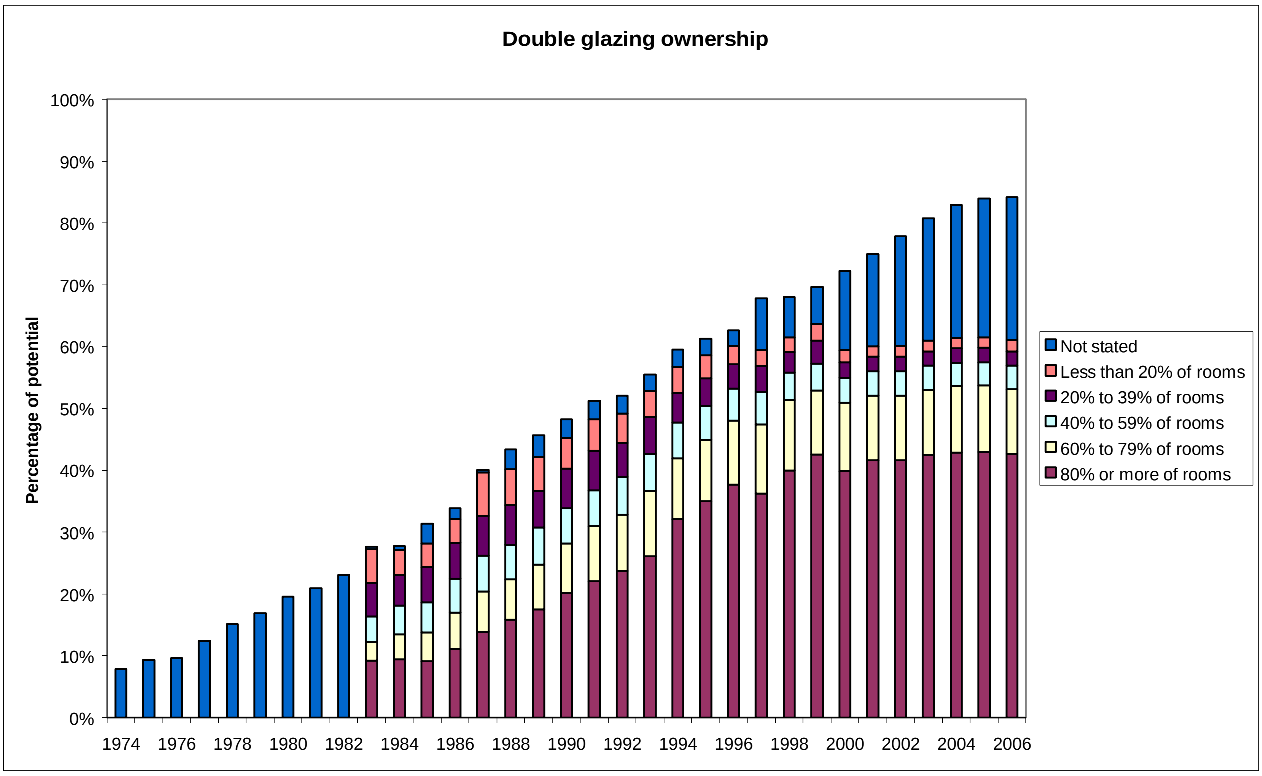

Figure 14 Double glazing ownership

Double glazing ownership has increased from 7.8% of households in 1974 to 84.1% in 2006. This is more than twice the uptake for cavity walls despite the cost being considerably more. In order to meet the Building Regulations most houses now being built will have double glazing.

Double glazing is rarely cost effective in terms of energy saving alone but it does have other benefits which are attractive to householders. If the windows have deteriorated to the point where they need replacing they now, in most circumstances, have to be replaced with double glazing to meet the Building Regulations introduced in 2002.

Additional information on the extent of double glazing, in terms of number of rooms treated, has been available since 1983. In 1983 9.2% of households had 80% of rooms double glazed. By 2006 this had risen to 42.7% with a further 10% having 60-79% of rooms double glazed. Again there are cases where the percentage of rooms double glazed is unknown so that the percentage ownership will tend to be an under estimate. However it is possible to say that in 2006 more than half of households had more than half of their rooms double glazed.

N.B. double glazing in this section includes both sealed units and windows with secondary glazing.

4.4 Draught proofing

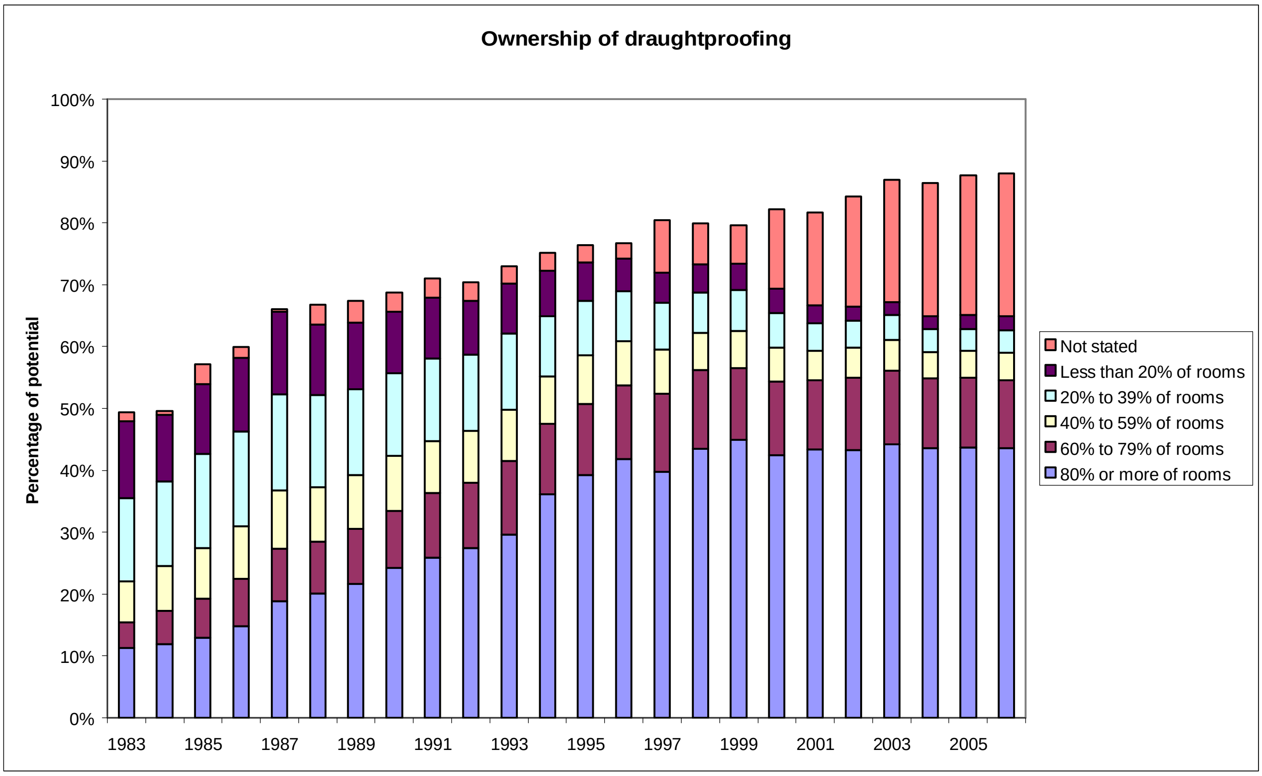

Figure 15 Ownership of draught proofing

Figure 15 shows ownership of draught proofing. Draught proofing has been defined as including single glazed windows that have been draught stripped as well as double glazed windows (because double glazing incorporates integral draught seals).

Some households have both some double glazing and some draught stripping. It is necessary in these cases to do further analysis to determine whether they are one and the same thing. This can only be done for years after 1987 where the data necessary for cross tabulations are available. Fortunately the number of such cases is small so their exclusion in earlier years does not distort the general trend.

In 1983 49.4% of households had some draught proofing and 15.4% had at least 60% of rooms draught proofed. By 2006 88% of households had some draught proofing and 54.6% had at least 60% of rooms draught proofed. As can be seen by comparison with the previous topic a large proportion of the draught proofing is as a result of double glazing.

4.5 Insulation ownership

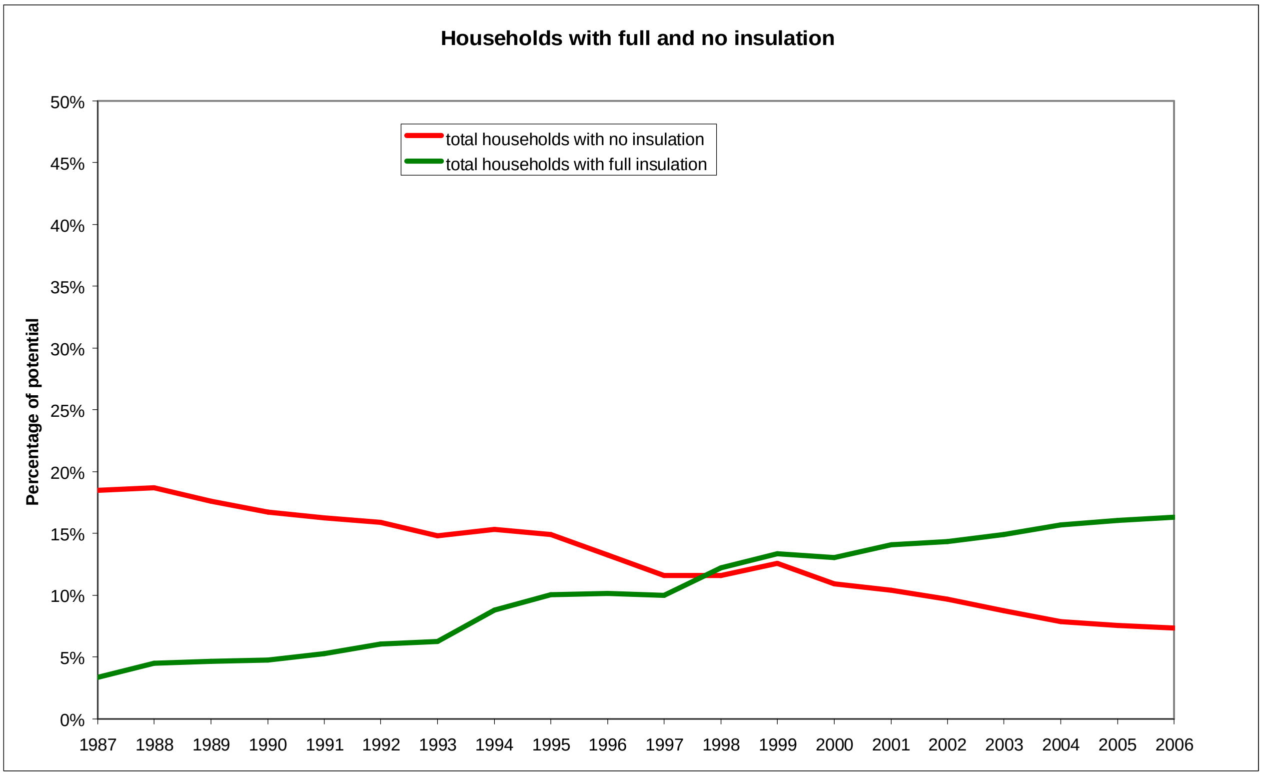

Figure 16 Households with full and no insulation

The previous charts have shown how individual fabric insulation measures to increase energy efficiency have been adopted over the last 35 years or so. In Figure 16 we can see how these measures combine. It shows that the percentage of dwellings with all insulation measures has been increasing while those with no additional insulation measures have decreased.

These are defined as:

Full insulation:	At least 100mm of loft insulation where there is a loft
	Cavity wall insulation where there is a cavity
	At least 80% of rooms with double glazing
No insulation:	No loft insulation where there is a loft
	No cavity wall insulation where there is a cavity
	No double glazing

Dwellings having either no loft or solid walls will fit into the appropriate category if they have or lack the other measures, i.e. a dwelling with solid walls with 100mm of loft insulation and 80% of rooms double glazed is fully insulated, whereas, one with no loft, no cavity wall insulation and no double glazing has no insulation according to these definitions.

In 1987 only 3.4% of households had full insulation but by 2006 this had risen to 16.3%, an improvement but still less than a fifth of the housing stock. Those with no insulation had fallen from 18.5% in 1987 to 7.4% in 2006, showing that there is now only a small percentage of the stock which does not have at least one insulation measure installed to an acceptable standard. The vast majority of houses built under the 2002 Building Regulations will be in the fully insulated category so the percentage of fully insulated should continue to rise.

5 Hot water tank insulation and combi boilers

Main trends

Whilst the insulation levels in the fabric of the average house have been increasing there has also been an increase in the insulation of hot water tanks. This has occurred in two different ways. Firstly through the addition of hot water cylinder jackets, the thickness of which has increased progressively with time as insulation standards have been raised. More recently, however, hot water cylinders have been replaced with ones that incorporate a factory bonded layer of foam insulation.

Insulating hot water tanks obviously reduces the energy needed for water heating, but by reducing the heat losses from the tank to the dwelling it actually results in a slight increase to the space heating requirements.

Instantaneous water heating

In recent years the number of homes that have no hot water tank has begun to increase quite markedly, thereby reducing the potential for tank insulation. Various forms of instantaneous water heating exist but it is clear that this trend is being driven by the increasing popularity of combi boilers. Central heating systems using combi boilers do not have hot water cylinders (although the boiler unit itself generally incorporates a small integral store).

5.1 Hot water tank insulation

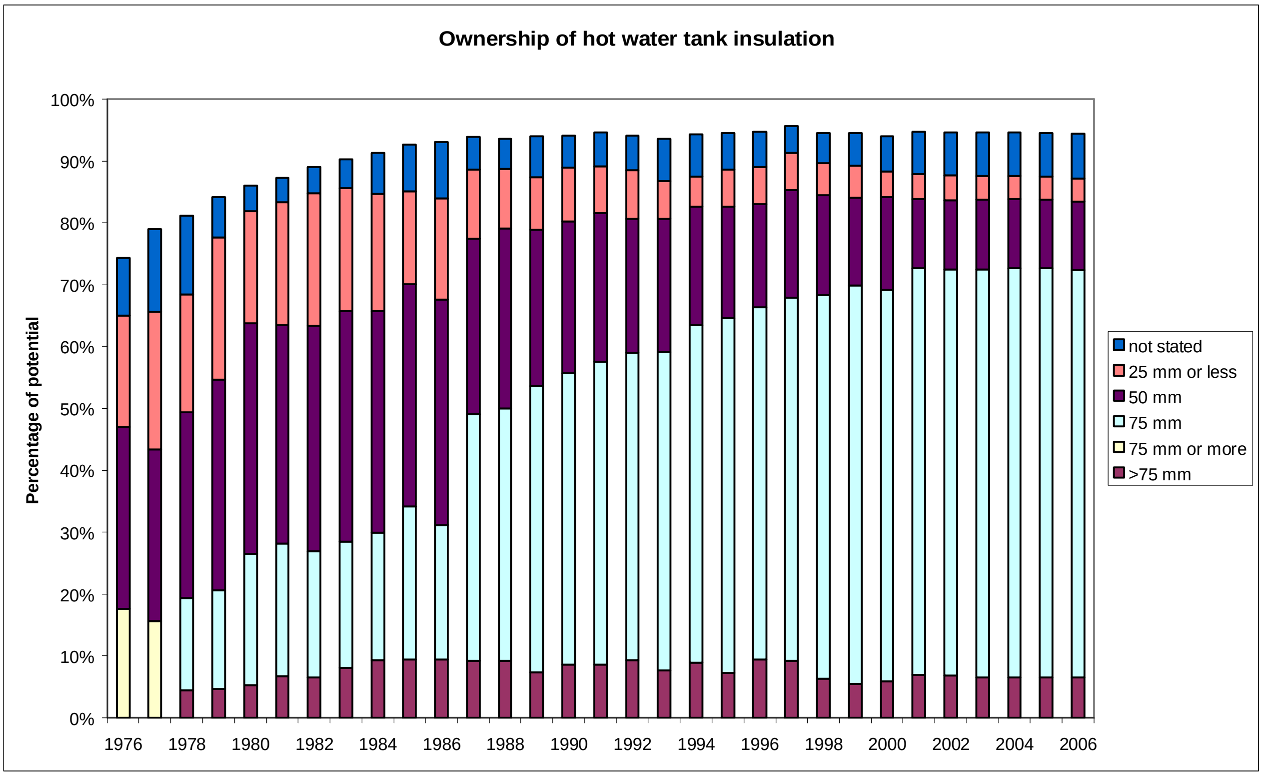

Figure 17 Ownership of hot water tank insulation

The energy efficiency measures considered so far are all measures which affect the heat loss through the fabric of the house. The insulation of hot water tanks is different in that it affects the heat loss from the tank and hence the cost of providing hot water. A decrease in heat lost from the hot water tank can result in an increase in the energy necessary to heat the house.

Insulation of the hot water tank with a loose fitted jacket is, however, a very cost effective measure. It is cheap and simple to install and usually pays back within one year.

In 1976 74.3% of households with hot water tanks had insulation. By 2006 this had risen to 94.4%. It has been at about this level since 1990 so would appear to be close to saturation. In 1976 only 18% of relevant households had 75 mm or more of insulation but in 2006 this had risen to 72%.

Many tanks are now factory insulated. These normally have about 25mm of insulation but this is equivalent in thermal performance to a jacket of about 75 mm. Prior to 1987 such insulation was recorded as the estimated actual thickness but since 1987 it has been recorded as 75mm to better reflect the true insulation properties. This is the reason for the slight discontinuity in 1987 that is evident in Figure 17.

Not all dwellings have hot water tanks as in some water is heated by instantaneous water heaters. The potential is therefore less than the total number of households. Since the mid 1980s the potential has been falling relative to the total number of households and this is clearly related to the introduction of combi boilers (see Figure 18)

5.2 Combi boilers

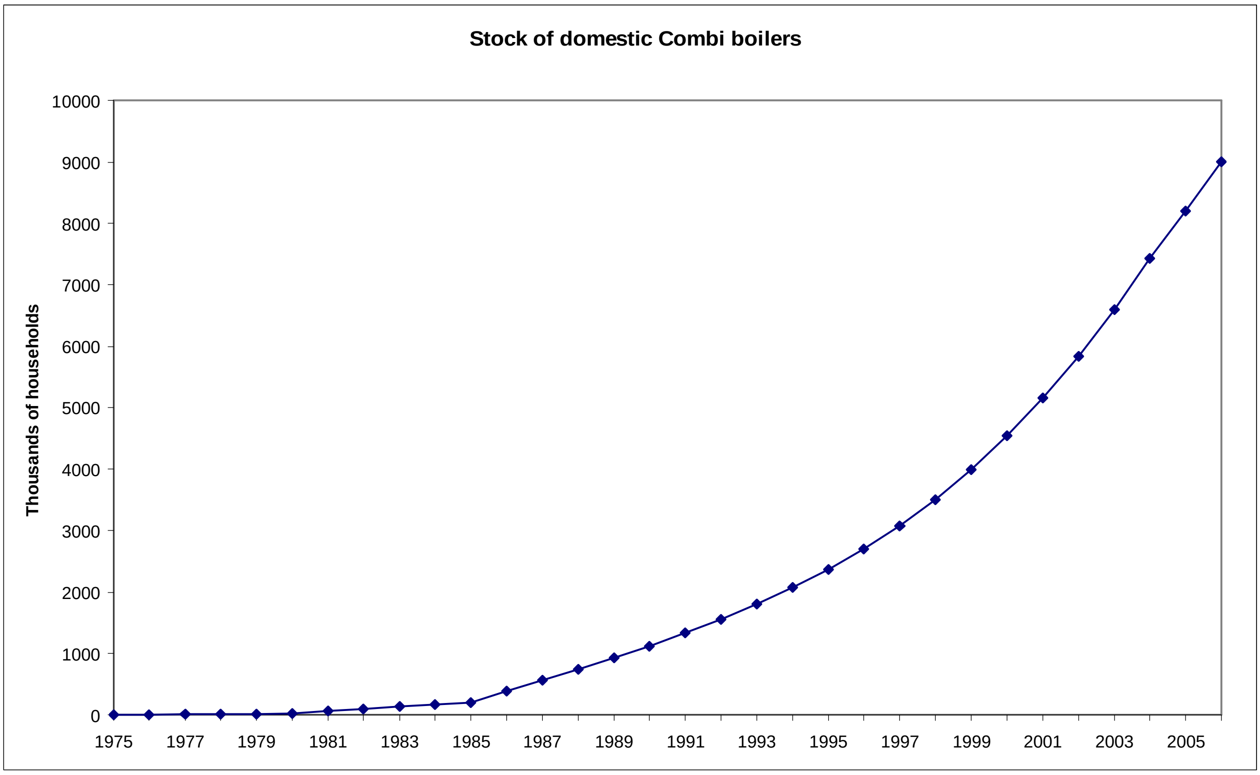

Figure 18 Ownership of combi boilers

Figure 18 shows the rapidly growing ownership of combi boilers. These do not require a hot water tank as the hot water is heated directly from the boiler as required.

In terms of energy efficiency this is a positive trend because it does away with the inevitable losses associated with storing large amounts of hot water. Combi boilers are also relatively efficient, although there have been some concerns expressed that the build up of scale in hard water areas may reduce their efficiency over the lifetime of the boiler. The Energy Saving Trust is currently carrying out work to assess this and other issues related to efficiencies achieved in practice.

6 Energy consumption

Main trends

This section presents overall trends in energy consumption in the context of the variables which affect it. The effects are summed up in Figure 28 and Table 27 – 'the effect of energy efficiency improvements'. The improvements are also summarised in terms of an energy rating for the average dwelling in Figure 29 and Table 28.

External temperatures, heat loss and energy consumption

Space heating accounts for the major part of energy used in the average home. The strength of the relationship between domestic energy consumption and external temperature depends on the proportion of energy use which is for space heating. This, in turn, depends on the heat loss of the average dwelling. As the heat loss reduces, a greater proportion of the total energy use goes towards end uses which are not related (at least not strongly related) to external temperature.

The quantity of energy required for space heating is related to external temperature. The insulation measures covered in sections 4 and 5 will have affected only space heating and water heating consumptions. Tank insulation acts to reduce water heating consumption whilst other insulation measures reduce space heating. A large part of the reduction in average heat loss is attributable to loft insulation. However, since most lofts now have some insulation it is the increasing depths of insulation which are providing further savings. This does not generate as great a saving as other measures such as cavity wall insulation and double glazing.

Central heating and increased comfort levels

Other things being equal, energy for space heating would have increased with the increasing proportion of houses having central heating (Figure 21 and Table 20) and with growing expectations of comfort in both centrally heated and non centrally heated homes (Figure 27 and Table 26). The trend towards more central heating and higher comfort levels will probably continue until such time as a saturation level is reached, corresponding to the attainment of desired levels of comfort by all households.

Despite the growth in ownership of central heating and increased standards of comfort, space heating energy consumption per household has hardly changed over the period under consideration (Table 25).

Efficiency of appliances

The rising trends in energy consumption have been offset by better standards of insulation (detailed in section 4 and summarised in Figure 16) and improved heating appliance efficiencies (see Figure 25). There has also been an increase in the incidental gains from appliances but a decrease in gains from lighting due to the introduction of at least some low energy lighting in many homes.

