Department
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Climate Change

Energy Efficiency Statistical Summary

November 2012

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Contents

Chapter 1: Introduction

Energy Efficiency Statistical Summary

1.1 This Statistical Summary has been produced by the Energy Efficiency Deployment Office (EEDO) as an accompanying document to the 2012 Energy Efficiency Strategy. The Statistical Summary sets out in section two a definition of energy efficiency and the indicators used to measure progress to improving energy efficiency.

1.2 Understanding energy consumption is key to identifying the major consuming sectors and activities. Section three outlines how the UK uses energy, which is necessary to identify the main areas of current efficiency and potential savings.

1.3 Actual energy savings and energy bill savings are achieved through energy efficiency measures, such as installing insulation in homes. Evidence on the savings that have been realised are outlined in section four.

1.4 Energy efficiency is not a new concept and section five highlights what has been achieved over the decades in terms of the uptake of energy efficiency measures. This shows how the UK is set up to respond to the challenge of an energy efficient, low carbon economy.

1.5 The report summarises EEDO's analysis of the important contribution energy efficiency makes to reducing overall UK emissions and energy consumption in section six.

1.6 The final section sets out how the UK performs internationally on energy efficiency, which is key to understanding the opportunities both for the UK and how we can work with international partners to improve energy efficiency overseas.

Chapter 2: Monitoring Energy Efficiency

Introduction

2.1 This section sets out key indicators of energy efficiency that will be used to monitor progress made by the UK to move to a lower level of energy intensity whilst enabling growth and continuing to provide households and businesses with the energy services they require. The indicators included monitor energy efficiency both at the macro economy level and in individual sectors.

Definition of energy efficiency

2.2 On a technical level, energy efficiency is the relationship between the energy consumed and the output produced by that energy, often called 'energy services', for example the number of miles travelled for a gallon of fuel. Increasing energy efficiency means using either less energy to provide the same level of energy services, or using same level of energy to provide a higher level of energy services.

2.3 The benefit of energy services can also be measured in terms of its economic value. At an economy-wide level this is the relationship between GDP and energy consumption.

2.4 This section sets out indicators that will be used to measure progress with energy efficiency and are as aligned to this definition as far as possible.

Summary of indicators

Ref	Indicators	Summary finding
2.1	Final energy consumption	Existing policy is due to deliver energy savings of 9 per cent in 2020 and 11 per cent in 2030 relative to business as usual.
2.2	Primary Energy Consumption	Increased by 17 per cent between 1980 and 2005 but following the contribution of energy efficiency, impact of the recession and de-industrialisation is now just 2 per cent above the 1980 level.
2.3	Energy Intensity	Since 1980, primary energy intensity has fallen by 52 per cent.
2.4	Energy consumption per capita	Existing policy is due to deliver annual savings in energy per capita of 1 per cent through to 2020, less than the 2 per cent per annum savings observed in the 5 years before the recession.
2.5a	Energy use per household	Domestic energy consumption per household rose by 21 per cent between 1990 and 2004 but has since fallen such that consumption in 2011 was 5 per cent below 1990 levels.
2.5b	Specific household consumption	After adjusting for the level of energy service received, UK households have reduced their energy consumption on average by 2 per cent per annum since 1990.
2.6	Domestic SAP rating	Since 1996, the energy efficiency of homes has improved such that the *theoretical* energy savings equate to a reduction in energy use of about 20 per cent.
2.7	Industrial energy intensity	Since 1980, industrial energy intensity has fallen by 54 per cent, measured as energy consumption per unit of production.
2.8	Service sector intensity	Since 1980, energy intensity in the services sector as measured by energy consumption per unit of Gross Value Added (GVA) has fallen by 60 per cent.
2.9	Car efficiency	Since 1995, car energy per vehicle kilometre has fallen by 18 per cent.
2.10	Road freight efficiency	Energy consumption per tonne-kilometre had been falling but has seen a 10 per cent increase during the recession.

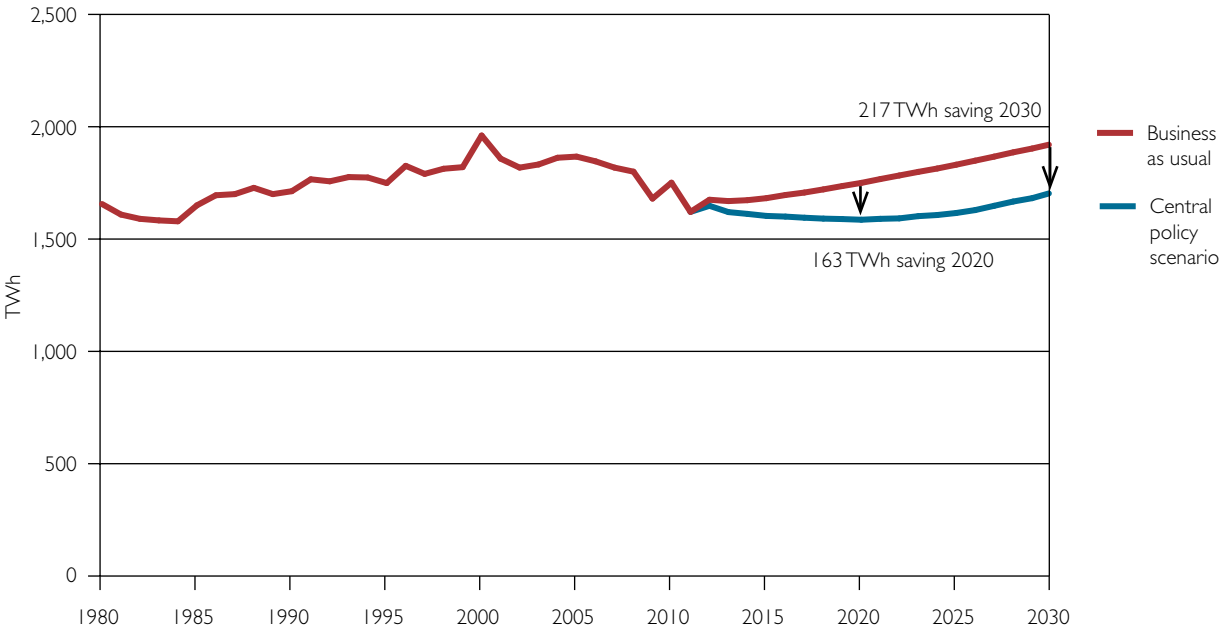
Macro indicators

2.5 Macro indicators provide a good measure of the direction of travel in energy efficiency over the long term and also enable high level comparisons to be made internationally. They also provide a measure of whether the UK is on track to achieve the level of ambition set for energy efficiency to meet 2050 emissions targets.

2.6 The Energy Efficiency Deployment Office (EEDO) was set up to drive a step change in energy efficiency. A key success measure for EEDO is for the UK to achieve lower final energy consumption than was projected based on the policy package before the Energy Efficiency Strategy. These projections were published by DECC in October 2012[1].

1 DECC Energy and Emissions Projections 2012, http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx#2012

Chart 2.1: Projected UK final energy consumption 2000-2030[2]