Total energy consumption figures include energy that has been used for space heating, water heating, cooking, lighting and the running of electrical appliances. All these categories of energy consumption will have been affected by the increasing numbers of households and by the improvements in the efficiencies of appliances. Increasing numbers of households will have tended to raise consumption but improving efficiencies will have acted to reduce consumption.

The delivered energy requirement of houses has undoubtedly been reduced by improvements in the efficiencies of heating appliances. It is difficult to quantify precisely this improvement in terms of an average efficiency in 1970 compared with an average efficiency calculated on the same basis in 2006. Table 24 attempts to do this. However, before considering this table, it is necessary to look briefly at what is known about improvements to heating appliance efficiencies. The discussion focuses on gas appliances as gas is the most used fuel for heating and so has the greatest influence on overall changes to heating efficiency. Also detailed data on some other forms of heating is rather sparse.

Over the past few years much work has been done on characterising the in use efficiencies of boilers in connection with the Standard Assessment Procedure. There is now a database for most gas and oil boilers (both current and obsolete) that may be accessed on the internet at www.boilers.org.uk. Data is provided by manufacturers and based on results certified by an independent Notified Body (accredited for the testing of boilers to European standards). The efficiencies quoted are the seasonal efficiencies based on the average annual efficiency achieved in typical domestic conditions, making reasonable assumptions about pattern of usage, climate, controls and other influences. It includes factors such as boiler type, fuel, ignition type, internal store size and UK climate and pattern of heating.

Conventional boilers achieve efficiencies of about 80% whereas modern condensing boilers may achieve 90% or more. In 1970 the average efficiency of gas boilers would have been closer to 70%. Boilers with a permanent pilot light will be less efficient than those with automatic ignition, however, most boilers manufactured since 1998 will have automatic ignition. With Government funding the Energy Saving Trust is conducting trials to assess the in-situ efficiencies of condensing boilers which will report towards the end of 2008.

Through the Market Transformation Programme a boiler model for the housing stock has been developed. This model contains information on historical efficiencies and when fed with assumptions about future trends it provides estimates of future efficiencies. The historical information from this model has been used to update and revise the average heating efficiency figures that are presented in this section.

Basis of calculations – BREHOMES

To investigate the interactions between the above factors, the Building Research Establishment Housing Model for Energy Studies (BREHOMES) has been used. Some tables in this section rely on the analyses of that model. The BREHOMES model has been used to calculate the heat losses of different types of dwelling. Sufficient data is available for more than twenty of the years between 1970 and 2006 to do this annual calculation on the stock and for those years, generally at the beginning of this period, where insufficient data is available it has been interpolated from adjoining years. These calculations have used the same information that is presented in section 4. The BREHOMES calculations of heat loss rely on factual statistical data where it exists, but inevitably, some assumptions have to be made where the available data is less robust.

End uses

Among the tables there is one (Table 25) which gives a breakdown of domestic energy consumption between the categories of end use mentioned above – space heating, water heating, cooking and lights & appliances. This table is a little more tentative than some of the others for a number of reasons. Firstly, there is no factual statistical source on which one can base such figures. By using BREHOMES, however, it is possible to make informed estimates.

Even so, it has to be recognised that the categorisation of end uses is not unequivocal. For example, because space and water heating are often supplied using the same appliance, there is no uniquely correct way of allocating the total consumption between space heating and water heating. Any such allocation is largely a matter of definition or convention. The numbers in Table 25 need to be viewed with this in mind – they are indicative rather than definitive figures.

6.1 Energy consumption and external temperatures

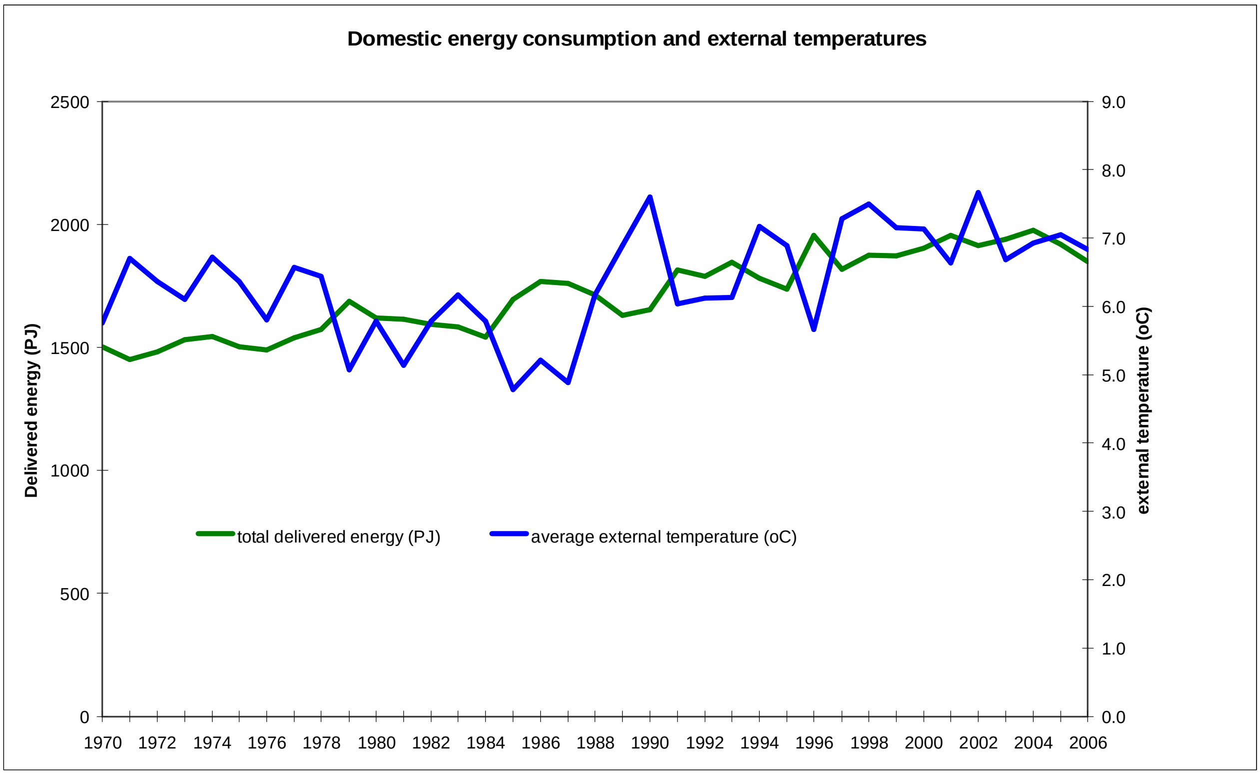

Figure 19 Domestic energy consumption and external temperatures

Figure 19 shows the relationship between energy consumption and average external temperature for the six winter months. The lowest temperatures generally correspond with the peaks in energy consumption. The effect of the cold winters of 1979, 1985, 1986, 1987 and 1996 can be seen.

Table 18 shows the average consumption per dwelling. Between 1970 and 2006 domestic energy consumption rose by 23.1%. In the same period the number of households rose by 40.6% so the average consumption per dwelling has actually fallen.

6.2 Heat loss of the average dwelling

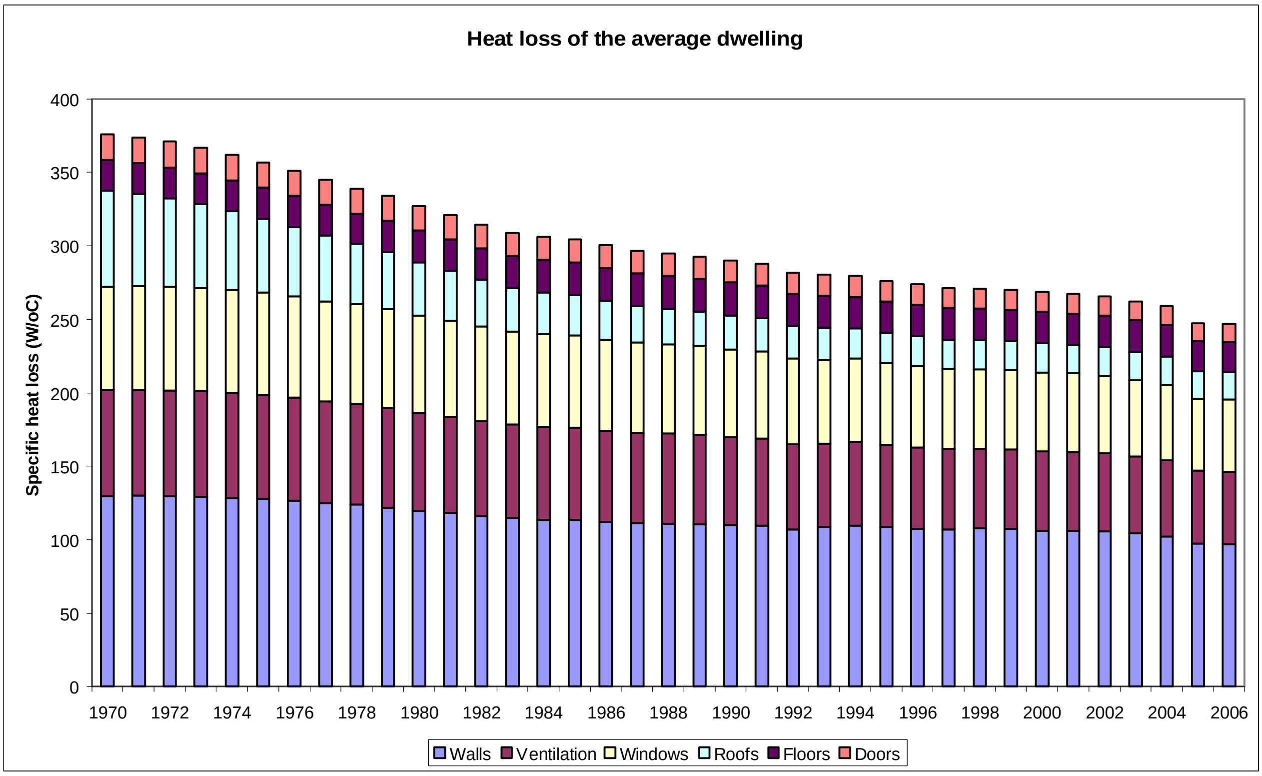

Figure 20 Heat loss of the average dwelling

Values for the heat loss of the average dwelling are shown in Figure 20 and Table 19. These figures have been calculated using the BREHOMES model and they show how the heat loss of the average dwelling has improved considerably over the years. In particular it is noticeable that the heat loss through the roof has decreased on average over the years as levels of loft insulation have increased.

The rate of heat loss of a dwelling is usually expressed as the specific rate in Watts per degree Celsius of difference in temperature between internal and external environments: hence the notation W/^{o}C in Figure 20 and Table 19. As indicated in the figure and the table, the specific heat loss rate includes both losses through the fabric of the dwelling and ventilation losses. The term *specific heat loss* is commonly replaced, for the sake of brevity, by *heat loss*. This practice has been adopted throughout the *Domestic Energy Fact File*.

Space heating consumption is not directly proportional to heat loss. This is mainly because of the contribution which is made to meeting the space heating requirement by other energy uses (heat from electrical appliances, cookers, etc.) and natural gains (heat from dwelling occupants and from solar energy. If these free gains were to remain constant then a given reduction in dwelling heat loss would result in a more than proportionate decrease in the heat supplied by the space heating system. The BREHOMES model suggests a 1% reduction in dwelling heat loss typically results in a 1.5% reduction in the heat supplied by the space heating system.

The final column of Table 19 shows the heat loss of the entire housing stock. The stock heat loss fell from the 1970s to the early 1980s. It then changed very little until about 2000, after which, it started to fall again.

This suggests through the 1980s and 1990s the rate of improvements to insulation were only keeping pace with the tendency to a larger heat loss due to the growth of the stock. Since 2000 the rate of improvements to insulation has started to accelerate again.

6.3 Central heating ownership

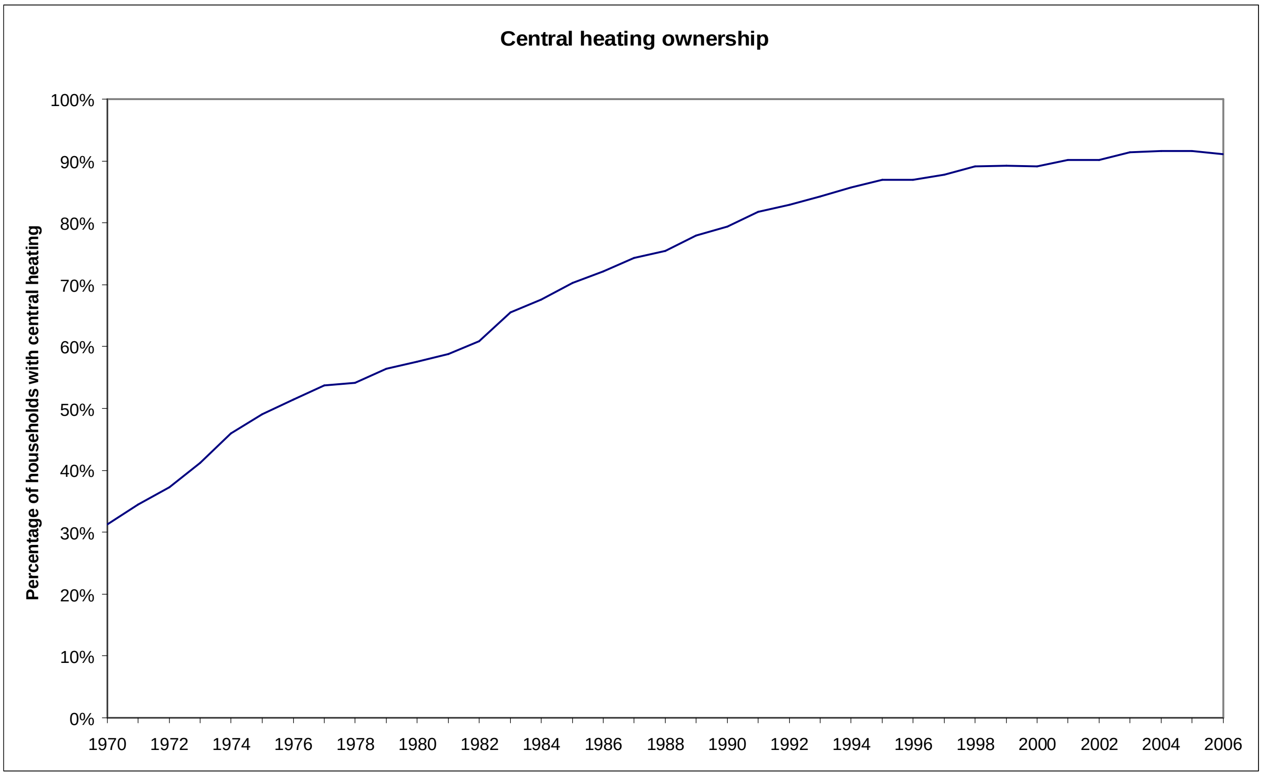

Figure 21 Central heating ownership

Only 31% of homes had central heating in 1970. By 2006 this had risen to 91%.

Central heating appliances are generally more efficient than individual room appliances so, for a given requirement for useful space heat in a dwelling, they would be expected to use less delivered energy.

However, installation of central heating is usually associated with a considerable increase in the occupant’s comfort expectation, particularly in respect to the number of rooms heated, and hence an increase in the useful heat requirement. As a result unless there is a concurrent improvement in insulation, an average centrally heated house would require about twice as much delivered energy for space heating as would a similar house in which only the living room is heated.

This proportion would be higher for a house with poor levels of insulation. On the other hand, it would be lower for a well insulated house where heat transfer from the living room can often achieve comfort temperatures throughout the house. In a very well insulated house, therefore, it may only be necessary to install a simple system of one or two room heaters instead of a full central heating system.

6.4 Heating appliances and efficiencies – central heating

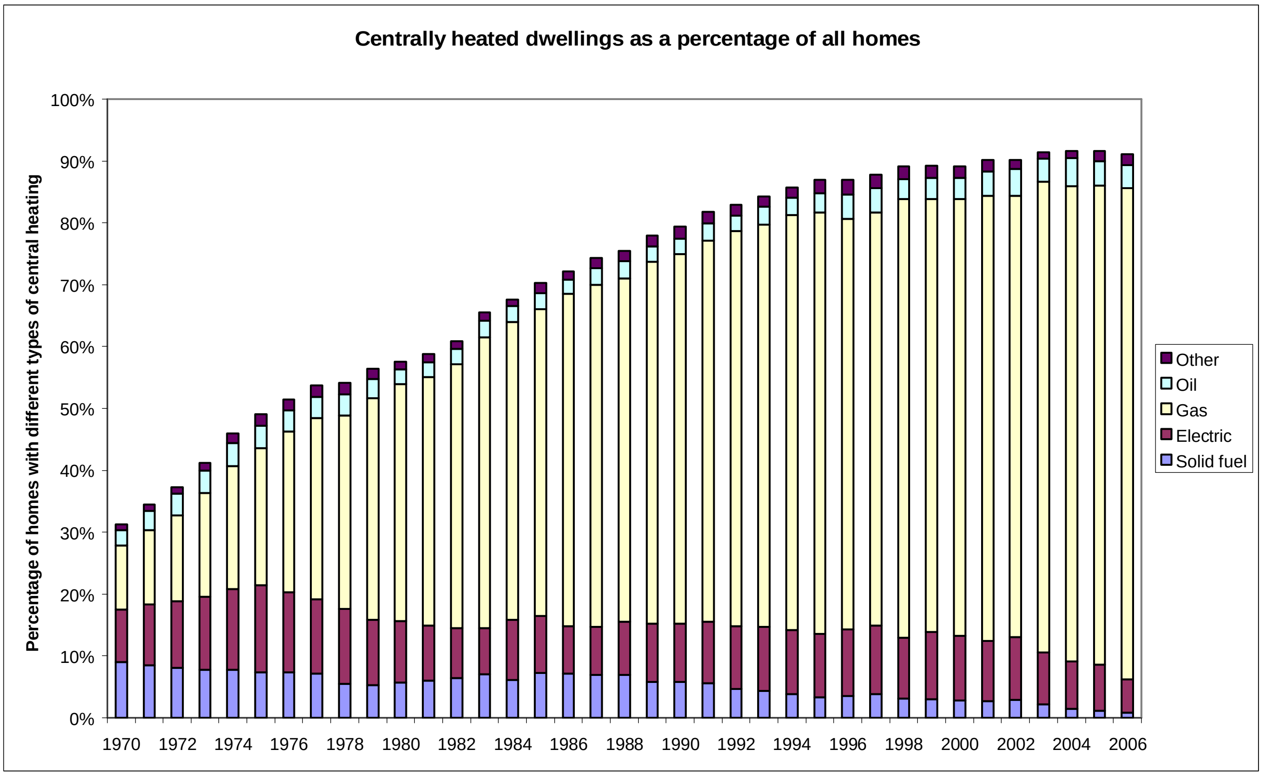

Figure 22 Main form of heating. Centrally heated homes as a proportion of all homes

Figure 22 shows the percentage of homes which are centrally heated by the different types of fuel. The overall growth in central heating ownership can be seen to be largely driven by the massive increase in gas central heating.

The ownership of gas fired central heating appliances has increased from 33% of centrally heated dwellings in 1970 to 87% in 2006. In contrast the use of solid fuel central heating shows a marked decline from 29% of the total households with central heating in 1970 to 1% in 2006.

The growth in gas central heating has brought with it a considerable improvement in the average heating efficiency (see Figure 25 and table 24).

6.5 Heating appliances and efficiencies – non central heating

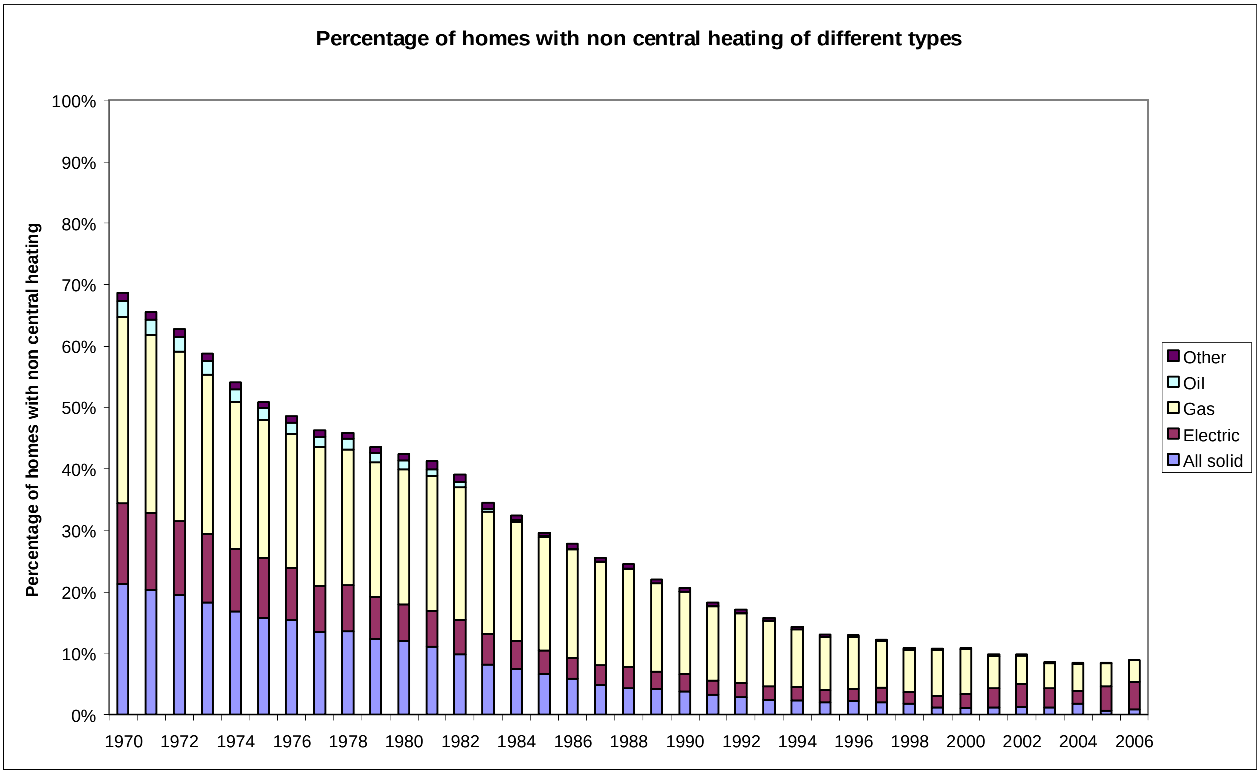

Figure 23 Main form of heating. Non centrally heated homes as a proportion of all homes

The number of non centrally heated homes has fallen steadily between 1970 and 2006. In 2006 only 8.9% of the stock was non centrally heated compared to 68.7% in 1970.

The figures clearly show that the use of all forms of non central heating has declined. However, the proportion of those using gas was increasing until the early 1990s. Since 2000, the proportion using gas has started to decrease and the proportion using electricity has increased. This may be due to an increase in the percentage of flats where electricity is more commonly used for heating.

6.6 Heating appliances and efficiencies – condensing boilers

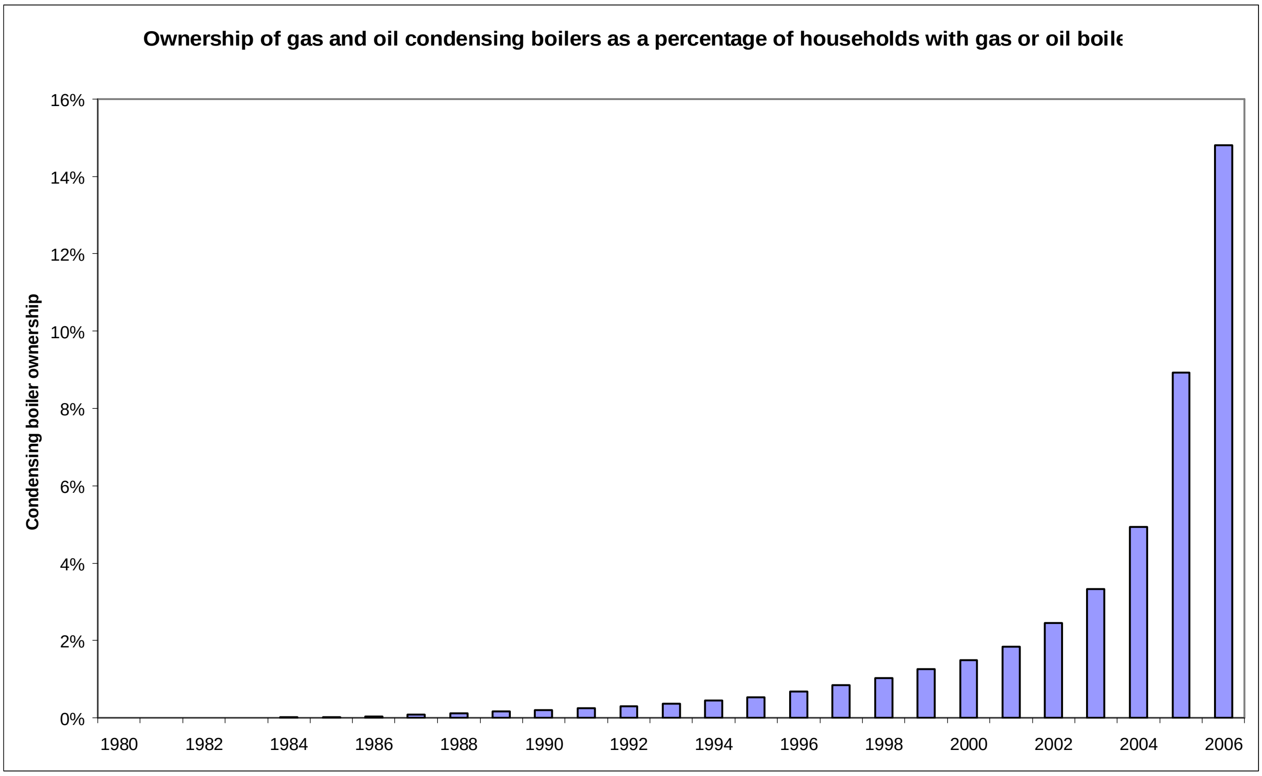

Figure 24 Condensing boiler ownership

The growth in gas central heating illustrated in Figure 22 has led to improved heating efficiencies within the stock as will be seen in Figure 25. Initially this was due to the replacement of inefficient forms of heating, such as open coal fires, with modern conventional gas boiler systems. In the 1980s, however, a new type of boiler known as a condensing boiler was introduced having a significantly higher efficiency than a conventional boiler. The introduction of these boilers, coupled with legislation that sets minimum efficiencies, has accelerated the trend towards increasing average heating efficiencies. Since April 2005 the minimum efficiency has been set so that in all but a few exceptional cases all new central heating boilers will be condensing.

In 2000 only 1.5% of those with gas or oil boilers had condensing boilers. By 2006 this had risen to 14.8% and by 2020 the Market Transformation boiler model shows it to be over 70%.

6.7 Heating appliances and efficiencies

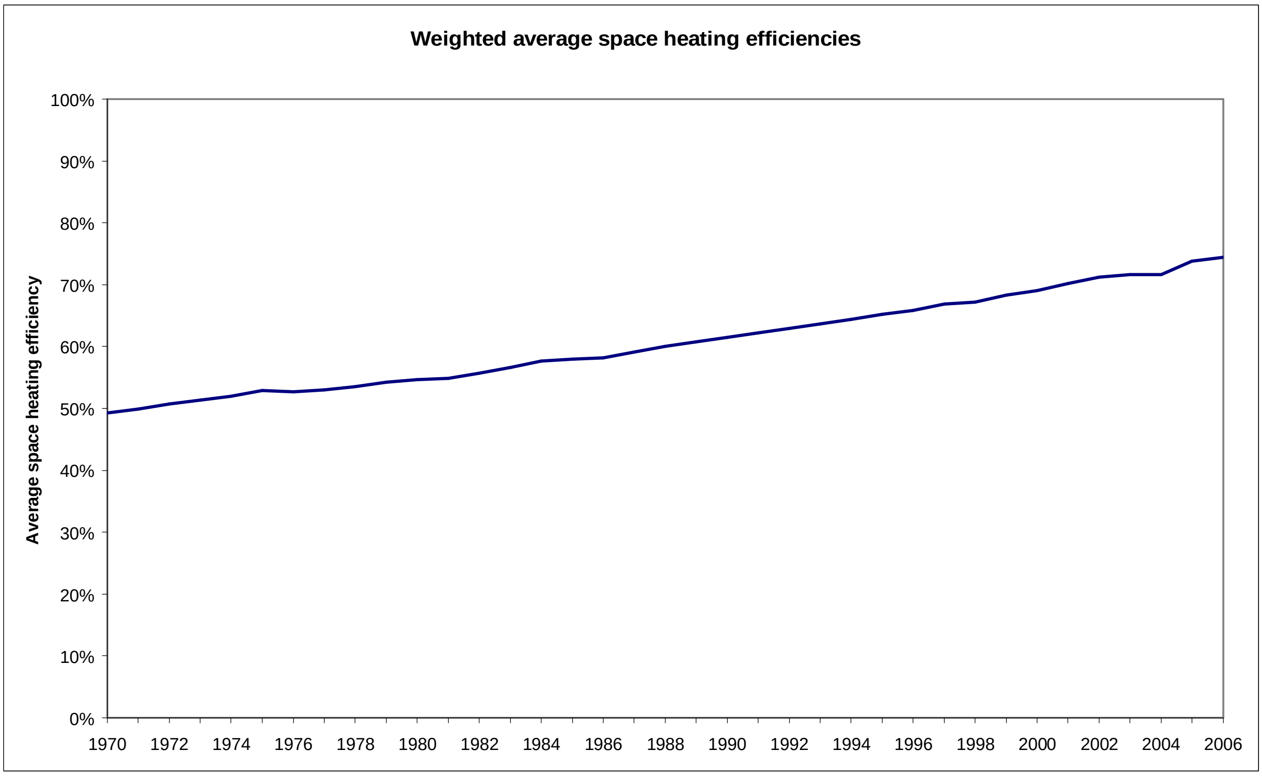

Figure 25 Weighted average space heating efficiencies

In estimating the average level of heating appliance efficiency, more confidence can be placed in the improvement over the years than in absolute values. In the past average efficiencies have been influenced more by changes from one fuel to another (i.e. largely from solid fuel to gas) and from individual fires to central heating, rather than through improvements to the efficiency of particular appliances. Now that over 90% of dwellings have central heating, efficiency improvements will come mainly from increased efficiency of boilers, in particular, the increasing number of condensing boilers, illustrated in Figure 24.

DEFRA's Market Transformation Programme aims to bring forward products, systems and services which do less harm to the environment, using less energy, water and other resources. As part of this programme work has been carried out looking at the efficiencies of boilers and at the current boiler stock. The resulting boiler model has provided information that is now being used in BREHOMES.

6.8 Energy consumption by end use

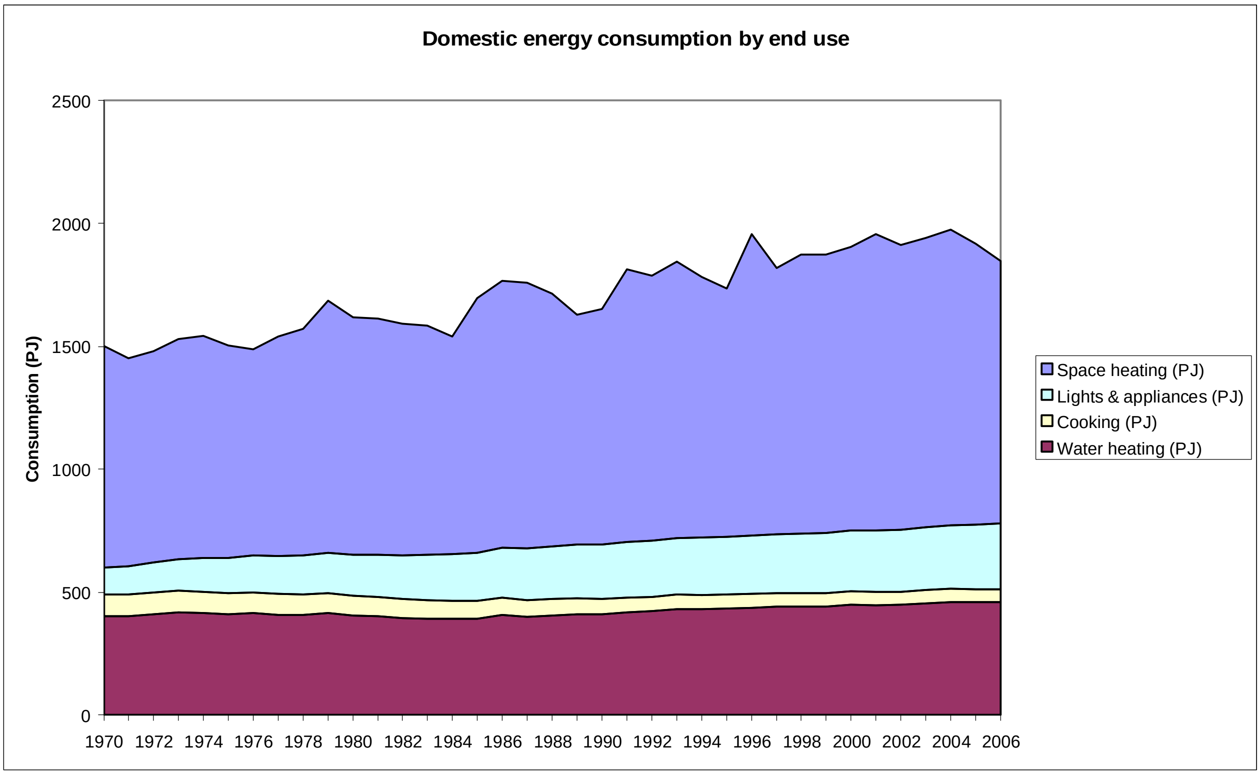

Figure 26 Domestic energy consumption by end use

The figures for the breakdown of domestic energy consumption by end use shown in Table 25 are a little more tentative than most of the others in this report. It is beyond the scope of this report to give exact details of how the estimates have been obtained. The following is a brief summary of the methodology.

The figures in Table 25 show total delivered energy for each end use. The figures were actually calculated fuel by fuel and then totalled. For electricity, the breakdown between space and water heating broadly follows estimates produced by the former Electricity Council and that between lights & appliances and cooking is based on the most recent estimates made by the Environmental Change Institute (ECI) of Oxford University for the DECADE project. The ECI figures for gas cooking have also been adopted for this edition of the Domestic Energy Fact File. It is interesting to note that the consumption for lights & appliances has risen considerably over the years – although this end use still represents a relatively small part of the total delivered energy.

Electricity estimates for cooking have been used to derive figures for the cooking consumptions for solid fuel and oil. Knowing the number of households using these fuels for cooking together with the efficiencies relative to electric cookers, it is possible to deduce the total delivered energy for cooking. In fact there are very few households using these fuels for cooking so the calculated amounts are small and hence not very critical in determining an overall cooking consumption.

Water heating consumption by fuels other than electricity has been based on an estimate of the average volume of hot water used per person together with figures on the proportions of households heating water using different fuels. The volume of hot water used per person has been assumed to rise in proportion to household incomes. The overall efficiencies of water heating appliances include an element to adjust for the loss from the hot water tank which reduces according to the level of tank insulation.

Having estimated the delivered energy for each fuel for each of the above mentioned end uses and knowing the total domestic energy consumption by fuel, the space heating energy use is obtained as the difference.

In all the years, space heating consumption is estimated to be around 60% of total consumption, varying only from 56.4% in 1976 to 62.7% in 1996. Interestingly, these two years are amongst the coldest with average external temperatures of 5.8°C and 5.7°C, suggesting the percentage used for space heating is not necessarily related to external temperature although generally in colder years the percentage used for space heating is higher. In the last three years the percentage of consumption for heating has fallen but it is too soon to see this as a trend. It is possible that increasing insulation levels together with increased use of electrical appliances is leading to this trend. The amount of heat actually provided by the space heating system is always less than the requirement of the dwelling since there are sources of free heat to be gained from appliances, lighting, cooking etc. This means that should there be a slightly incorrect allocation between space heating and other end uses, it will not have as great an effect on calculated internal temperatures or on estimates of potential energy savings through insulation as might be expected.

6.9 Standards of comfort

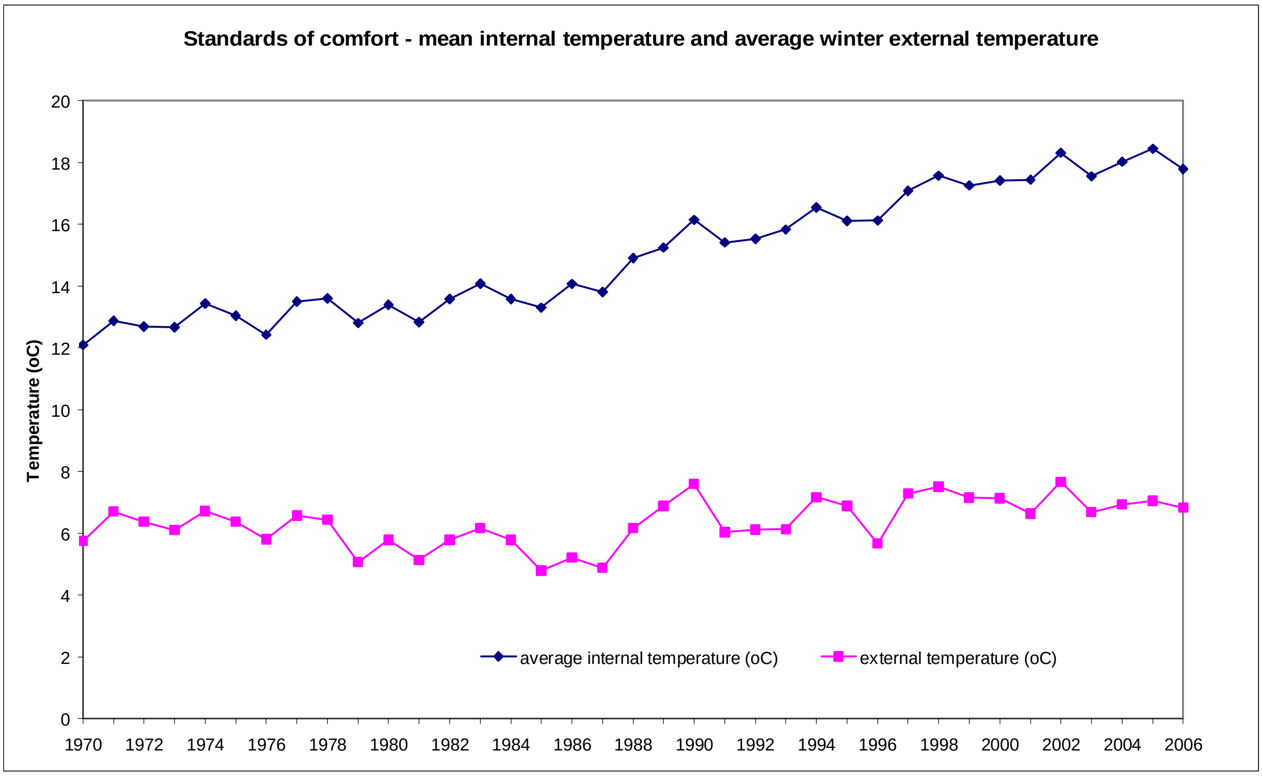

Figure 27 Standards of comfort – mean internal and average winter external temperatures

The average household used 83.5 GJ of energy in 1970 and 73.1GJ in 2006. The corresponding space heating figures were 50.1 GJ in 1970 and 42.2 GJ in 2006. Both the overall energy requirement and the space heating requirement per household has reduced in the last few years although in general it has remained fairly stable. This is despite the large growth in central heating ownership from 31% to 91% in this period.

The effect of the increase in central heating ownership must have been to raise average dwelling temperatures. Broad estimates can be made of the magnitude of the rise. By running heat balance equations for all the years in question it is possible to deduce a 24 hour average internal temperature during the main heating season. The results of these calculations are illustrated in Figure 27 above and Table 26.

The absolute value of these temperatures cannot be quoted with as much confidence as estimates of the rise. However the general level of temperatures in houses has been suggested by a number of surveys. One such survey carried out in February and March 1978 gave the average daytime temperature of occupied dwellings as approximately 17^{o}C and 14^{o}C for centrally heated and non centrally heated households respectively. For comparison the 1991 English House Condition Survey recorded spot temperatures of 18.6^{o}C and 16.6^{o}C in hallways of centrally heated and non centrally heated homes. The values from the 1996 survey were 18.1^{o}C and 16.8^{o}C. The 1998 survey gives values of ? and ?. The 24 hour averages would be slightly lower.

The temperature rise over the period for both centrally heated and non-centrally heated dwellings is estimated to be 4.2^{o}C but the average temperature has increased by 5.7^{o}C because of the increasing numbers of centrally heated homes.

It would be expected that the average temperature would stabilise as more households move towards their desired comfort levels. For most people a living room temperature during occupied periods of 21^{o}C would be regarded as comfortable. A temperature perhaps 2^{o}C below this would generally be considered adequate elsewhere in the dwelling so that the overall comfort level might be around 19-20^{o}C. As insulation improves and central heating ownership increases it is likely that this temperature will become the optimum throughout a dwelling for 24 hours per day and could therefore be taken to be the ultimate comfort level beyond which most people would not wish to go. Although, however, recent German research on low energy ‘passive’ houses suggests a mean internal temperature of 22^{o}C is what people regard as comfortable in these houses (7).

6.10 The effect of energy efficiency improvements

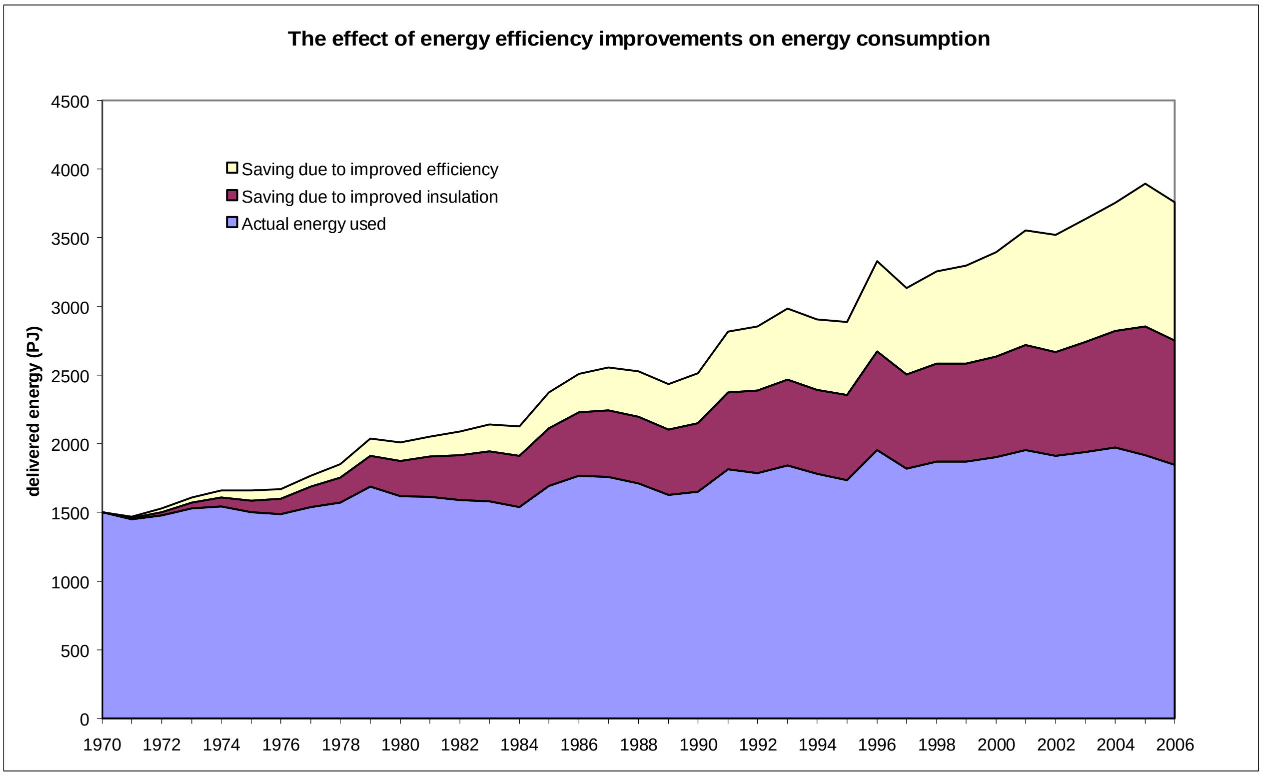

Figure 28 The effect of energy efficiency improvements on energy consumption

Table 26 suggests that an average 24 hour temperature of 12.1°C was achieved in 1970 when the GB domestic energy consumption was 1502 PJ and that an average temperature of 17.8°C was achieved in 2006 when consumption was 1848 PJ.

If insulation and efficiency measures had remained as they were in 1970 how much more energy would now be required to maintain the average 2006 internal temperature? In Table 26 internal temperatures were calculated from a given consumption of energy. In Figure 28 the calculation is reversed. Energy consumption is calculated from a given level of temperature. The figure shows the consumptions calculated for each year using the temperatures from Table 26 but assuming that the efficiency and insulation levels are those for 1970. The values are given in Table 27.

The 2006 consumption, if insulation and efficiency improvements had not occurred, is calculated to be 3760 PJ which is 1912 PJ more than the actual energy used. Of this difference 903.3 PJ would be ascribed to improvements in insulation and 1008.8 PJ to improved heating efficiency. Thus, it may be concluded that energy efficiency measures have resulted in a saving of 51% relative to what the consumption would have been without those measures.

Readers should be aware of a number of conceptual difficulties in the definition of savings achieved by energy efficiency measures. For example, it has been assumed that 2006 households would maintain 2006 temperatures despite having 1970 insulation measures. In reality, the temperature would probably be allowed to drop from the 2006 level by choice and for reasons of building physics (the 24 hour temperature in a dwelling for any given intermittent heating pattern, depends on the insulation standard – it is lower in a poorly insulated dwelling). The problem is of course, that there is no way of knowing by how much the temperature would have been allowed to fall in practice.

The calculated figure is therefore hypothetical but it does give a good indication of the quantity of energy that has been saved by energy efficiency measures. The definition used is actually a measure of two things – the energy saved and the energy value of improved comfort standards.

6.11 Comparison of SAP ratings

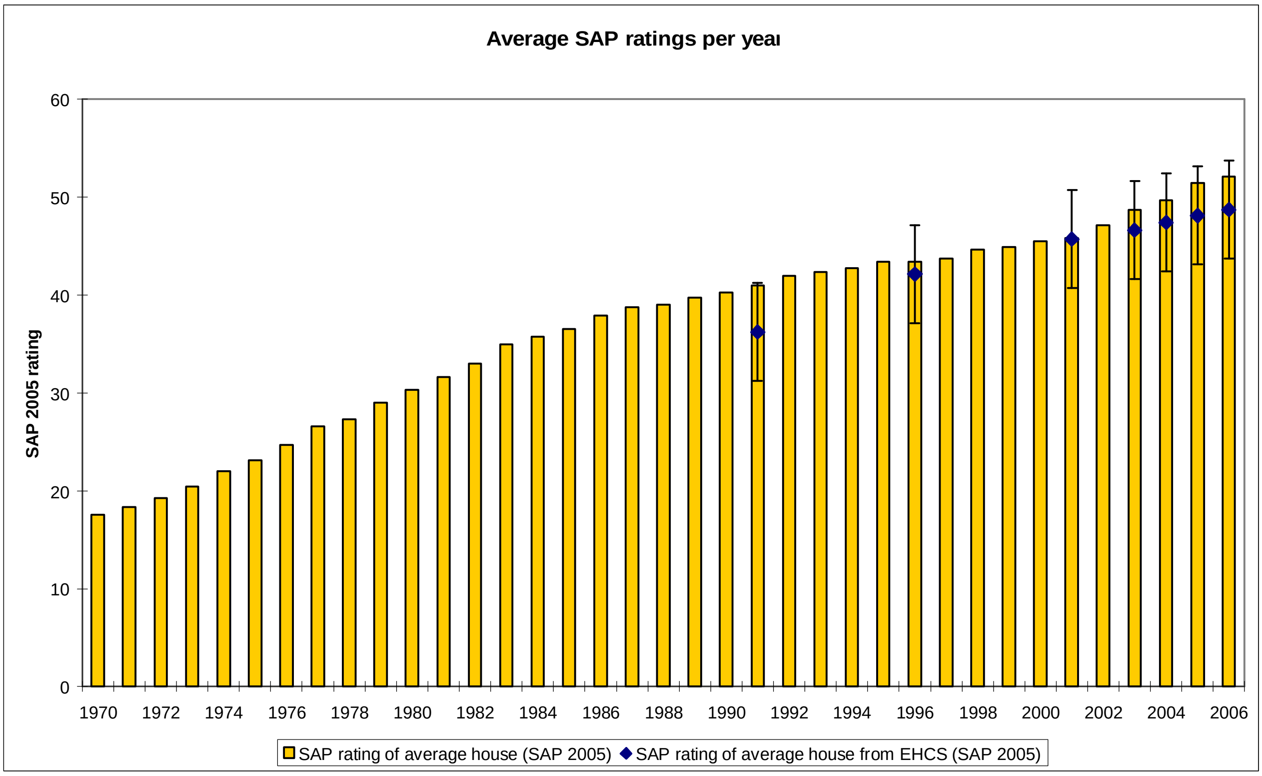

Figure 29 Average SAP 2005 ratings by year

An alternative way of illustrating the overall effect of energy efficiency improvements is by considering the energy rating of the average dwelling within the stock. The energy rating that is used for this purpose is the Government's Standard Assessment Procedure, commonly referred to as SAP. This is a rating on a scale 1 to 100 where 1 indicates an extremely energy inefficient dwelling and 100 indicates an extremely energy efficient dwelling that is energy self sufficient. It is indeed possible to have a rating of higher than 100 if enough energy is being generated to run the dwelling and still have excess energy to sell back to the electricity grid. It is determined from an estimate of the space heating, water heating and lighting costs for the dwelling. This is normalised for floor area and incorporates a number of standardised assumptions about occupancy, heating patterns, internal temperatures, climatic factors etc.

The specific heat loss of a dwelling, the type of heating system and the fuel that it uses, are key factors in determining the SAP rating. Changes in these factors have already been discussed in this report and this information can be used to calculate SAP ratings from 1970 to 2006. The resulting SAP ratings are illustrated in Figure 29. This shows that the average SAP rating in 1970 was about 18 and by 2006 this had increased to about 52. Bearing in mind the uncertainty in SAP ratings of about +/-5 points, the figures obtained are in close agreement with estimates that have emerged from the English House Condition Survey, as Figure 29 shows. Also, note that the SAP ratings presented here are nominal values because much of the information required for a full SAP calculation is not available.

It is questionable whether it is actually meaningful to present a SAP rating for years long before the rating was defined. Several of the standardised assumptions that form an integral part of SAP would not strictly apply to these years. Nonetheless, it is clear from the calculated figures that the energy rating of the average dwelling has improved substantially and that, in addition to the obvious effect of the improvement in heat loss, this is largely due to the increasing ownership of central heating. These figures are shown in Table 28.

7 How domestic sector energy is determined

Main trends

There are many interacting factors which determine the energy consumption of the housing stock. For space heating these can be summarised as follows:

- *There is a natural variation due to changes in external temperature.*
- *There is a trend towards lower heat losses due to insulation, which tends to reduce energy consumption.*
- *There is a trend towards improved comfort linked to the growth in central heating, which tends to increase consumption.*
- *There is a trend towards improved space heating efficiencies due to changes of fuel, more central heating and better, more efficient, heating appliances which tends to reduce energy consumption.*

In addition there is a continuing growth in the size of the housing stock which tends to increase energy consumption across all end uses. It is this growth in the housing stock which means energy consumption overall will tend to rise despite savings made by individual households.

The improvement in comfort standards is just one aspect of an improvement in the general level of service required by households. Another clear example is the increasing use of electricity for lights and other appliances. In particular, appliances are used in ever increasing numbers for saving labour, time and effort as well as for entertainment and leisure. Although there may be several individual level of service effects, they are all ultimately related to a general improvement in our standard of living, so it is convenient to consider them all together.

Predicting housing stock energy use

The above considerations suggest that it should be possible to derive an equation which describes the changes in the energy consumption of the housing stock since 1970. Following the discussion above, it is clear that suitable variables for such an equation are a term increasing each year to allow for increased levels of service demanded by householders, the external temperature, the improvement in the average dwelling heat loss, the improvement in the average heating efficiency and the number of households.

Using regression techniques, together with the figures in several tables from the last section, the following equation has been derived:

$Q=N [97.84 + (2.18*\{year-1970\}) - (3.28*Te) - (0.28*\Delta H) - (1.56*\Delta E\%)]$

Where

- Q *is the housing stock consumption (PJ)*
- N *is the number of households (millions)*
- Te *is the winter external temperature* (^oC)
- ΔH *is the improvement in the average dwelling heat loss relative to 1970 (for 2006 this is 376.0-246.8=129.2* $W/^oC$*. See Table 19)*
- $\Delta E\%$ *is the improvement in the average heating efficiency relative to 1970 (for 2006 this is 74%-49%=25%. See Table 24)*

The predictions of this equation are in quite good agreement with actual consumptions as shown in Figure 30 and Table A.

7.1 Predicting domestic energy consumption

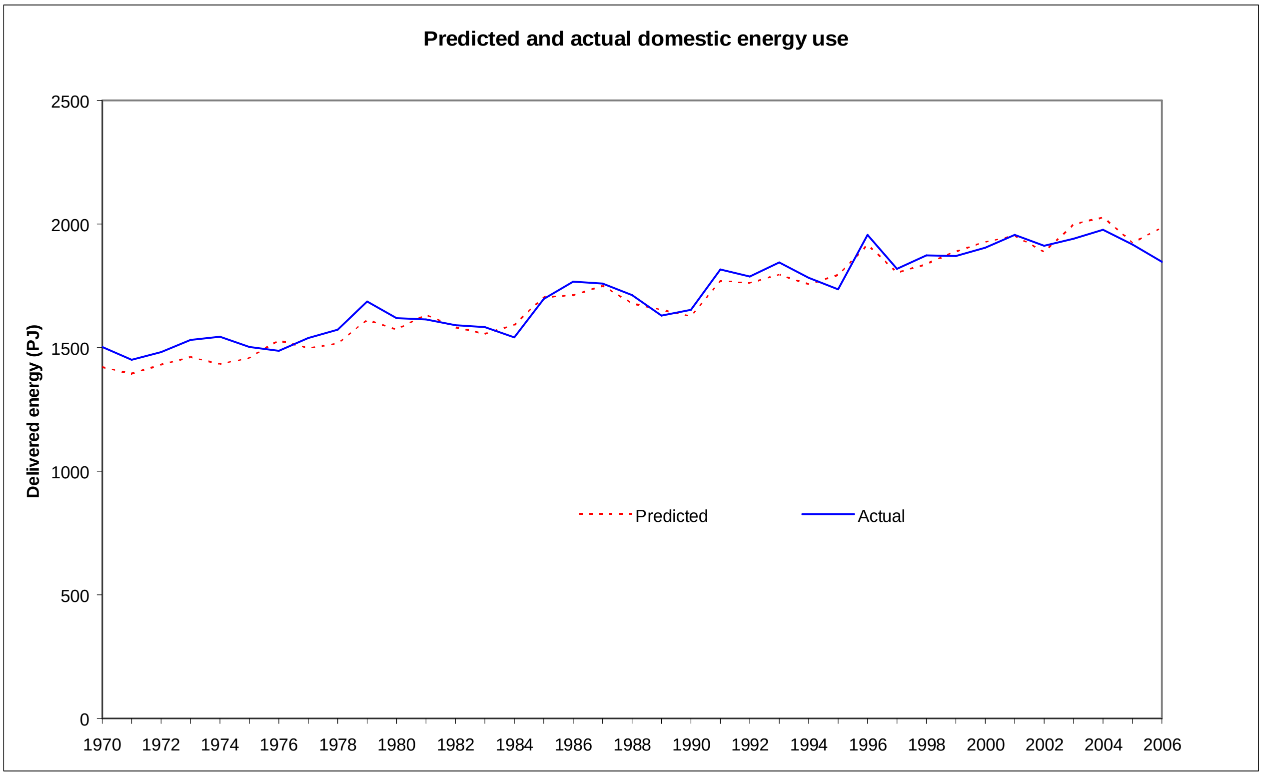

Figure 30 Predicted and actual domestic energy use

Figure 30 shows the predicted energy consumption for the housing stock and the actual energy consumption. It can be seen that there is close agreement between the two. Table A (overleaf) shows what is happening in greater detail. It illustrates how the changes in each variable have combined to produce the overall housing stock energy consumption.

Year	Year corrected for year (GJ)	Te Corrected for temps (GJ)	ΔH Effect of improved insulation (GJ)	ΔE Effect of improved efficiency (GJ)	N Grossed up to stock (PJ)	Q Actual energy use (PJ)
1970	77.03	79.00	79.00	79.00	1420.9	1501.6
1971	79.21	78.06	77.50	76.57	1395.2	1452.0
1972	81.39	81.33	79.93	77.67	1431.2	1481.3
1973	83.56	84.38	81.87	78.61	1462.3	1530.6
1974	85.74	84.54	80.62	76.31	1433.3	1543.4
1975	87.92	87.86	82.55	76.77	1457.8	1502.7
1976	90.09	91.89	84.97	79.61	1529.7	1488.2
1977	92.27	91.56	82.90	77.04	1498.4	1538.5
1978	94.45	94.17	83.84	77.16	1516.3	1572.0
1979	96.62	100.82	89.09	81.31	1612.2	1685.9
1980	98.80	100.65	86.97	78.61	1572.9	1619.3
1981	100.98	104.96	89.60	80.90	1632.3	1614.2
1982	103.15	105.01	87.88	77.84	1582.2	1591.6
1983	105.33	105.93	87.21	75.78	1555.3	1583.6
1984	107.51	109.36	89.83	76.63	1591.5	1540.6
1985	109.68	114.81	94.79	81.14	1705.4	1696.3
1986	111.86	115.57	94.45	80.52	1711.4	1767.3
1987	114.04	118.84	96.74	81.45	1749.9	1758.8
1988	116.21	116.81	94.10	77.34	1678.9	1712.9
1989	118.39	116.64	93.34	75.40	1653.2	1629.1
1990	120.57	116.47	92.50	73.49	1627.1	1653.6
1991	122.74	123.78	99.14	79.01	1769.1	1814.9
1992	124.92	125.68	99.37	77.99	1762.2	1787.8
1993	127.09	127.80	101.15	78.66	1795.1	1844.5
1994	129.27	126.59	99.64	76.10	1756.0	1782.0
1995	131.45	129.70	101.76	76.94	1793.9	1735.8
1996	133.62	135.86	107.36	81.56	1916.0	1956.4
1997	135.80	132.74	103.52	76.13	1803.7	1818.8
1998	137.98	134.21	104.82	76.91	1837.9	1873.2
1999	140.15	137.53	107.98	78.32	1889.0	1871.8
2000	142.33	139.76	109.83	79.08	1927.5	1904.0
2001	144.51	143.57	113.27	80.74	1951.4	1956.3
2002	146.68	142.37	111.59	77.41	1886.2	1912.0
2003	148.86	147.76	116.03	81.28	1999.0	1941.4
2004	151.04	149.14	116.47	81.65	2026.8	1975.4
2005	153.21	150.93	114.98	76.79	1923.9	1917.6
2006	155.39	153.80	117.71	78.49	1984.7	1847.8

Table A How domestic energy consumption is determined (PJ/GJ) – GB figures

- Year – the first column shows an increase of 2.18GJ per year as a result of increasing levels of service / standards of comfort.
- Te - in the next column the variations to be expected from fluctuating external temperatures are introduced. The temperature variation alters the consumption by 3.28 GJ per ^{o}C change.
- ΔH – in the third column, the effect of improving heat loss is added in. For each 1W/ ^{o}C improvement the consumption falls by 0.28 GJ.
- ΔE – in the fourth column the effect of improving heating efficiency is introduced. For each percentage point improvement in the efficiency the consumption falls by 1.56 GJ.
- N - in the fifth column, the figure in the fourth column (which is the estimate of the average dwelling consumption) is multiplied by the number of households.

It can be seen that the “grossed up to stock” estimates are in quite good agreement with the actual housing stock energy consumption figures shown in the final column. In fact, the difference between the predictions and the actual consumptions has a standard deviation of only 50 PJ, i.e. the predictions are generally within 2.7% to 3.3% of the actual consumptions.

The general level of agreement between the predictions and the actual consumption figures can also be gauged from Figure 30. It is clear that the equation derived describes the observed changes to the housing stock energy consumption quite well. However, in the most recent years there appears to be a downward trend in energy consumption that is not being picked up by the predictions. It is too soon to tell if this is significant but it may be that the recent high fuel cost is having some effect in limiting the consumption.

In principle this equation could also be used to predict future housing stock consumption, given estimates of the relevant variables for the years under consideration. Short term projections would probably prove to be reasonably reliable (timescales of less than 10 years). However, longer term predictions would be expected to be less robust. As central heating ownership approaches saturation, so other level of service effects would become more dominant. Notwithstanding this, it would be expected that many other levels of service would also have saturated or would be close to saturation at about the same time as central heating. The fairly steady historical growth due to improving levels of service, which is illustrated in the first column of Table A would not be expected to continue indefinitely.

The equation can also be used to investigate the historical importance of the individual factors and how they have contributed to the changes in energy use and carbon emissions. A separate paper on this topic, focusing on decomposing the historical carbon emission changes illustrated in Figure 32 was presented in 2002 at ECEEE (8).

8 Types of fuel, carbon emissions and primary energy use

Main trends

Up to this point, energy has been treated as though it were a single homogenous entity. Apart from mention of ownership and efficiency of different heating systems, the different forms of delivered energy (i.e. different fuels including electricity) have not been discussed.

Delivered fuel type is an important consideration because each fuel has different primary sources associated with it and different losses in conversion, transmission and distribution. This also means that the environmental implications of consumption of each delivered fuel are different.

In this section the delivered fuels used by the housing stock and the changes to these over the past decades are examined. The delivered fuel consumptions are translated into both carbon emissions and primary energy consumptions. Finally, a simplified energy balance for the housing stock is presented, which illustrates the relationships between primary energy and delivered energy and how the delivered energy for space heating and other uses, together with natural gains, meets the useful heat requirement of the housing stock.

Domestic consumption by fuel

While overall delivered energy consumption has only grown slowly, the proportion of different fuels used for space heating has shifted steadily towards natural gas.

Carbon emissions

Whenever a fossil fuel is burnt to extract energy carbon dioxide is produced. Carbon dioxide plays an important role in regulating the climate of the Earth, even though it is present in the atmosphere in quite small concentrations, in that it absorbs infra red radiation emitted from the Earth's surface, causing a warming of the lower atmosphere. This 'greenhouse effect' is responsible for maintaining temperatures near the Earth's surface which makes life possible. There is now considerable concern that the unrelenting burning of fossil fuels, along with other human activities, is increasing the concentration of carbon dioxide and other 'greenhouse gases' and disturbing the Earth's heat energy balance, thereby leading to an additional warming at the Earth's surface. Carbon dioxide is known to be the most important contributor to this additional warming because of the extremely large quantities which are emitted. Energy efficiency and use of non fossil renewable energy sources are now seen as the most promising means of substantially reducing carbon dioxide emissions whilst maintaining or improving the levels of service achieved.

Since 1970 the carbon dioxide emission which can be attributed to domestic energy use has fallen substantially. Table 30 shows the emissions associated with the different fuels in tonnes of carbon. This unit and tonnes of carbon dioxide are both used to describe carbon emissions. It is easy to convert tonnes of carbon to tonnes of carbon dioxide by multiplying by 44 and dividing by 12.

Primary consumption

Each delivered fuel has associated with it an equivalent in terms of primary energy and this equivalence can be expressed as a primary energy ratio. This ratio indicates the size of the losses involved in the conversion, transmission and distribution as well as the amount of energy used by the energy industries themselves. The primary energy ratio differs considerably between different delivered fuels. For a fuel where there are few losses the primary energy ratio is close to one. As the size of the losses increases the primary energy ratio increases.

The overall domestic sector primary energy ratio has shown a substantial improvement between 1970 and 2006 mainly because of efficiency improvements to the supply of energy. Consequently, the domestic sector now makes better use of natural resources.

8.1 Domestic energy use by fuel

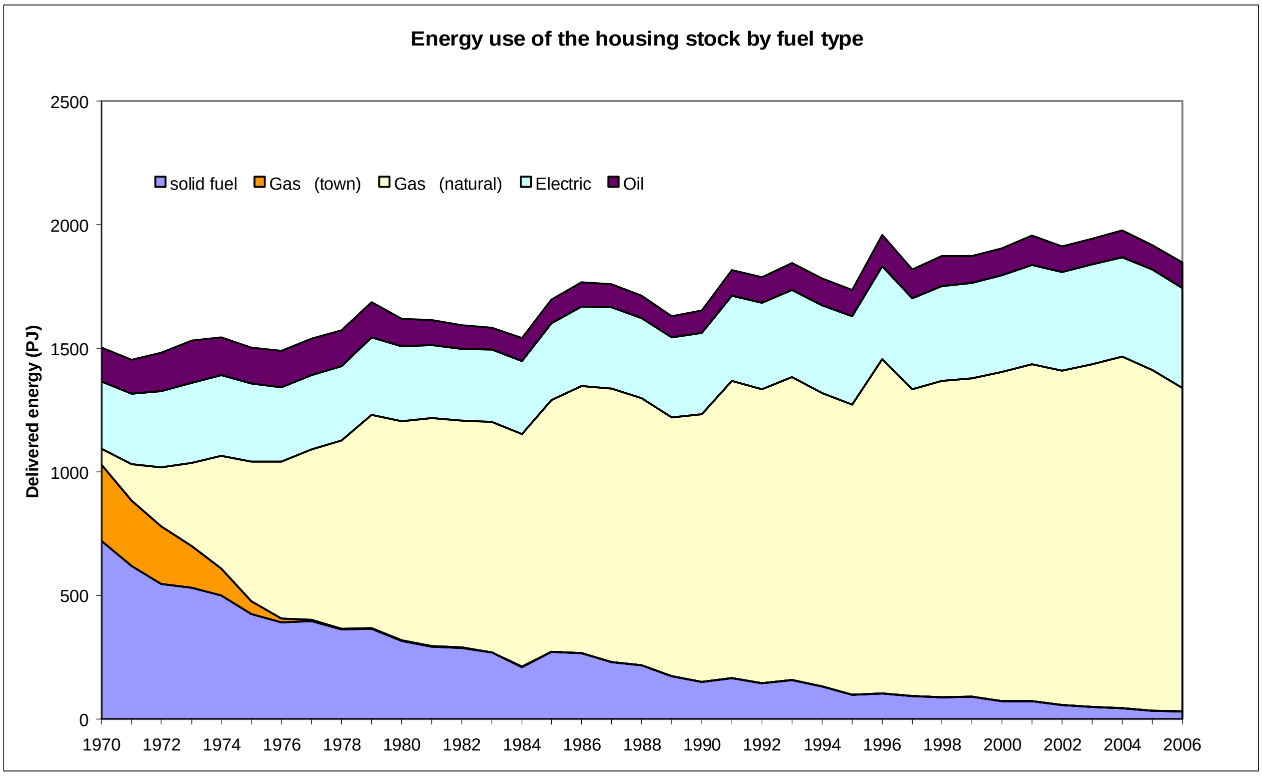

Figure 31 Energy use of the housing stock by fuel

During the period 1970 to 2006 there has been a dramatic change in the proportions of different fuels delivered to the housing stock in GB as shown in Figure 31. This is in marked contrast to the slight increase in the total delivered energy use of the housing stock.

The main feature of the changes is the rapid penetration of natural gas. Natural gas supplied 4% of the total energy delivered to the housing stock in 1970. By 1984 the proportion had risen to 60% and by 2000 it had reached 70%. In 2006 it was 70.8% of the total delivered energy. Whereas in 1970 town gas supplied 20% of total energy in 2006 it had completely disappeared. Solid fuel use has also declined. In 1970 it accounted for 48% of the total but in 2006 it only accounted for 2%.Oil and electricity have seen slight changes in percentage of delivered energy. Oil has reduced from 9.2% to 5.7% while electricity has increased from 18.1% to 22.0%.

Although electricity has only increased slightly in proportion of total energy in absolute terms it has increased from 271 PJ to 406 PJ, an increase of 50%. Figure 26 shows the energy related to end use. This shows an increase in energy use for lights and appliances, the overwhelming majority of which will be electricity. Thus, the increase in electricity consumption is related to an increase in lights and appliances consumption rather than an increase in electricity use for heating.

8.2 Carbon emissions

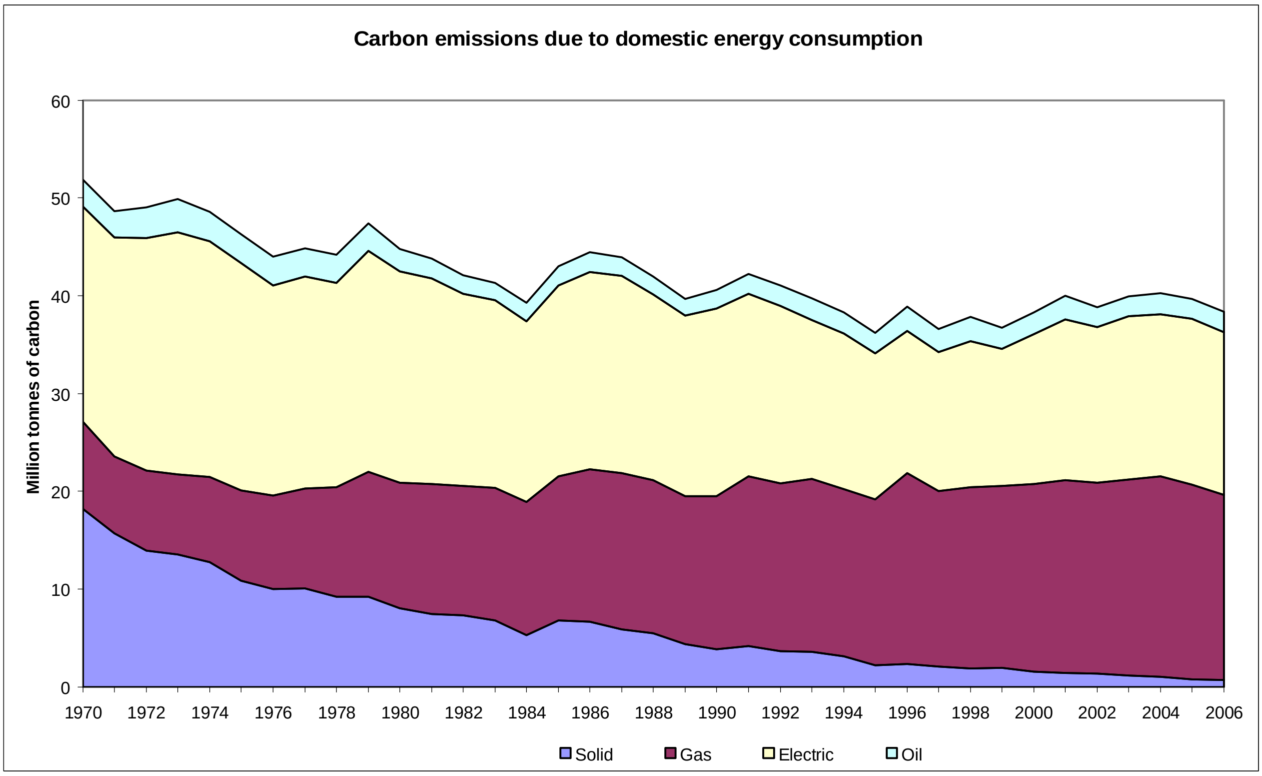

Figure 32 Carbon emissions due to domestic energy consumption

The carbon emission associated with the GB housing stock has decreased since 1970. In 1970 it was 52 million tonnes by 2006 it had dropped to 38 million tonnes. These figures include the carbon emitted at power stations to produce electricity for domestic use.

This reduction in carbon emission is due to a number of things:

Firstly, the energy efficiency measures discussed in this report have kept domestic energy consumption levels down and avoided the increase in carbon emissions which would otherwise have resulted from an increase in energy use.

Secondly the change in fuel types used in the home has been important. Burning solid fuel produces roughly twice as much carbon per unit of delivered energy obtained as does gas, whilst oil comes between the two. Clearly, therefore, the move towards gas and away from solid fuel has had a beneficial effect.

Thirdly, although electricity use has increased, the carbon emission associated with that electricity use has declined. This has occurred because the efficiency of generation, transmission and distribution has improved and because of an increase in non fossil fuel derived electricity. The increase in use of gas turbine technology for electricity generation in the 1990s reduced the carbon factor applied to electricity. However, recent changes back to solid fuel for electricity generation will increase the carbon factor for electricity unless this is also matched by an increase in renewably generated electricity by such means as wind, water or solar power. Decommissioning of nuclear power stations will also increase the carbon factor for electricity unless they are replaced by more nuclear power stations or renewable energy.

A separate paper has been prepared, as previously mentioned, on historical carbon emissions, focusing on decomposing these into the factors identified in the previous section and this provides more detail of the importance of the changes noted above.

The government has announced the aim that all new homes built from 2016 onwards should be zero carbon. This, however, will only be a small fraction of the total stock for many years to come. Current dwellings, once additional insulation and more efficient heating systems have been installed, will need to look to low and zero carbon technologies to achieve further carbon savings.

Table B, taken from a recent report (9), shows the number of low and zero carbon installations in all sectors in the UK in 2005.

Technology	**Number**
Solar water heating	78,470
Community combined heat and power*	25,000
Solar photovoltaics	1,300
Micro-CHP	990
Micro-wind	650
Ground source heat pumps	545
Biomass boilers (pellets)	150
Micro-hydro	90
Fuel cells	5
Total	**107,200**

Source: based on EST 2005

*CHP, domestic only

Table B Low- and zero-carbon installations, UK 2005 (all sectors)

It can be seen from Table B that with 26 million dwellings in the UK those with low or zero carbon installations represent a minute proportion of the stock.

8.3 Primary energy consumption

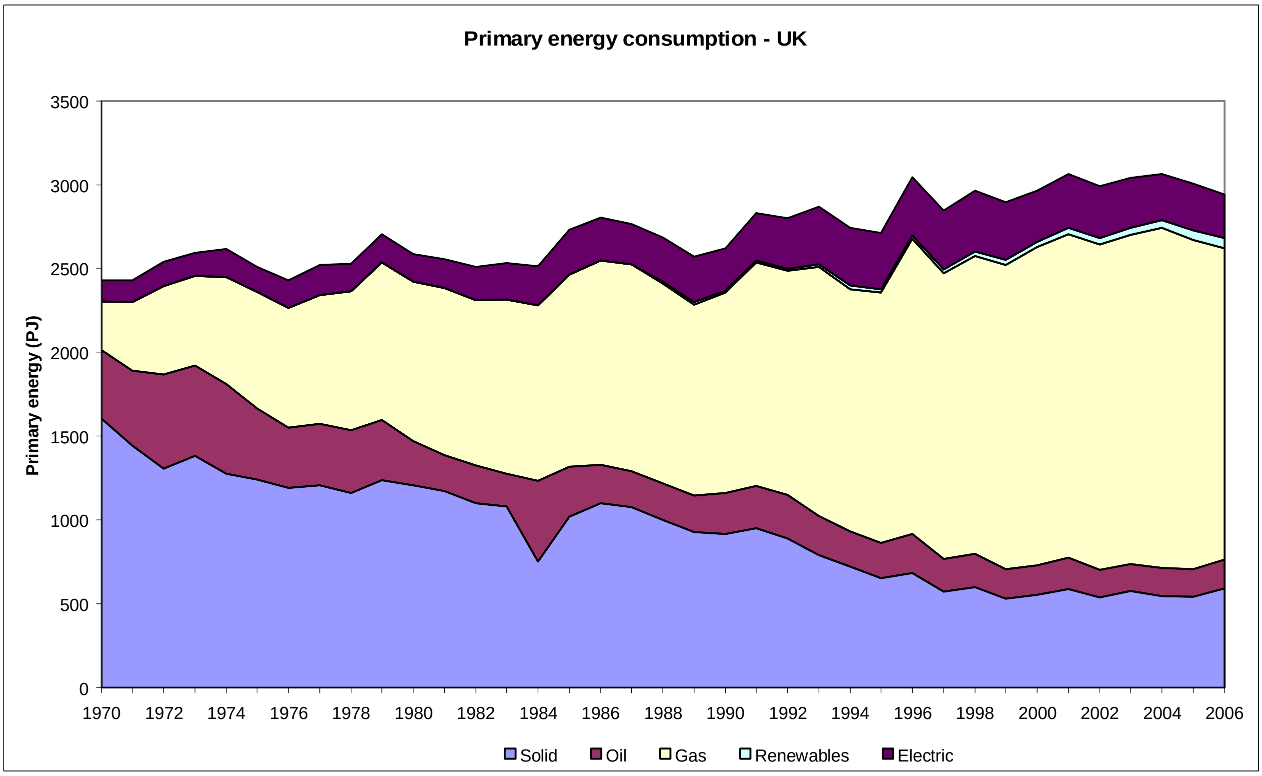

Figure 33 Primary energy consumption

As should be clear from the discussion on carbon emissions, a saving of one petajoule of one delivered fuel may not necessarily be as beneficial as a similar saving of another fuel. If there were an ideal price structure for carbon saving then price might be a good measure of the relative value of different forms of energy. Clearly prices do, at least partially, reflect the values of different fuels – particularly the value of electricity relative to other fuels (see Figure 3). A better measure, however, is one which is related to the amount of primary energy consumed. This is the energy consumed in homes plus that required for conversion, transmission and distribution. Figure 33 shows the dramatic changes that have taken place in the proportions of different primary fuels consumed in order to meet the energy needs of the UK housing stock.

Between 1970 and 2006 the composition of primary energy fuels has changed significantly. In 1970, 66% of the total was solid fuel and 12% was gas. By 2006 only 20% was solid fuel and 63% was now gas. In this period the percentage of oil also dropped from 17% in 1970 to 6% in 2006 while electricity increased from 5% in 1970 to 9% in 2006. By 2006 renewables accounted for 2% of primary energy consumption in the UK domestic sector. Much of this was wood consumption which in the delivered energy tables (Tables 29 and 32) is included with solid fuel.

The total primary energy consumption of the UK housing stock rose by 21% between 1970 and 2006 whereas the delivered energy consumed by the GB housing stock rose by 23% as shown earlier. Section 8.5 will look at energy ratios of primary to delivered energy in the UK over the years 1970 -2006.

8.4 Delivered energy use by the UK housing stock

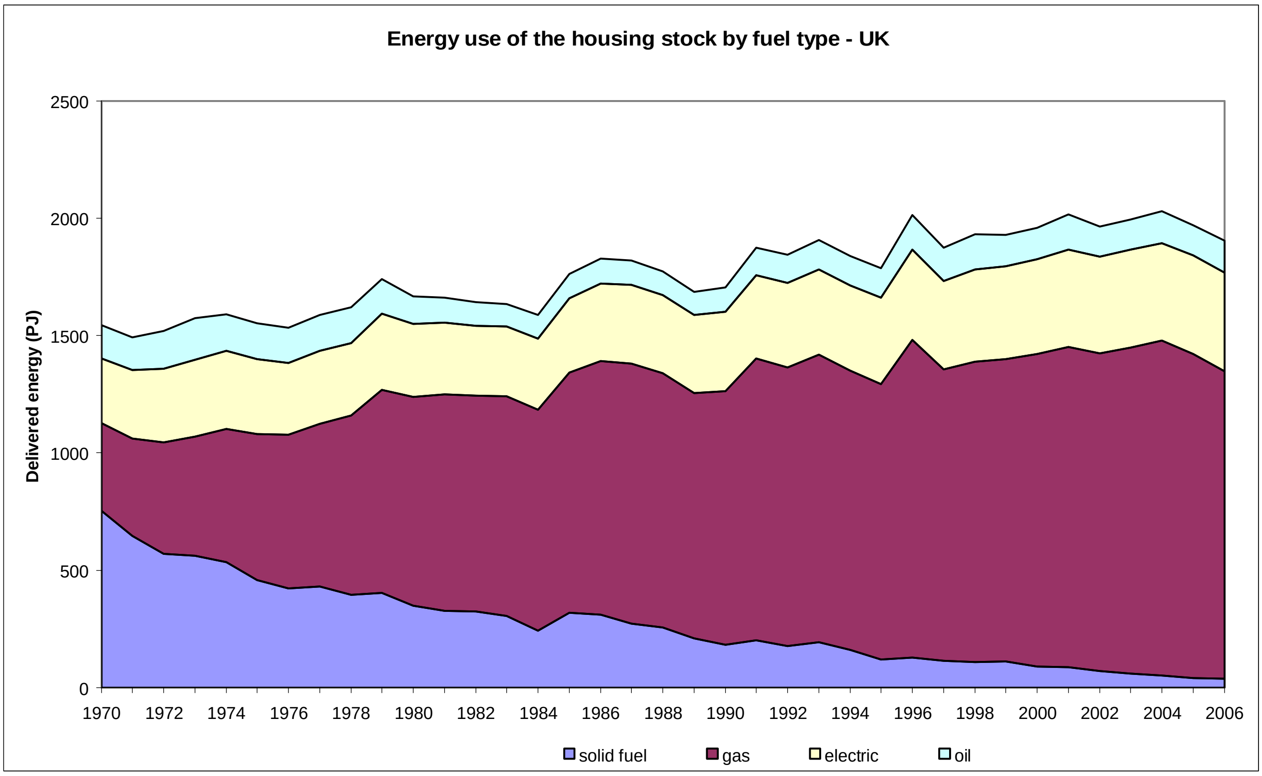

Figure 34 Energy use of the housing stock by fuel type.

In order to illustrate the improvement in the domestic sector primary energy ratio it is necessary to compare the delivered energy figures with the primary energy figures presented in Table 31. Delivered energy figures were shown in Table 29 but these were only for GB. The equivalent figures for the UK are shown in Table 32 and illustrated in Figure 34. Similarly to GB the delivered energy for the UK has increased by 23% between 1970 and 2006.

8.5 Primary energy ratios

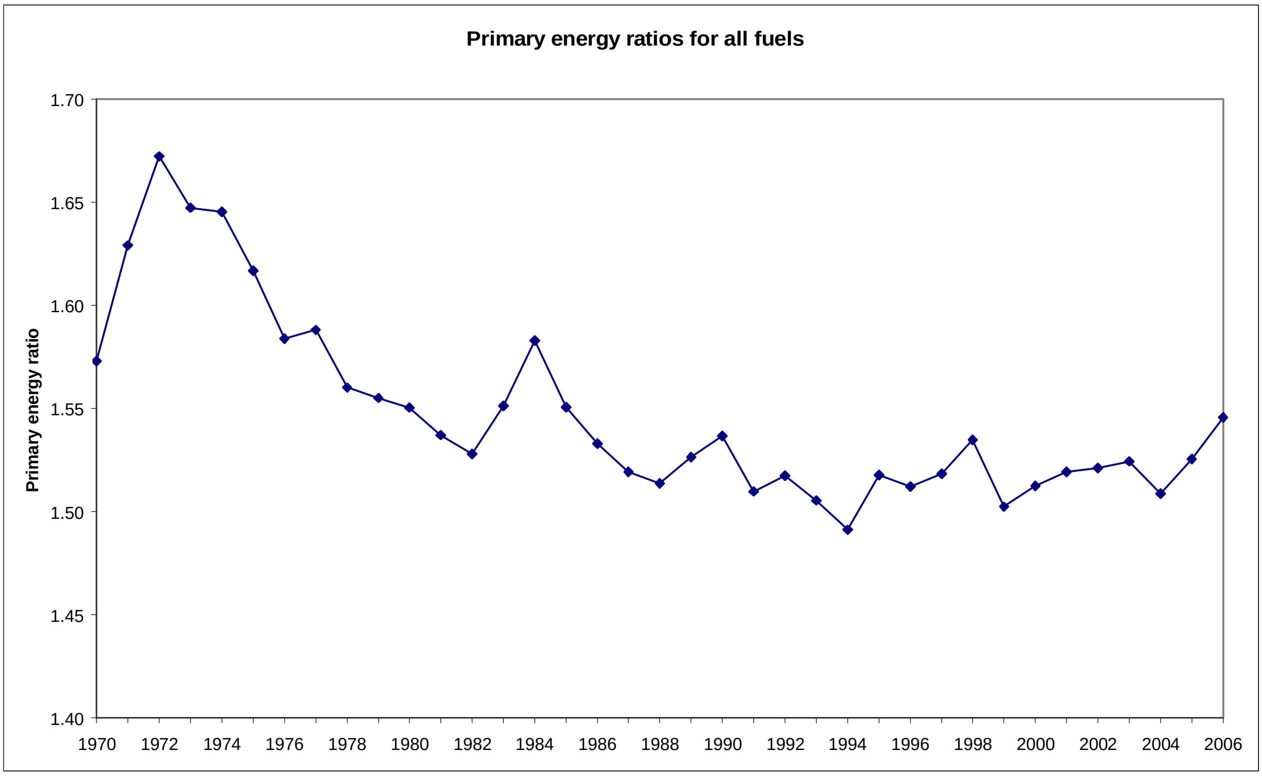

Figure 35 Primary energy ratios for all fuels

Table 33 shows the total domestic sector primary energy consumption taken from Table 31 and the delivered energy consumption taken from Table 32. The ratio of the two figures is known as the primary energy ratio as shown in Table 33 and illustrated in Figure 35. This was 1.57 in 1970. It rose sharply to 1.67 in 1972 and by 2006 had dropped slowly back to 1.55.

Primary energy ratios for individual fuels are more difficult to determine than the overall ratio. It is important to recognise, however, that there are marked differences between the ratios for different fuels. For example the ratio for electricity in 1995 would have been about 2.8. For gas the ratio would have been about 1.15 whilst that for oil would have been about 1.19 and that for coal about 1.07 (secondary solid fuels such as coke and breeze have much higher primary energy ratios). The ratio for all fuels that year was 1.52.

For electricity, the ratio between primary energy consumption and delivered energy is necessarily quite high, although it has improved quite considerably over the years. It does need to be noted, however, that there are several complications involved in relating delivered energy to primary energy for electricity. For some end uses it is possible for consumers to save money by switching from on peak to off peak electricity. Such a switch may not involve either an increase or a saving of delivered energy. However, using more off peak electricity and less on peak electricity helps to even out the daily demand variations. This means that power stations are able to run more continuously which, in turn, means that the conversion process is more efficient. The net effect, therefore, is that primary energy consumption is reduced. Hence it is important not just to consider delivered energy when looking at potential savings.

8.6 Energy balance of the housing stock

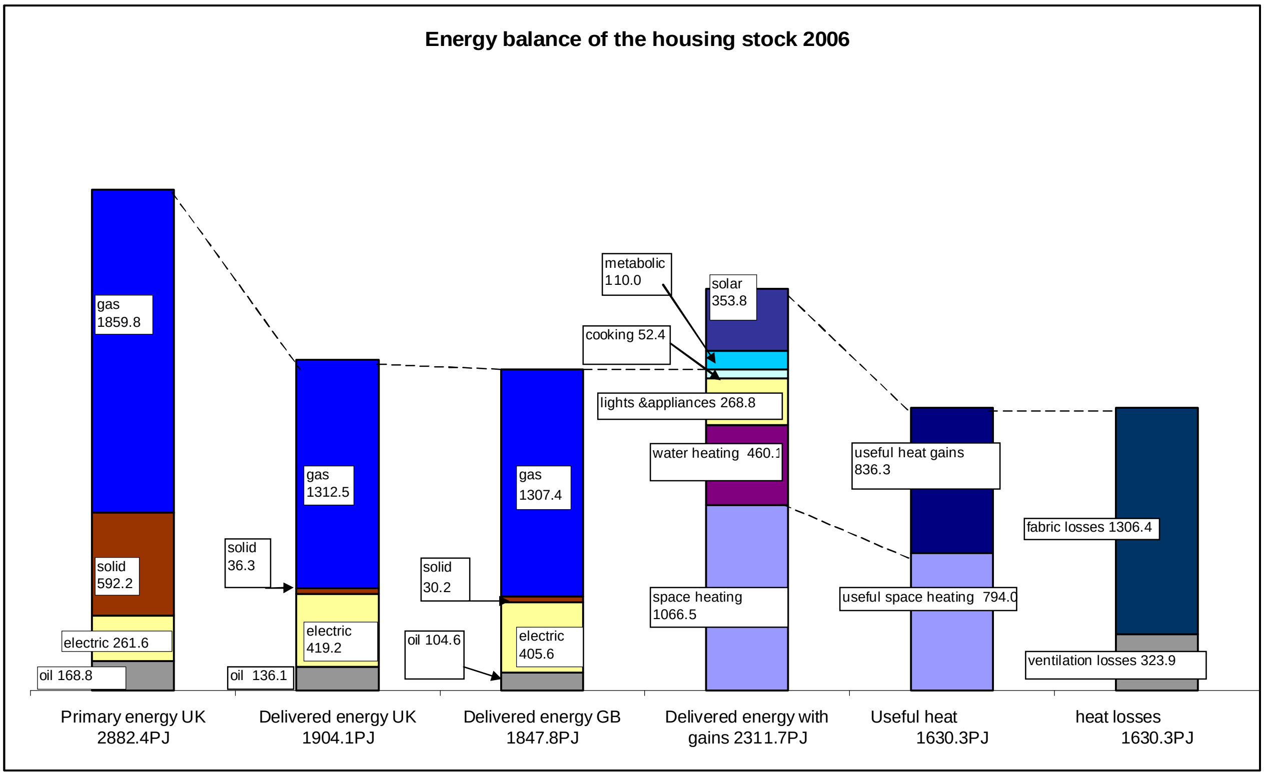

Figure 36 Energy balance of the housing stock - 2006

Figure 36 illustrates the scale of the housing stock related energy flows for 2006. The figure shows the relationships between primary energy, delivered energy, useful heat and the housing stock losses. Some of the figures in the energy balance are known quite accurately (e.g. delivered gas) while others are more uncertain (e.g. useful heat gains). However, all numbers are undoubtedly of the right order. As in previous Fact Files renewable energy has not been included in the primary energy for the UK in Figure 36.

The first block in the diagram shows that part of the national primary consumption which is related to the housing stock.

The amount of energy and the fuels actually delivered are shown in the second block. The difference between the first and second block is the losses associated with conversion, transmission and distribution, as well as the energy used by the energy industries themselves.

Domestic energy flow figures for the whole of the United Kingdom are difficult to ascertain so the third block shows delivered energy for Great Britain – i.e. figures for Northern Ireland are excluded.

The fourth block shows the same delivered energy as the third, augmented by natural gains (solar and metabolic). This block illustrates the end uses of the delivered energy rather than the fuels delivered.

The fifth block shows that part of the total delivered energy which supplies useful heat. A part of the useful heat is supplied directly by the energy delivered for space heating (reduced according to the average efficiency of heating systems). The rest is supplied as incidental heat gains from lights, appliances, cookers, hot water systems and natural gains. Only a part of the potential incidental heat gains are useful. In summer, for example, a large proportion of incidental gains are deliberately rejected because they would otherwise cause overheating. Even in winter, a large part of the potential gains from hot water are lost as water flows away through the drains. Similarly, much of the heat produced by cooking is often lost through extraction to the outside.

The sixth block shows how the useful heat is lost to the external environment through the fabric and ventilation losses associated with the national housing stock. Any reduction in losses at this stage, such as improved insulation, will effectively reduce the primary energy input shown in the first block. This can also be achieved through improvements to other parts of the overall energy balance:

- The losses between the fourth and fifth block can be reduced through improvements to the efficiencies of heating systems and by recovery of incidental gains which are lost.
- The solar heat gains can be increased by solar design features and appropriate orientation. Such "passive solar" techniques result in a reduced proportion of the useful heat being supplied by the heating system and hence a reduced amount of fuel has to be delivered for space heating.
- A given delivered energy requirement can be supplied from a reduced amount of primary energy by reducing the losses between the first and second blocks. This can be done, for example, by improving conversion efficiency or by the energy industries reducing the amount of energy which they themselves use.

9 Conclusion

This report has demonstrated progress and trends in energy efficiency from 1970 to 2006.

Although most dwellings now have some fabric insulation measures to an acceptable level at least 80% could improve the fabric insulation.

There are now central heating systems in 91% of dwellings which has led to an improvement in the efficiency of heating systems, especially with the increase in installation of condensing boilers. There has also been an improvement to comfort of occupants with higher internal temperatures.

Although space heating still accounts for over 50% of energy use in the housing stock, the percentage used by lights and appliances has more than doubled in the this period.

Energy consumption has increased due to the larger number of households in 2006 but the increase has been constrained by the increases in insulation and efficiency achieved by householders and through government grants.

These increases in insulation and efficiency have led to carbon savings which have been increased due to fuel switching.

Some insulation measures are reaching saturation levels and continued savings will only be made by looking at those dwellings which are difficult to insulate to provide added incentives. Also by looking at low and zero carbon technologies to continue the progress in carbon saving.

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The Domestic Central Heating Market in Great Britain. BSRIA report MR 3/92. June 1992
European Space and Water Heating. Domestic Boilers. United Kingdom. BSRIA report 14847/6. April 2000

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www.statistics.gov.uk
www.defra.gov.uk
www.berr.gov.uk/energy
www.communities.gov.uk/housing/housingresearch
www.mtprog.com

Appendix A – Tables

Table 1 Delivered energy consumption 1970-2006 (PJ) – GB and UK figures

Year	UK Total (PJ)	UK Domestic (PJ)	GB Domestic (PJ)
1970	6112	1544	1502
1971	6012	1491	1452
1972	6122	1518	1481
1973	6437	1573	1531
1974	6147	1591	1543
1975	5893	1552	1503
1976	6046	1534	1488
1977	6173	1587	1539
1978	6245	1620	1572
1979	6512	1740	1686
1980	5962	1668	1619
1981	5793	1661	1614
1982	5725	1642	1592
1983	5699	1634	1584
1984	5684	1587	1541
1985	5940	1761	1696
1986	6101	1830	1767
1987	6119	1820	1759
1988	6221	1774	1713
1989	6121	1685	1629
1990	6166	1706	1654
1991	6357	1874	1815
1992	6326	1845	1788
1993	6396	1907	1845
1994	6387	1840	1782
1995	6297	1787	1736
1996	6574	2014	1956
1997	6444	1874	1819
1998	6528	1931	1873
1999	6554	1929	1872
2000	6666	1959	1904
2001	6738	2015	1956
2002	6552	1966	1912
2003	6617	1995	1941
2004	6692	2031	1975
2005	6703	1971	1918
2006	6607	1904	1848

Source: Digest of United Kingdom Energy Statistics

Table 2 Retail price index and fuel price index – UK figures

1990 = 100	Retail Price Index	Fuel Price Index
1970	14.7	13.2
1971	16.1	14.6
1972	17.2	15.7
1973	18.8	16.1
1974	21.8	18.9
1975	27.1	25.1
1976	31.6	31.1
1977	36.6	36.1
1978	39.7	38.8
1979	45.0	42.7
1980	53.0	53.4
1981	59.3	64.8
1982	64.4	73.9
1983	67.3	79.4
1984	70.7	81.6
1985	75.0	85.2
1986	77.6	86.3
1987	80.8	85.5
1988	84.8	87.7
1989	91.4	92.6
1990	100.0	100.0
1991	105.9	107.9
1992	109.8	110.3
1993	111.6	108.9
1994	114.3	113.6
1995	118.2	116.0
1996	121.1	116.3
1997	124.9	112.7
1998	129.2	107.8
1999	131.2	107.4
2000	135.1	107.0
2001	137.4	107.8
2002	139.7	111.1
2003	143.8	113.4
2004	148.0	121.4
2005	152.2	137.8
2006	157.1	171.8

Source: Digest of United Kingdom Energy Statistics

Table 3 Domestic sector fuel prices corrected to 2006 money values (£/GJ) – UK figures

Year	Coal	Coke, breeze + other solid	total solid	Gas	Electricity	Oil	Total (weighted mean all fuels)
1970	4.94	8.21	5.62	11.04	24.91	6.46	13.21
1971	5.08	8.50	5.81	10.12	24.53	6.30	13.22
1972	5.04	8.38	5.77	9.69	24.22	6.25	13.02
1973	4.82	8.11	5.51	8.81	22.51	6.65	12.22
1974	4.83	7.75	5.47	7.68	23.12	9.22	12.16
1975	4.87	7.99	5.56	7.09	26.97	9.00	12.58
1976	5.18	8.42	5.89	7.62	29.65	9.70	13.37
1977	5.30	8.46	5.95	7.45	29.67	10.11	13.24
1978	5.57	8.80	6.23	7.06	30.53	9.70	13.10
1979	5.92	9.83	6.69	6.34	28.95	11.20	12.58
1980	6.95	11.00	7.81	6.25	31.67	12.75	13.40
1981	7.28	9.87	7.80	7.05	34.02	13.87	14.10
1982	6.91	9.83	7.48	8.14	34.39	14.90	14.66
1983	7.21	10.01	7.78	8.78	33.61	15.86	14.99
1984	6.89	10.73	7.60	8.62	33.06	14.23	14.63
1985	6.80	9.88	7.34	8.39	31.93	13.55	14.07
1986	6.84	10.05	7.40	8.22	31.29	8.59	13.53
1987	6.22	10.28	7.05	7.84	29.78	7.69	12.81
1988	5.27	8.36	5.98	7.51	29.77	6.62	12.28
1989	5.52	7.54	6.03	7.32	30.02	6.80	12.35
1990	5.41	7.57	6.01	7.07	29.10	7.34	11.97
1991	5.24	7.85	5.90	7.13	29.85	5.77	11.82
1992	5.12	7.47	5.74	6.84	29.79	5.44	11.65
1993	5.63	7.81	5.67	6.76	29.83	5.41	11.69
1994	5.27	7.65	5.83	6.97	29.63	4.97	11.74
1995	6.49	7.72	6.83	6.80	29.10	4.98	11.72
1996	6.39	6.86	6.54	6.24	28.09	5.55	10.82
1997	-	-	6.26	6.19	26.64	4.96	10.21
1998	-	-	5.95	5.71	23.45	3.81	9.20
1999	-	-	5.87	5.21	22.92	4.21	8.83
2000	-	-	6.06	4.79	21.59	6.30	8.41
2001	-	-	7.08	4.80	20.76	5.53	8.24
2002	-	-	7.56	5.05	20.48	5.61	8.41
2003	-	-	6.02	4.92	20.08	6.21	8.20
2004	-	-	5.89	6.16	23.28	6.25	9.67
2005	-	-	5.73	6.86	25.04	8.37	10.82
2006	-	-	5.65	8.78	29.52	9.22	13.32

Source: Digest of United Kingdom Energy Statistics

Table 4 Average weekly expenditure on all goods and on fuel, light and power (£/week) – UK figures

	Contemporary prices		2006 prices		
Year	All goods (£/week)	Fuel light & power (£/week)	All goods (£/week)	Fuel light & power (£/week)	% on Fuel light & power
1970	28.57	1.79	305.94	19.17	6.3%
1971	30.99	1.85	302.42	18.05	6.0%
1972	35.06	2.06	320.07	18.81	5.9%
1973	39.43	2.17	329.59	18.14	5.5%
1974	46.13	2.42	332.31	17.43	5.2%
1975	54.58	2.99	316.15	17.32	5.5%
1976	61.70	3.53	307.11	17.57	5.7%
1977	71.84	4.38	308.71	18.82	6.1%
1978	80.26	4.76	318.00	18.86	5.9%
1979	94.17	5.25	329.02	18.34	5.6%
1980	110.60	6.15	328.00	18.24	5.6%
1981	125.41	7.46	332.14	19.76	5.9%
1982	133.92	8.35	326.72	20.37	6.2%
1983	142.59	9.22	332.72	21.51	6.5%
1984	151.92	9.42	337.40	20.92	6.2%
1985	162.50	9.95	340.29	20.84	6.1%
1986	178.10	10.43	360.76	21.13	5.9%
1987	188.62	10.55	366.69	20.51	5.6%
1988	204.41	10.48	378.81	19.42	5.1%
1989	224.32	10.58	385.75	18.19	4.7%
1990	247.16	11.11	388.29	17.45	4.5%
1991	259.04	12.25	384.39	18.18	4.7%
1992	271.83	13.02	388.81	18.62	4.8%
1993	276.68	13.24	389.56	18.64	4.8%
1994	283.58	12.95	389.85	17.80	4.6%
1995	289.86	12.92	385.13	17.17	4.5%
1996	309.07	13.35	400.97	17.32	4.3%
1997	328.78	12.66	413.54	15.92	3.9%
1998	346.58	11.78	421.48	14.33	3.4%
1999	353.47	11.39	423.36	13.64	3.2%
2000	379.61	11.92	441.58	13.87	3.1%
2001	397.20	11.70	454.05	13.37	2.9%
2002	406.20	11.70	456.69	13.15	2.9%
2003	441.25	12.20	482.06	13.33	2.8%
2004	457.90	12.70	486.05	13.48	2.8%
2005	465.43	13.99	480.33	14.43	3.0%
2006	455.90	15.90	455.90	15.90	3.5%

Source: Family Expenditure Survey/ Expenditure and Food Survey

In years where the survey relates to financial years it has been assumed to apply to the calendar year at the start of the financial year.

Table 5 Weekly expenditure on fuel, light and power by income (£/wk) – UK figures 2006

Gross income decile group	Lower boundary of income (£/week)	Average spend on fuel light and power (£/week)	Average total spend (£/week)	% on fuel light & power
Lowest ten percent		10.2	155.6	6.6%
Second decile group	143	12.5	199.8	6.3%
Third decile group	215	14.0	271.4	5.2%
Fourth decile group	293	14.0	333.0	4.2%
Fifth decile group	384	15.4	380.2	4.1%
Sixth decile group	497	15.9	438.1	3.6%
Seventh decile group	624	16.4	506.9	3.2%
Eighth decile group	763	18.0	594.1	3.0%
Ninth decile group	939	19.7	715.5	2.8%
Highest ten percent	1274	22.9	964.4	2.4%

Source: Expenditure and Food Survey

Table 6 Population, households and household size – GB figures

Year	Population (1,000s)	Households (1,000s)	Popul./ H'holds	Mean Size GHS
1970	54105	17987	3.01	
1971	54388	18221	2.98	2.91
1972	54558	18426	2.96	
1973	54693	18603	2.94	2.83
1974	54709	18783	2.91	
1975	54702	18988	2.88	2.78
1976	54693	19215	2.85	
1977	54667	19450	2.81	2.71
1978	54655	19650	2.78	
1979	54712	19827	2.76	2.67
1980	54797	20010	2.74	
1981	54815	20177	2.72	2.70
1982	54746	20327	2.69	
1983	54765	20525	2.67	2.64
1984	54852	20769	2.64	2.59
1985	54989	21017	2.62	2.56
1986	55110	21254	2.59	2.55
1987	55222	21485	2.57	2.55
1988	55331	21710	2.55	2.48
1989	55486	21927	2.53	2.51
1990	55642	22140	2.51	2.46
1991	55831	22392	2.49	2.48
1992	55962	22595	2.48	2.45
1993	56078	22822	2.46	2.44
1994	56218	23076	2.44	2.44
1995	56377	23315	2.42	2.40
1996	56502	23492	2.41	2.43
1997	56643	23694	2.39	
1998	56798	23896	2.38	2.32
1999	57006	24120	2.36	
2000	57203	24375	2.35	2.30
2001	57424	24170	2.38	2.33
2002	57625	24365	2.37	2.31
2003	57851	24595	2.35	2.32
2004	58125	24825	2.34	2.30
2005	58486	25055	2.33	2.30
2006	58800	25285	2.33	

Source: Annual Abstract of Statistics/ Housing and Construction Statistics/ General Household Survey

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Table 7 Housing stock distribution by age (1,000s) – GB figures

	Pre-1918	1918-38	1939-59	1960-75	1976-	Total
1970	4474	4779	4625	4109	0	17987
1971	4474	4779	4625	4343	0	18221
1972	4544	4725	5094	4063	0	18426
1973	4404	4800	4965	4435	0	18603
1974	4271	4623	4645	5245	0	18783
1975	4403	4707	4452	5426	0	18988
1976	4187	4773	4563	5375	316	19215
1977	4040	4722	4522	5541	624	19450
1978	4639	4170	4815	5208	818	19650
1979	4863	4350	4143	5367	1105	19827
1980	5111	4432	4140	5304	1023	20010
1981	5041	4359	3994	5366	1417	20177
1982	5061	4356	3984	5180	1746	20327
1983	4964	4332	4003	5274	1952	20525
1984	4882	4364	4028	5264	2231	20769
1985	4851	4363	4033	5306	2464	21017
1986	4718	4422	4082	5418	2613	21254
1987	4622	4470	4120	5329	2944	21485
1988	4452	4493	4170	5384	3211	21710
1989	4493	4514	4211	5286	3423	21927
1990	4536	4473	4260	5290	3581	22140
1991	4568	4501	4255	5262	3806	22392
1992	4542	4497	4271	5287	3998	22595
1993	4585	4543	4315	5226	4153	22822
1994	4592	4546	4315	5241	4383	23076
1995	4639	4595	4363	5246	4472	23315
1996	4649	4627	4396	5217	4604	23492
1997	4642	4620	4384	5214	4834	23694
1998	4659	4636	4397	5210	4994	23896
1999	4678	4631	4415	5235	5161	24120
2000	4727	4682	4437	5267	5261	24375
2001	4663	4592	4402	5198	5315	24170
2002	4701	4630	4437	5239	5358	24365
2003	4721	4674	4453	5239	5508	24595
2004	4592	4524	4333	5458	5918	24825
2005	4616	4546	4357	5486	6051	25055
2006	4647	4574	4385	5524	6155	25285

Source: GfK Home Audit

Table 8 Housing stock distribution by tenure (1,000s) – GB figures

Year	Owner occupied	Local authority	Private rented	RSL
1970	8454	6206	3328	
1971	8591	6314	3315	
1972	8742	6423	3261	
1973	8948	6429	3227	
1974	9094	6223	3466	
1975	9685	6430	2872	
1976	10138	6552	2525	
1977	10529	6685	2236	
1978	10550	6703	2397	
1979	10672	6718	2437	
1980	11023	6402	2585	
1981	10778	6777	2153	469
1982	10857	6828	2159	483
1983	12175	6030	1816	504
1984	12319	6102	1823	525
1985	12884	5903	1682	548
1986	13029	5972	1687	565
1987	13777	5751	1290	666
1988	14133	5645	1238	694
1989	14607	5369	1250	701
1990	14813	5289	1284	753
1991	15048	5173	1433	739
1992	15207	5084	1558	746
1993	15405	4930	1597	890
1994	15599	4845	1593	1039
1995	15713	4897	1655	1050
1996	15858	4790	1715	1128
1997	16017	4833	1729	1115
1998	16201	4827	1743	1124
1999	16353	4630	1955	1182
2000	16672	4387	1974	1343
2001	16626	4061	2055	1428
2002	16760	4093	2072	1439
2003	16946	3542	1574	2533
2004	17103	3575	1590	2557
2005	17261	3609	1604	2581
2006	16993	4476	1953	1862

Source: GfK Home Audit

Note that prior to 1981 RSL homes are included within the figures for private rented.

Table 9 Housing stock distribution by type (1,000s) – GB figures

Year	semi detached	terrace	flat	detached	bungalow	other	Total
1970	5794	5566	3003	1915	1392	317	17987
1971	5869	5638	3043	1940	1410	321	18221
1972	5992	5667	3100	1905	1439	322	18426
1973	6254	5583	3036	1945	1443	342	18603
1974	6224	5442	3209	2039	1525	344	18783
1975	6341	5701	3298	1986	1422	239	18988
1976	6707	5680	3301	1834	1505	187	19215
1977	6359	5879	3226	2231	1564	191	19450
1978	6293	5752	3277	2377	1643	309	19650
1979	6332	6023	3027	2581	1663	201	19827
1980	6347	6293	3104	2491	1569	207	20010
1981	6362	6139	3092	2687	1697	201	20177
1982	6412	6185	3115	2705	1708	203	20327
1983	6441	6239	3160	2755	1785	144	20525
1984	6519	6315	3200	2783	1806	147	20769
1985	6583	6334	3275	2871	1829	126	21017
1986	6674	6419	3295	2891	1849	126	21254
1987	6618	6361	3432	3030	1936	108	21485
1988	6621	6340	3537	3128	1952	130	21710
1989	6687	6159	3768	3293	1932	88	21927
1990	6796	6218	3766	3365	1929	67	22140
1991	6785	6338	3919	3314	1970	67	22392
1992	6779	6418	4044	3276	2011	68	22595
1993	6757	6390	4176	3376	2054	68	22822
1994	6784	6368	4290	3487	2078	69	23076
1995	6807	6458	4359	3546	2075	69	23315
1996	6860	6459	4416	3619	2068	71	23492
1997	6917	6494	4454	3696	2061	72	23694
1998	6976	6547	4492	3731	2079	72	23896
1999	7019	6584	4535	3811	2098	73	24120
2000	7067	6606	4581	3950	2097	74	24375
2001	6865	6696	4591	3915	2030	73	24170
2002	6920	6750	4629	3946	2047	73	24365
2003	6986	6813	4672	3984	2066	74	24595
2004	7052	6876	4716	4021	2086	74	24825
2005	7116	6940	4761	4058	2105	75	25055
2006	7182	7003	4803	4097	2124	76	25285

Source: GfK Home Audit

Table 10 Housing stock distribution by region (1,000s) – GB figures

Year	South West	Wales	South East	East Anglia	Yorks/ Humber	East Midlands	West Midlands	North West	North	Scotland	Total GB
1970	1390	876	5889	504	1708	1057	1654	2213	1053	1643	17987
1971	1408	887	5966	511	1730	1071	1675	2242	1067	1665	18221
1972	1424	897	6033	516	1750	1083	1694	2267	1079	1683	18426
1973	1437	906	6091	521	1766	1093	1710	2289	1089	1699	18603
1974	1451	915	6150	527	1784	1104	1727	2311	1100	1716	18783
1975	1540	918	6286	576	1776	1168	1661	2318	991	1753	18988
1976	1396	988	6230	634	1758	1223	1795	2359	1112	1719	19215
1977	1537	962	6177	648	1761	1348	1824	2321	1096	1777	19450
1978	1513	993	6141	716	1773	1546	1727	2303	1120	1817	19650
1979	1679	1041	6040	753	1750	1346	1919	2339	1174	1786	19827
1980	1633	1010	6236	688	1841	1411	1887	2353	1154	1797	20010
1981	1648	1001	6426	710	1816	1403	1869	2371	1115	1818	20177
1982	1661	1008	6474	716	1828	1414	1884	2389	1123	1831	20327
1983	1660	1037	6481	712	1851	1433	1895	2412	1176	1868	20525
1984	1680	1049	6559	720	1873	1450	1917	2440	1190	1890	20769
1985	1726	1051	6729	742	1877	1469	1952	2409	1162	1900	21017
1986	1746	1063	6805	751	1897	1486	1974	2436	1175	1921	21254
1987	1772	1083	6740	774	1942	1519	1992	2496	1220	1946	21485
1988	1808	1053	6867	793	1975	1546	2013	2472	1220	1963	21710
1989	1845	1054	6940	805	1991	1561	2030	2483	1223	1995	21927
1990	1880	1069	7014	817	2006	1576	2044	2491	1229	2015	22140
1991	1905	1080	7125	840	2015	1610	2060	2501	1222	2033	22392
1992	1928	1089	7197	849	2020	1631	2076	2524	1229	2052	22595
1993	1938	1159	7207	847	2015	1625	2081	2572	1271	2107	22822
1994	1975	1171	7317	869	2014	1646	2109	2509	1304	2162	23076
1995	1987	1175	7375	875	2056	1672	2121	2613	1289	2152	23315
1996	2001	1180	7435	876	2089	1682	2137	2634	1299	2159	23492
1997	2035	1187	7528	895	2097	1704	2144	2635	1301	2168	23694
1998	2045	1195	7608	896	2115	1716	2170	2665	1312	2175	23896
1999	2074	1206	7694	916	2122	1737	2171	2678	1327	2195	24120
2000	2121	1195	7824	951	2145	1755	2170	2681	1317	2218	24375
2001	2103	1184	7759	942	2127	1740	2151	2659	1305	2200	24170
2002	2119	1194	7821	950	2144	1754	2169	2681	1316	2217	24365
2003	2140	1205	7895	959	2164	1771	2189	2705	1328	2238	24595
2004	2140	1259	8033	945	2150	1820	2289	2711	1296	2182	24825
2005	2160	1270	8108	954	2170	1836	2310	2736	1308	2203	25055
2006	2179	1282	8182	964	2190	1853	2331	2761	1320	2223	25285

Source: GfK Home Audit

Table 11 Ownership and depth of loft insulation (1,000s) – GB figures

Year	<25mm	25mm	50mm	75mm	100mm	100mm+	125mm	125mm+	150mm+	Not stated	Total with	Potential	Total houses
1974	-	-	-	-	-	-	-	-	-	5945	5945	14005	18783
1975	-	-	-	-	-	-	-	-	-	6384	6384	14158	18988
1976	424	877	2447	1909	-	422	-	-	-	1166	7246	14327	19215
1977	495	1396	2668	2253	-	624	-	-	-	790	8226	14627	19450
1978	398	1203	2682	2814	-	993	-	-	-	874	8965	14626	19650
1979	348	900	2711	3411	-	1475	-	-	-	1346	10192	15265	19827
1980	321	789	3291	3943	-	1944	-	-	-	902	11189	15748	20010
1981	308	1106	3282	3996	-	2627	-	-	-	1074	12392	15860	20177
1982	297	811	3387	3921	-	3321	-	-	-	1219	12957	16189	20327
1983	274	691	2964	3772	-	4774	-	-	-	1347	13821	16469	20525
1984	235	638	2826	4034	-	5869	-	-	-	1254	14857	16884	20769
1985	143	921	2427	3187	-	6244	-	-	-	2019	14941	17133	21017
1986	180	820	2379	3588	-	6853	-	-	-	1723	15543	17503	21254
1987	271	824	2101	3502	5035	-	-	2408	-	1588	15728	17530	21485
1988	137	588	2050	3544	5085	-	-	2769	-	1762	15934	17821	21710
1989	142	575	2016	3684	4960	-	-	2659	-	1908	15943	17614	21927
1990	168	583	2281	3764	4935	-	-	2865	-	1807	16403	18054	22140
1991	122	634	2055	3823	4251	-	-	3064	-	2183	16133	17986	22392
1992	256	422	1908	3456	4890	-	-	2890	-	2515	16335	18018	22595
1993	178	356	2200	3607	4618	-	-	2955	-	2742	16657	18426	22822
1994	98	382	1729	3039	4657	-	1455	-	2585	2550	16494	18147	23076
1995	150	330	1724	3078	4235	-	1490	-	2945	2814	16765	18334	23315
1996	132	401	1717	2794	4466	-	1398	-	3310	2911	17129	18613	23492
1997	50	302	1588	3426	4661	-	1548	-	3643	2281	17497	18866	23694
1998	112	352	1759	3078	4739	-	1901	-	3318	2378	17638	18864	23896
1999	66	332	1409	3631	4442	-	1641	-	3495	2415	17430	18832	24120
2000	59	249	1715	3674	4854	-	1426	-	3187	2396	17561	19229	24375
2001	31	153	1201	3236	4928	-	2149	-	3451	2431	17581	18798	24170
2002	32	154	1192	3210	4894	-	2135	-	3467	2447	17530	18949	24365
2003	33	161	1181	3138	4867	-	2166	-	3470	2558	17572	19206	24595
2004	33	162	1209	3319	5050	-	2209	-	3770	2563	18315	19383	24825
2005	34	163	1216	3349	5086	-	2218	-	3856	2603	18525	19562	25055
2006	33	168	1249	3263	5052	-	2204	-	4049	2700	18718	19729	25285

Source: GfK Home Audit

Table 12 Ownership of cavity wall insulation (1,000s) – GB figures

Year	Houses with cavity insulation	Not known if cavity insulated	Potential	Total households
1974	295	-	12411	18783
1975	375	-	12570	18988
1976	485	-	12744	19215
1977	626	-	12938	19450
1978	674	-	13225	19650
1979	1029	-	13434	19827
1980	1115	-	13616	20010
1981	1275	-	13787	20177
1982	1464	-	13946	20327
1983	1773	-	14134	20525
1984	2156	-	14326	20769
1985	2230	2464	14515	21017
1986	2501	2623	14695	21254
1987	2672	2935	14951	21485
1988	2895	3070	15144	21710
1989	3150	3086	15514	21927
1990	3369	3448	15461	22140
1991	3475	3746	15874	22392
1992	3756	4198	16289	22595
1993	3653	3775	15767	22822
1994	3678	4673	15986	23076
1995	3970	4932	16086	23315
1996	4019	5544	16750	23492
1997	4193	5262	16832	23694
1998	4428	5054	16524	23896
1999	4869	1830	16922	24120
2000	5695	1863	16833	24375
2001	5588	2108	17296	24170
2002	5859	1761	17436	24365
2003	6095	1767	17641	24595
2004	6655	1712	18073	24825
2005	6934	7744	18274	25055
2006	7264	7687	18501	25285

Source: GfK Home Audit

Table 13 Double glazing ownership (1,000s) – GB figures

Year	Less than 20% of rooms	20% to 39% of rooms	40% to 59% of rooms	60% to 79% of rooms	80% or more of rooms	Not stated	Total with double glazing	Potential
1974	-	-	-	-	-	1473	1473	18783
1975	-	-	-	-	-	1763	1763	18988
1976	-	-	-	-	-	1856	1856	19215
1977	-	-	-	-	-	2414	2414	19450
1978	-	-	-	-	-	2980	2980	19650
1979	-	-	-	-	-	3339	3339	19827
1980	-	-	-	-	-	3926	3926	20010
1981	-	-	-	-	-	4222	4222	20177
1982	-	-	-	-	-	4695	4695	20327
1983	1126	1102	835	632	1884	97	5675	20525
1984	830	1042	952	848	1958	129	5758	20769
1985	804	1185	1032	970	1921	692	6604	21017
1986	819	1235	1169	1239	2360	378	7201	21254
1987	1499	1380	1258	1387	2986	90	8600	21485
1988	1252	1408	1195	1427	3436	700	9419	21710
1989	1198	1298	1311	1589	3844	769	10008	21927
1990	1096	1424	1270	1758	4470	671	10689	22140
1991	1138	1441	1291	2014	4924	661	11470	22392
1992	1076	1239	1375	2051	5361	671	11773	22595
1993	951	1357	1380	2397	5965	616	12666	22822
1994	1000	1075	1345	2271	7408	630	13729	23076
1995	877	1019	1283	2317	8165	630	14291	23315
1996	699	912	1208	2446	8848	591	14705	23492
1997	604	972	1260	2660	8576	1979	16051	23694
1998	573	804	1048	2728	9548	1558	16260	23896
1999	629	918	1025	2514	10257	1454	16798	24120
2000	495	598	976	2715	9705	3116	17606	24375
2001	414	576	940	2531	10060	3586	18107	24170
2002	416	581	948	2551	10145	4322	18962	24365
2003	430	581	946	2611	10436	4856	19862	24595
2004	423	574	931	2683	10631	5336	20578	24825
2005	425	578	935	2711	10755	5639	21043	25055
2006	455	595	959	2638	10792	5833	21272	25285

Source: GfK Home Audit

Table 14 Ownership of draught proofing (1,000s) – GB figures

Year	Less than 20% of rooms	20% to 39% of rooms	40% to 59% of rooms	60% to 79% of rooms	80% or more of rooms	Not stated	Total with draught proofing	Potential
1983	2546	2767	1358	854	2316	296	10138	20525
1984	2227	2852	1496	1119	2471	134	10298	20769
1985	2348	3198	1735	1318	2725	692	12016	21017
1986	2513	3266	1798	1631	3149	378	12734	21254
1987	2876	3319	2026	1829	4050	90	14190	21485
1988	2470	3249	1911	1802	4367	700	14500	21710
1989	2362	3044	1911	1948	4745	769	14779	21927
1990	2218	2948	1971	2052	5352	671	15212	22140
1991	2215	2997	1867	2357	5781	678	15895	22392
1992	1973	2767	1901	2391	6194	688	15914	22595
1993	1838	2811	1891	2711	6763	636	16650	22822
1994	1701	2232	1774	2620	8348	655	17329	23076
1995	1449	2051	1826	2679	9145	650	17800	23315
1996	1224	1896	1692	2796	9814	600	18023	23492
1997	1154	1806	1697	2986	9413	1995	19050	23694
1998	1094	1558	1449	3042	10380	1573	19096	23896
1999	1028	1603	1421	2807	10840	1493	19192	24120
2000	957	1371	1343	2885	10352	3133	20040	24375
2001	685	1087	1154	2697	10483	3638	19745	24170
2002	540	1065	1199	2844	10542	4335	20527	24365
2003	500	995	1216	2925	10878	4867	21381	24595
2004	538	897	1067	2801	10817	5338	21458	24825
2005	554	890	1088	2836	10945	5643	21956	25055
2006	562	936	1112	2782	11010	5835	22238	25285

Source: GfK Home Audit

Table 15 Households with full and no insulation measures – GB figures

Year	Total households with no insulation	Total households with full insulation	Total households
1987	3971	724	21485
1988	4061	970	21710
1989	3864	1018	21927
1990	3701	1053	22140
1991	3638	1177	22392
1992	3596	1372	22595
1993	3383	1430	22822
1994	3535	2032	23076
1995	3469	2341	23315
1996	3114	2388	23492
1997	2751	2370	23694
1998	2764	2915	23896
1999	3034	3220	24120
2000	2660	3174	24375
2001	2512	3398	24170
2002	2360	3486	24365
2003	2150	3669	24595
2004	1953	3895	24825
2005	1895	4016	25055
2006	1861	4123	25285

Source: GfK Home Audit

Table 16 Ownership of hot water tank insulation (1,000s) – GB figures

Year	25 mm or less	50 mm	75mm	75 mm or more	>75 mm	Not stated	Total with insulation	Potential	Total households
1976	2988	4870	-	2918	-	1552	12328	16588	19215
1977	3751	4660	-	2625	-	2240	13277	16804	19450
1978	3211	5025	2505	-	750	2124	13615	16783	19650
1979	3982	5892	2754	-	809	1126	14563	17305	19827
1980	3182	6554	3742	-	919	718	15116	17579	20010
1981	3484	6165	3741	-	1176	677	15243	17471	20177
1982	3785	6428	3593	-	1154	742	15701	17639	20327
1983	3594	6745	3706	-	1460	843	16348	18116	20525
1984	3494	6625	3816	-	1716	1227	16878	18489	20769
1985	2870	6877	4742	-	1791	1457	17737	19139	21017
1986	3158	7025	4203	-	1822	1756	17964	19307	21254
1987	2197	5539	7804	-	1811	1026	18377	19581	21485
1988	1900	5777	8075	-	1814	963	18528	19803	21710
1989	1687	5044	9182	-	1473	1308	18694	19893	21927
1990	1749	4925	9440	-	1731	1022	18867	20059	22140
1991	1535	4842	9899	-	1731	1111	19117	20194	22392
1992	1555	4322	9924	-	1854	1122	18778	19956	22595
1993	1225	4330	10321	-	1536	1370	18783	20068	22822
1994	988	3843	10977	-	1786	1377	18971	20113	23076
1995	1214	3606	11487	-	1455	1160	18921	20035	23315
1996	1186	3310	11266	-	1865	1117	18743	19797	23492
1997	1203	3535	11876	-	1862	881	19357	20246	23694
1998	1031	3206	12281	-	1262	954	18732	19821	23896
1999	987	2737	12375	-	1056	1025	18179	19234	24120
2000	823	2918	12284	-	1157	1085	18267	19446	24375
2001	761	2081	12216	-	1286	1279	17623	18595	24170
2002	767	2098	12314	-	1297	1303	17779	18783	24365
2003	724	2111	12389	-	1215	1314	17753	18769	24595
2004	707	2103	12472	-	1230	1321	17833	18860	24825
2005	710	2115	12580	-	1242	1340	17987	19026	25055
2006	724	2145	12699	-	1257	1389	18214	19300	25285

Source: GfK Home Audit

Table 17 Combi boiler ownership (1,000s) – UK figures

	Combi boilers
1975	1
1976	6
1977	10
1978	15
1979	20
1980	24
1981	60
1982	97
1983	133
1984	169
1985	205
1986	386
1987	568
1988	750
1989	931
1990	1113
1991	1333
1992	1560
1993	1809
1994	2081
1995	2371
1996	2702
1997	3080
1998	3507
1999	3992
2000	4542
2001	5160
2002	5841
2003	6596
2004	7426
2005	8203
2006	9004

Source: Market Transformation Programme Boiler Model

Table 18 Domestic energy consumption and external temperatures – GB figures

Year	Total houses (1,000s)	Total delivered energy (PJ)	Average external temperature (oC)	Average consumption per dwelling (GJ)
1970	17987	1502	5.8	83.5
1971	18221	1452	6.7	79.7
1972	18426	1481	6.4	80.4
1973	18603	1531	6.1	82.3
1974	18783	1543	6.7	82.2
1975	18988	1503	6.4	79.1
1976	19215	1488	5.8	77.5
1977	19450	1539	6.6	79.1
1978	19650	1572	6.4	80.0
1979	19827	1686	5.1	85.0
1980	20010	1619	5.8	80.9
1981	20177	1614	5.1	80.0
1982	20327	1592	5.8	78.3
1983	20525	1584	6.2	77.2
1984	20769	1541	5.8	74.2
1985	21017	1696	4.8	80.7
1986	21254	1767	5.2	83.2
1987	21485	1759	4.9	81.9
1988	21710	1713	6.2	78.9
1989	21927	1629	6.9	74.3
1990	22140	1654	7.6	74.7
1991	22392	1815	6.0	81.1
1992	22595	1788	6.1	79.1
1993	22822	1845	6.1	80.8
1994	23076	1782	7.2	77.2
1995	23315	1736	6.9	74.4
1996	23492	1956	5.7	83.3
1997	23694	1819	7.3	76.8
1998	23896	1873	7.5	78.4
1999	24120	1872	7.2	77.6
2000	24375	1904	7.1	78.1
2001	24170	1956	6.6	80.9
2002	24365	1912	7.7	78.5
2003	24595	1941	6.7	78.9
2004	24825	1975	6.9	79.6
2005	25055	1918	7.0	76.5
2006	25285	1848	6.8	73.1

Source: Digest of United Kingdom Energy Statistics

Table 19 Heat loss of the average dwelling and the whole stock – GB figures

	Average dwelling heat loss by building element (W/ºC)						Average dwelling heat loss W/ºC	Stock loss GW/ºC
	Walls	Ventilation	Windows	Roofs	Floors	Doors		
1970	129.7	72.1	70.2	65.4	21.0	17.5	376.0	6.76
1971	129.8	72.2	70.4	62.8	21.1	17.6	374.0	6.81
1972	129.7	72.2	70.5	59.9	21.1	17.6	371.0	6.84
1973	129.2	71.9	70.4	56.8	21.1	17.6	367.0	6.83
1974	128.4	71.4	70.1	53.6	21.1	17.5	362.0	6.80
1975	127.7	70.8	69.7	50.4	21.0	17.4	357.0	6.78
1976	126.7	70.1	69.1	47.2	20.9	17.3	351.2	6.75
1977	124.8	69.2	68.3	44.7	20.9	17.1	345.0	6.71
1978	123.8	68.7	68.0	40.8	20.7	17.0	339.0	6.66
1979	121.7	68.0	67.4	38.7	21.4	16.8	334.0	6.62
1980	119.6	66.7	66.2	36.4	21.6	16.5	327.0	6.54
1981	118.1	65.7	65.3	34.0	21.5	16.3	321.0	6.48
1982	116.2	64.6	64.3	31.9	21.6	16.1	314.7	6.40
1983	114.6	63.8	63.2	29.7	21.7	15.9	309.0	6.34
1984	113.5	63.3	63.1	28.3	22.1	15.8	306.1	6.36
1985	113.4	62.9	62.8	27.3	22.2	15.7	304.3	6.40
1986	112.1	62.0	62.1	26.3	22.4	15.5	300.4	6.38
1987	111.4	61.4	61.4	25.0	22.3	15.4	296.9	6.38
1988	111.1	61.0	60.8	23.9	22.5	15.3	294.7	6.40
1989	110.5	60.8	60.7	23.1	22.2	15.2	292.6	6.42
1990	110.0	59.8	59.7	23.1	22.5	15.0	290.2	6.43
1991	109.5	59.4	59.4	22.5	22.2	14.9	287.8	6.44
1992	106.9	58.2	58.5	21.9	21.8	14.6	281.8	6.37
1993	108.5	57.0	57.2	21.8	21.8	14.3	280.6	6.40
1994	109.7	57.0	56.7	20.4	21.5	14.3	279.5	6.45
1995	108.6	56.1	55.8	20.2	21.3	14.0	276.0	6.43
1996	107.3	55.6	55.4	20.2	21.5	13.9	274.0	6.44
1997	107.0	54.9	54.3	19.9	21.6	13.7	271.4	6.43
1998	107.8	54.2	53.9	19.9	21.4	13.5	270.8	6.47
1999	107.2	54.2	54.2	19.7	21.3	13.5	270.2	6.52
2000	106.3	53.8	53.6	20.2	21.6	13.4	268.8	6.55
2001	106.0	53.8	53.4	19.4	21.6	13.4	267.5	6.47
2002	105.5	53.3	52.9	19.4	21.6	13.2	265.8	6.48
2003	104.3	52.4	51.9	19.4	21.5	13.0	262.4	6.45
2004	102.2	51.8	51.4	19.4	21.4	12.8	259.0	6.43
2005	97.5	49.3	49.2	18.6	20.5	12.2	247.3	6.20
2006	97.1	49.0	49.4	18.6	20.5	12.1	246.8	6.24

Source: BREHOMES

Figures for 1970 to 1975, 1977 to 1981, 1983 and 2000 have been determined by interpolation and extrapolation. Full heat loss calculations have been performed for all other years.

Table 20 Central heating ownership (1,000s) – GB figures

	With central heating	Without central heating	Total households
1970	5628	12359	17987
1971	6271	11950	18221
1972	6867	11559	18426
1973	7669	10934	18603
1974	8628	10155	18783
1975	9315	9673	18988
1976	9888	9327	19215
1977	10454	8996	19450
1978	10633	9017	19650
1979	11192	8635	19827
1980	11517	8493	20010
1981	11851	8326	20177
1982	12374	7953	20327
1983	13443	7082	20525
1984	14029	6740	20769
1985	14778	6239	21017
1986	15337	5917	21254
1987	15981	5504	21485
1988	16396	5314	21710
1989	17089	4838	21927
1990	17573	4567	22140
1991	18309	4083	22392
1992	18727	3868	22595
1993	19229	3593	22822
1994	19782	3294	23076
1995	20274	3041	23315
1996	20438	3054	23492
1997	20791	2903	23694
1998	21294	2602	23896
1999	21517	2603	24120
2000	21718	2657	24375
2001	21803	2367	24170
2002	21979	2386	24365
2003	22474	2121	24595
2004	22729	2096	24825
2005	22943	2112	25055
2006	23033	2252	25285

Source: GfK Home Audit

Table 21 Main form of heating – centrally heated dwellings (1,000s) – GB figures

Year	Solid fuel	Electric storage	Electric other	All electric	Gas	Oil	Other	Total
1970	1615	1094	436	1529	1856	460	167	5628
1971	1543	1280	510	1789	2201	555	184	6271
1972	1483	1417	564	1981	2563	649	189	6867
1973	1434	1577	640	2217	3109	685	225	7669
1974	1461	1733	703	2436	3747	688	295	8628
1975	1394	1869	803	2672	4213	676	360	9315
1976	1407	1739	747	2486	5003	647	345	9888
1977	1398	1626	698	2324	5704	671	357	10454
1978	1073	1665	715	2380	6160	666	354	10633
1979	1052	1457	626	2083	7113	615	328	11192
1980	1134	1395	599	1994	7655	478	255	11517
1981	1209	1219	580	1799	8102	488	252	11851
1982	1303	1065	570	1635	8677	505	253	12374
1983	1457	947	584	1531	9644	545	265	13443
1984	1273	1319	708	2027	9977	552	199	14029
1985	1521	1313	632	1945	10422	528	363	14778
1986	1523	1154	466	1620	11414	490	291	15337
1987	1499	1267	404	1671	11871	565	375	15981
1988	1515	1384	474	1858	12050	600	372	16396
1989	1284	1513	545	2058	12821	535	392	17089
1990	1277	1641	454	2095	13223	557	421	17573
1991	1262	1802	413	2215	13790	620	421	18309
1992	1047	1881	420	2301	14419	569	391	18727
1993	982	1991	376	2367	14850	659	371	19229
1994	890	1910	468	2378	15490	626	397	19782
1995	786	1994	395	2389	15870	721	507	20274
1996	840	2113	390	2503	15608	915	572	20438
1997	896	2249	400	2650	15803	932	510	20791
1998	740	2105	256	2361	16932	780	481	21294
1999	721	2172	465	2637	16862	842	456	21517
2000	668	2140	436	2576	17198	841	435	21718
2001	659	1927	423	2350	17396	936	461	21803
2002	700	1616	852	2468	17398	1055	359	21979
2003	547	1249	804	2054	18696	916	262	22474
2004	365	1295	611	1906	19049	1135	274	22729
2005	287	1268	598	1867	19394	1001	394	22943
2006	211	701	657	1358	20083	927	455	23033

Source: GfK Home Audit

Table 22 Main form of heating – non centrally heated dwellings (1,000s) – GB figures

Year	Solid fuel fire	Solid fuel stove	All solid	Electric	Gas	Oil	Other	Total
1970	3221	619	3840	2351	5447	469	251	12359
1971	3115	599	3714	2274	5266	454	242	11950
1972	3013	580	3593	2199	5094	439	235	11559
1973	2850	548	3398	2080	4819	415	222	10934
1974	2647	508	3155	1931	4477	386	206	10155
1975	2521	485	3006	1840	4262	368	197	9673
1976	2485	478	2963	1621	4191	360	192	9327
1977	2194	421	2615	1466	4386	345	184	8996
1978	2232	429	2661	1478	4349	344	184	9017
1979	1827	612	2439	1372	4333	304	188	8635
1980	1735	680	2415	1182	4393	301	203	8493
1981	1630	604	2234	1173	4447	212	260	8326
1982	1383	614	1997	1133	4381	178	264	7953
1983	1048	622	1670	1033	4074	92	213	7082
1984	988	566	1554	938	4033	56	159	6740
1985	895	495	1390	813	3876	32	127	6239
1986	811	436	1247	700	3781	22	166	5917
1987	671	360	1030	710	3605	25	133	5504
1988	613	330	943	748	3450	23	150	5314
1989	597	321	917	630	3136	16	138	4838
1990	543	292	835	628	2978	7	121	4567
1991	473	255	728	503	2718	15	119	4083
1992	417	224	641	529	2572	10	115	3868
1993	366	197	563	486	2434	6	104	3593
1994	359	193	552	486	2169	3	84	3294
1995	300	161	461	471	2019	7	83	3041
1996	338	182	519	463	1986	4	81	3054
1997	309	166	475	563	1797	3	65	2903
1998	283	152	435	433	1662	2	69	2602
1999	190	102	293	449	1791	5	66	2603
2000	179	96	275	550	1782	2	48	2657
2001	196	106	302	740	1262	0	63	2367
2002	207	111	318	908	1115	0	45	2386
2003	193	104	297	768	1001	0	55	2121
2004	302	163	465	519	1065	0	48	2096
2005	114	61	175	995	913	0	29	2112
2006	142	76	219	1152	877	0	5	2252

Source: GfK Home Audit

Table 23 Condensing boilers – gas and oil (1,000s) – UK figures

	Condensing boilers	Total boilers
1980	0	6309
1981	0	6907
1982	0	7505
1983	0	8103
1984	1	8702
1985	2	9302
1986	4	9961
1987	8	10623
1988	13	11285
1989	20	11949
1990	26	12613
1991	33	13134
1992	41	13631
1993	52	14148
1994	68	15203
1995	85	15764
1996	112	16359
1997	142	16960
1998	181	17587
1999	228	18206
2000	280	18815
2001	358	19441
2002	491	20045
2003	686	20650
2004	1049	21240
2005	1948	21820
2006	3308	22349

Source: Market Transformation Programme Boiler Model

Table 24 Weighted average space heating efficiencies – GB figures

Year	Central heating efficiency	Non central heating efficiency	Average efficiency
1970	59%	46%	49%
1971	60%	46%	50%
1972	60%	46%	51%
1973	61%	46%	51%
1974	61%	46%	52%
1975	61%	47%	53%
1976	61%	46%	53%
1977	60%	46%	53%
1978	61%	47%	54%
1979	60%	48%	54%
1980	60%	48%	55%
1981	60%	49%	55%
1982	60%	50%	56%
1983	60%	51%	57%
1984	62%	51%	58%
1985	62%	51%	58%
1986	62%	51%	58%
1987	62%	51%	59%
1988	63%	52%	60%
1989	64%	51%	61%
1990	65%	52%	61%
1991	65%	51%	62%
1992	66%	52%	63%
1993	66%	52%	64%
1994	67%	52%	64%
1995	68%	53%	65%
1996	68%	52%	66%
1997	69%	53%	67%
1998	70%	53%	67%
1999	71%	54%	68%
2000	71%	55%	69%
2001	72%	58%	70%
2002	73%	60%	71%
2003	73%	59%	72%
2004	74%	54%	72%
2005	75%	64%	74%
2006	76%	65%	74%

Source: BREHOMES

These are average efficiencies, weighted in accordance with the number of appliances of different types. Variations between years reflect changes between fuels and between appliances.

Table 25 Domestic energy consumption by end use (PJ and GJ) – GB figures

Year	Space heating (PJ)	Water heating (PJ)	Cooking (PJ)	Lights & appliances (PJ)	Total energy (PJ)	Total energy per household (GJ)	Space heating per household (GJ)
1970	901.4	402.2	89.5	108.4	1501.5	83.5	50.1
1971	846.9	401.4	89.0	114.7	1452.0	79.7	46.5
1972	861.0	410.4	88.4	121.6	1481.3	80.4	46.7
1973	896.3	417.3	87.8	129.3	1530.6	82.3	48.2
1974	904.9	414.8	87.0	136.8	1543.4	82.2	48.2
1975	862.6	410.7	86.2	143.2	1502.7	79.1	45.4
1976	839.3	414.6	85.3	149.0	1488.2	77.5	43.7
1977	891.6	408.7	84.4	153.9	1538.5	79.1	45.8
1978	922.6	407.4	83.3	158.6	1572.0	80.0	47.0
1979	1026.0	414.5	82.2	163.2	1685.9	85.0	51.7
1980	966.0	404.4	80.9	167.9	1619.3	80.9	48.3
1981	961.5	400.3	79.6	172.8	1614.2	80.0	47.7
1982	941.5	394.7	78.1	177.3	1591.6	78.3	46.3
1983	932.0	392.5	76.4	182.7	1583.6	77.2	45.4
1984	886.5	390.6	74.5	189.1	1540.6	74.2	42.7
1985	1036.2	391.7	72.6	195.9	1696.3	80.7	49.3
1986	1087.8	406.1	70.5	202.9	1767.3	83.2	51.2
1987	1080.9	400.1	68.4	209.4	1758.8	81.9	50.3
1988	1027.2	405.4	66.2	214.1	1712.9	78.9	47.3
1989	935.6	410.6	64.2	218.7	1629.1	74.3	42.7
1990	959.5	409.7	62.3	222.1	1653.6	74.7	43.3
1991	1111.5	417.7	60.6	225.1	1814.9	81.1	49.6
1992	1078.6	421.9	59.3	228.0	1787.8	79.1	47.7
1993	1124.2	431.6	58.1	230.6	1844.5	80.8	49.3
1994	1060.6	431.0	57.1	233.2	1782.0	77.2	46.0
1995	1010.4	433.6	56.3	235.4	1735.8	74.4	43.3
1996	1226.4	436.7	55.7	237.5	1956.4	83.3	52.2
1997	1083.2	440.5	55.2	239.9	1818.8	76.8	45.7
1998	1134.7	441.3	54.8	242.4	1873.2	78.4	47.5
1999	1130.4	442.3	54.4	244.7	1871.8	77.6	46.9
2000	1153.4	449.5	54.0	247.1	1904.0	78.1	47.3
2001	1205.9	447.4	53.7	249.3	1956.3	80.9	49.9
2002	1157.3	449.2	53.4	252.1	1912.0	78.5	47.5
2003	1177.6	455.1	53.1	255.6	1941.4	78.9	47.9
2004	1202.7	460.0	52.8	259.8	1975.4	79.6	48.4
2005	1141.9	458.7	52.6	264.5	1917.6	76.5	45.6
2006	1066.5	460.1	52.4	268.8	1847.8	73.1	42.2

Source: BREHOMES

Table 26 Standards of comfort mean internal and average winter external temperatures – GB figures

Year	Dwellings with central heating %	Centrally heated homes (oC)	Non centrally heated homes (oC)	Average internal temperature (oC)	External temperature (oC)	Total households (1,000s)
1970	31.3%	13.82	11.32	12.10	5.8	17987
1971	34.4%	14.52	12.02	12.88	6.7	18221
1972	37.3%	14.25	11.75	12.69	6.4	18426
1973	41.2%	14.13	11.63	12.66	6.1	18603
1974	45.9%	14.78	12.28	13.43	6.7	18783
1975	49.1%	14.31	11.81	13.03	6.4	18988
1976	51.5%	13.63	11.13	12.42	5.8	19215
1977	53.7%	14.65	12.15	13.49	6.6	19450
1978	54.1%	14.74	12.24	13.59	6.4	19650
1979	56.4%	13.89	11.39	12.80	5.1	19827
1980	57.6%	14.45	11.95	13.39	5.8	20010
1981	58.7%	13.87	11.37	12.84	5.1	20177
1982	60.9%	14.56	12.06	13.58	5.8	20327
1983	65.5%	14.94	12.44	14.08	6.2	20525
1984	67.5%	14.39	11.89	13.58	5.8	20769
1985	70.3%	14.04	11.54	13.30	4.8	21017
1986	72.2%	14.76	12.26	14.06	5.2	21254
1987	74.4%	14.45	11.95	13.80	4.9	21485
1988	75.5%	15.52	13.02	14.90	6.2	21710
1989	77.9%	15.79	13.29	15.24	6.9	21927
1990	79.4%	16.65	14.15	16.13	7.6	22140
1991	81.8%	15.86	13.36	15.41	6.0	22392
1992	82.9%	15.95	13.45	15.52	6.1	22595
1993	84.3%	16.22	13.72	15.82	6.1	22822
1994	85.7%	16.89	14.39	16.54	7.2	23076
1995	87.0%	16.43	13.93	16.10	6.9	23315
1996	87.0%	16.44	13.94	16.11	5.7	23492
1997	87.7%	17.39	14.89	17.08	7.3	23694
1998	89.1%	17.84	15.34	17.57	7.5	23896
1999	89.2%	17.52	15.02	17.25	7.2	24120
2000	89.1%	17.68	15.18	17.40	7.1	24375
2001	90.2%	17.68	15.18	17.44	6.6	24170
2002	90.2%	18.55	16.05	18.30	7.7	24365
2003	91.4%	17.76	15.26	17.55	6.7	24595
2004	91.6%	18.23	15.73	18.02	6.9	24825
2005	91.6%	18.65	16.15	18.44	7.0	25055
2006	91.1%	18.00	15.50	17.78	6.8	25285

Source: BREHOMES

Table 27 The effect of energy efficiency improvements on energy consumption (PJ) – GB figures

Year	Total households (1,000s)	Actual energy used	Energy use if 1970 insulation standard	Energy use if 1970 insulation and efficiency standard	Saving due to improved insulation	Saving due to improved efficiency	Total saving
1970	17987	1501.6	1501.6	1501.6	0.0	0.0	0.0
1971	18221	1452.0	1460.6	1471.0	8.5	10.4	18.9
1972	18426	1481.3	1503.0	1529.1	21.7	26.0	47.7
1973	18603	1530.6	1571.0	1610.9	40.4	39.8	80.3
1974	18783	1543.4	1607.5	1662.1	64.1	54.6	118.7
1975	18988	1502.7	1588.4	1660.0	85.7	71.6	157.3
1976	19215	1488.2	1601.2	1667.7	113.0	66.6	179.5
1977	19450	1538.5	1687.1	1766.7	148.6	79.6	228.1
1978	19650	1572.0	1755.4	1851.7	183.4	96.4	279.7
1979	19827	1685.9	1909.8	2036.8	223.9	127.0	350.9
1980	20010	1619.3	1876.7	2010.2	257.4	133.6	391.0
1981	20177	1614.2	1908.2	2050.7	293.9	142.6	436.5
1982	20327	1591.6	1920.2	2086.8	328.6	166.6	495.3
1983	20525	1583.6	1945.9	2139.1	362.2	193.3	555.5
1984	20769	1540.6	1909.9	2126.4	369.3	216.5	585.8
1985	21017	1696.3	2113.3	2372.2	417.0	258.9	675.9
1986	21254	1767.3	2227.8	2509.5	460.4	281.7	742.1
1987	21485	1758.8	2242.5	2555.1	483.7	312.6	796.3
1988	21710	1712.9	2197.1	2528.0	484.2	330.9	815.1
1989	21927	1629.1	2102.8	2433.1	473.7	330.3	804.0
1990	22140	1653.6	2150.4	2511.9	496.8	361.5	858.3
1991	22392	1814.9	2376.0	2815.8	561.1	439.7	1000.8
1992	22595	1787.8	2386.8	2855.1	599.0	468.3	1067.4
1993	22822	1844.5	2468.6	2982.2	624.1	513.6	1137.7
1994	23076	1782.0	2392.8	2906.6	610.9	513.8	1124.7
1995	23315	1735.8	2356.7	2885.5	621.0	528.8	1149.7
1996	23492	1956.4	2673.8	3328.5	717.4	654.7	1372.1
1997	23694	1818.8	2503.4	3135.8	684.6	632.4	1317.0
1998	23896	1873.2	2583.2	3255.5	710.0	672.3	1382.4
1999	24120	1871.8	2583.2	3296.5	711.3	713.4	1424.7
2000	24375	1904.0	2636.9	3394.3	732.9	757.5	1490.4
2001	24170	1956.3	2717.7	3553.4	761.4	835.7	1597.1
2002	24365	1912.0	2668.1	3522.0	756.1	853.9	1610.0
2003	24595	1941.4	2740.8	3638.0	799.5	897.1	1696.6
2004	24825	1975.4	2822.8	3754.9	847.4	932.1	1779.5
2005	25055	1917.6	2854.4	3891.3	936.9	1036.8	1973.7
2006	25285	1847.8	2751.1	3760.0	903.3	1008.8	1912.1

Source: BREHOMES

Table 28 Average SAP 2005 ratings by year – GB figures (EHCS figures for England)

Year	With central heating	Without central heating	Total households	SAP rating of average house (SAP 2005)	SAP rating of average house from EHCS (SAP 2005)
1970	5628	12359	17987	17.6	
1971	6271	11950	18221	18.4	
1972	6867	11559	18426	19.2	
1973	7669	10934	18603	20.5	
1974	8628	10155	18783	22.0	
1975	9315	9673	18988	23.1	
1976	9888	9327	19215	24.7	
1977	10454	8996	19450	26.6	
1978	10633	9017	19650	27.3	
1979	11192	8635	19827	29.0	
1980	11517	8493	20010	30.3	
1981	11851	8326	20177	31.6	
1982	12374	7953	20327	33.0	
1983	13443	7082	20525	34.9	
1984	14029	6740	20769	35.7	
1985	14778	6239	21017	36.5	
1986	15337	5917	21254	37.9	
1987	15981	5504	21485	38.7	
1988	16396	5314	21710	39.0	
1989	17089	4838	21927	39.7	
1990	17573	4567	22140	40.2	
1991	18309	4083	22392	41.0	36.2
1992	18727	3868	22595	41.9	
1993	19229	3593	22822	42.4	
1994	19782	3294	23076	42.7	
1995	20274	3041	23315	43.4	
1996	20438	3054	23492	43.4	42.1
1997	20791	2903	23694	43.7	
1998	21294	2602	23896	44.6	
1999	21517	2603	24120	44.9	
2000	21718	2657	24375	45.5	
2001	21803	2367	24170	45.8	45.7
2002	21979	2386	24365	47.1	
2003	22474	2121	24595	48.7	46.6
2004	22729	2096	24825	49.6	47.4
2005	22943	2112	25055	51.4	48.1
2006	23033	2252	25285	52.1	48.7

Source: BREHOMES / English House Condition Survey

Table 29 Energy use of the housing stock by fuel type (PJ) – GB figures

Year	Solid (PJ)	Gas (natural) (PJ)	Gas (town) (PJ)	Gas (total) (PJ)	Electric (PJ)	Oil (PJ)	All fuels (PJ)
1970	720.9	65.8	305.8	371.6	271.5	137.5	1501.6
1971	618.6	149.2	263.2	412.4	285.2	135.9	1452.0
1972	545.0	240.6	232.7	473.3	306.8	156.2	1481.3
1973	531.4	338.7	167.0	505.7	322.7	170.9	1530.6
1974	499.5	456.3	109.1	565.4	327.0	151.5	1543.4
1975	422.9	567.1	52.0	619.1	314.5	146.3	1502.7
1976	391.2	635.8	15.2	651.0	299.9	146.0	1488.2
1977	396.0	688.6	4.6	693.2	302.3	147.1	1538.5
1978	361.3	762.1	2.0	764.1	302.0	144.7	1572.0
1979	363.6	863.8	1.9	865.7	315.5	141.0	1685.9
1980	315.1	886.7	1.8	888.5	302.9	112.8	1619.3
1981	292.8	921.2	1.7	922.9	297.5	101.1	1614.2
1982	287.8	916.9	1.5	918.4	291.4	93.9	1591.6
1983	267.7	933.4	1.2	934.6	292.0	89.3	1583.6
1984	210.5	940.1	1.1	941.2	295.2	93.7	1540.6
1985	270.0	1019.5	1.1	1020.6	310.1	95.6	1696.3
1986	265.9	1078.7	0.8	1079.5	322.9	99.0	1767.3
1987	229.7	1106.7	0.5	1107.2	327.9	94.0	1758.8
1988	215.8	1081.6	0.0	1081.6	324.5	91.0	1712.9
1989	172.1	1046.2	0.0	1046.2	324.4	86.4	1629.1
1990	150.6	1081.7	0.0	1081.7	329.5	91.8	1653.6
1991	164.2	1202.5	0.0	1202.5	344.4	103.8	1814.9
1992	144.7	1188.6	0.0	1188.6	349.2	105.4	1787.8
1993	158.1	1224.7	0.0	1224.7	352.4	109.3	1844.5
1994	131.5	1186.9	0.0	1186.9	355.6	107.9	1782.0
1995	97.3	1173.5	0.0	1173.5	358.3	106.8	1735.8
1996	103.1	1352.4	0.0	1352.4	376.6	124.3	1956.4
1997	91.3	1243.1	0.0	1243.1	365.7	118.8	1818.8
1998	87.2	1280.0	0.0	1280.0	382.9	123.1	1873.2
1999	89.6	1287.5	0.0	1287.5	385.8	108.9	1871.8
2000	72.7	1329.7	0.0	1329.7	391.0	110.6	1904.0
2001	70.5	1363.5	0.0	1363.5	402.9	119.3	1956.3
2002	56.6	1352.1	0.0	1352.1	399.9	103.4	1912.0
2003	47.7	1387.9	0.0	1387.9	404.0	101.8	1941.4
2004	42.3	1423.0	0.0	1423.0	402.9	107.3	1975.4
2005	32.0	1377.9	0.0	1377.9	407.1	100.6	1917.6
2006	30.2	1307.4	0.0	1307.4	405.6	104.6	1847.8

Source: Digest of United Kingdom Energy Statistics

Table 30 Carbon emissions due to domestic energy consumption (million tonnes) – GB figures

Year	Solid	Gas	Electric	Oil	Total	UK total
1970	18.2	8.9	22.0	2.8	51.9	53.3
1971	15.7	7.8	22.4	2.7	48.7	49.9
1972	13.9	8.2	23.8	3.1	49.1	50.3
1973	13.6	8.2	24.7	3.4	49.9	51.3
1974	12.8	8.7	24.1	3.0	48.6	50.1
1975	10.8	9.3	23.2	2.9	46.3	47.8
1976	10.0	9.6	21.5	2.9	44.0	45.4
1977	10.1	10.2	21.7	2.9	44.9	46.4
1978	9.2	11.2	20.9	2.9	44.2	45.7
1979	9.2	12.7	22.6	2.8	47.4	49.1
1980	8.1	12.8	21.6	2.3	44.8	46.3
1981	7.4	13.3	21.0	2.0	43.8	45.2
1982	7.3	13.3	19.7	1.9	42.1	43.6
1983	6.8	13.5	19.2	1.8	41.3	42.8
1984	5.3	13.6	18.5	1.9	39.3	40.7
1985	6.8	14.7	19.6	1.9	43.0	44.8
1986	6.7	15.6	20.2	2.0	44.4	46.2
1987	5.8	16.0	20.2	1.9	43.9	45.7
1988	5.5	15.6	19.0	1.8	42.0	43.7
1989	4.4	15.1	18.5	1.7	39.7	41.3
1990	3.9	15.6	19.2	1.8	40.6	42.1
1991	4.2	17.4	18.7	2.1	42.3	43.9
1992	3.7	17.2	18.1	2.1	41.1	42.7
1993	3.6	17.7	16.3	2.2	39.7	41.3
1994	3.1	17.1	15.9	2.2	38.3	39.8
1995	2.2	17.0	14.9	2.1	36.2	37.5
1996	2.4	19.5	14.5	2.5	38.9	40.3
1997	2.1	18.0	14.2	2.4	36.6	38.0
1998	1.9	18.5	15.0	2.5	37.8	39.2
1999	1.9	18.6	14.0	2.2	36.8	38.1
2000	1.6	19.2	15.3	2.2	38.3	39.7
2001	1.5	19.7	16.5	2.4	40.0	41.4
2002	1.4	19.5	15.9	2.1	38.8	40.2
2003	1.1	20.0	16.7	2.0	39.9	41.3
2004	1.0	20.6	16.6	2.1	40.3	41.7
2005	0.8	19.9	17.0	2.0	39.6	41.0
2006	0.7	18.9	16.7	2.1	38.4	39.8

Source: Market Transformation Programme emission factors applied to Table 29

Table 31 Primary energy consumption (PJ) – UK figures

Year	Solid	Oil	Gas	Renewables	Electric	Total
1970	1602.1	410.3	292.2		124.6	2429.2
1971	1444.0	445.8	409.0		130.9	2429.7
1972	1304.9	562.1	526.3		145.4	2538.7
1973	1382.9	537.0	536.2		135.6	2591.7
1974	1273.7	535.2	639.8		169.4	2618.1
1975	1239.4	424.1	696.9		148.4	2508.8
1976	1189.5	360.2	715.3		164.5	2429.5
1977	1207.1	365.7	768.0		179.1	2519.8
1978	1160.4	376.6	825.7		164.6	2527.3
1979	1236.8	361.0	939.3		169.2	2706.4
1980	1205.1	263.3	953.1		165.0	2586.5
1981	1171.9	211.8	1000.2		169.5	2553.3
1982	1097.5	227.9	986.5		197.0	2509.0
1983	1081.8	192.4	1040.2		219.5	2533.9
1984	749.9	483.8	1045.4		232.5	2511.5
1985	1017.7	300.2	1146.9		265.9	2730.7
1986	1099.7	229.4	1217.9		257.6	2804.7
1987	1076.4	213.4	1236.8		238.2	2764.8
1988	999.3	219.4	1190.8	11.6	263.5	2684.6
1989	927.6	216.3	1142.2	11.7	274.8	2572.5
1990	916.1	243.7	1196.7	11.5	253.8	2621.7
1991	950.8	251.1	1334.3	12.1	281.2	2829.4
1992	889.5	258.7	1337.4	12.4	301.3	2799.2
1993	789.4	234.6	1484.7	17.7	344.1	2870.5
1994	721.7	209.0	1446.2	20.4	346.2	2743.4
1995	653.1	208.0	1493.9	20.9	336.5	2712.4
1996	683.3	233.0	1761.2	19.7	348.7	3045.9
1997	570.8	194.8	1705.3	24.3	350.8	2845.9
1998	599.6	196.9	1778.9	24.7	363.1	2963.2
1999	530.9	176.4	1815.0	29.7	345.8	2897.7
2000	551.8	177.6	1898.8	31.3	303.8	2963.4
2001	587.0	185.4	1932.6	35.9	321.1	3061.9
2002	536.4	164.3	1943.5	38.8	307.0	2990.0
2003	576.7	160.2	1964.3	42.3	297.2	3040.8
2004	545.8	168.1	2026.7	46.9	276.7	3064.2
2005	541.0	163.1	1964.9	57.7	280.2	3007.0
2006	592.2	168.8	1859.8	60.5	261.6	2942.9

Source: DTI / BERR

Table 32 Energy use of the housing stock by fuel type (PJ) – UK figures

Year	Solid fuel	Gas	Electric	Oil	Total
1970	752.7	373.6	277.3	140.8	1544.4
1971	647.1	414.5	290.5	139.3	1491.5
1972	569.2	475.6	312.8	160.6	1518.2
1973	560.9	507.8	328.6	175.9	1573.3
1974	533.6	567.8	333.4	156.3	1591.1
1975	458.1	621.4	321.1	151.2	1551.8
1976	422.8	653.3	306.4	151.4	1533.9
1977	429.5	695.0	309.3	153.0	1586.8
1978	394.0	765.8	308.9	151.2	1620.0
1979	401.9	867.5	322.9	148.2	1740.4
1980	349.4	890.1	310.0	118.7	1668.1
1981	325.9	924.3	304.0	106.9	1661.2
1982	324.6	919.6	297.9	99.9	1642.0
1983	304.5	935.6	298.5	94.9	1633.5
1984	242.7	942.2	302.0	99.9	1586.7
1985	319.6	1021.4	317.5	102.7	1761.1
1986	310.7	1080.1	330.4	108.4	1829.7
1987	273.1	1107.5	335.6	103.6	1819.7
1988	257.3	1081.6	332.4	102.2	1773.6
1989	208.2	1046.2	332.2	98.6	1685.2
1990	182.9	1081.7	337.7	103.8	1706.2
1991	200.1	1202.5	353.2	118.3	1874.1
1992	176.9	1188.6	358.2	121.0	1844.7
1993	193.8	1224.9	361.7	126.4	1906.8
1994	161.6	1187.2	365.1	125.8	1839.7
1995	119.7	1173.9	368.0	125.5	1787.1
1996	127.0	1353.1	387.0	147.3	2014.4
1997	112.4	1244.0	376.1	141.9	1874.4
1998	107.3	1281.3	393.9	148.3	1930.8
1999	110.2	1289.1	397.1	132.4	1928.8
2000	89.3	1331.7	402.7	135.6	1959.3
2001	86.4	1366.0	415.2	147.7	2015.3
2002	69.2	1355.0	412.3	129.3	1965.7
2003	58.1	1391.4	416.8	128.5	1994.7
2004	51.3	1427.1	415.9	136.7	2031.1
2005	38.7	1382.5	420.5	129.5	1971.2
2006	36.3	1312.5	419.2	136.1	1904.1

Source: Digest of United Kingdom Energy Statistics

Table 33 Primary energy ratios for all fuels – UK figures

Year	Primary energy consumption (PJ)	Delivered energy (PJ)	Primary energy ratio
1970	2429.2	1544.4	1.57
1971	2429.7	1491.5	1.63
1972	2538.7	1518.2	1.67
1973	2591.7	1573.3	1.65
1974	2618.1	1591.1	1.65
1975	2508.8	1551.8	1.62
1976	2429.5	1533.9	1.58
1977	2519.8	1586.8	1.59
1978	2527.3	1620.0	1.56
1979	2706.4	1740.4	1.56
1980	2586.5	1668.1	1.55
1981	2553.3	1661.2	1.54
1982	2509.0	1642.0	1.53
1983	2533.9	1633.5	1.55
1984	2511.5	1586.7	1.58
1985	2730.7	1761.1	1.55
1986	2804.7	1829.7	1.53
1987	2764.8	1819.7	1.52
1988	2684.6	1773.6	1.51
1989	2572.5	1685.2	1.53
1990	2621.7	1706.2	1.54
1991	2829.4	1874.1	1.51
1992	2799.2	1844.7	1.52
1993	2870.5	1906.8	1.51
1994	2743.4	1839.7	1.49
1995	2712.4	1787.1	1.52
1996	3045.9	2014.4	1.51
1997	2845.9	1874.4	1.52
1998	2963.2	1930.8	1.53
1999	2897.7	1928.8	1.50
2000	2963.4	1959.3	1.51
2001	3061.9	2015.3	1.52
2002	2990.0	1965.7	1.52
2003	3040.8	1994.7	1.52
2004	3064.2	2031.1	1.51
2005	3007.0	1971.2	1.53
2006	2942.9	1904.1	1.55

Source: DTI / BERR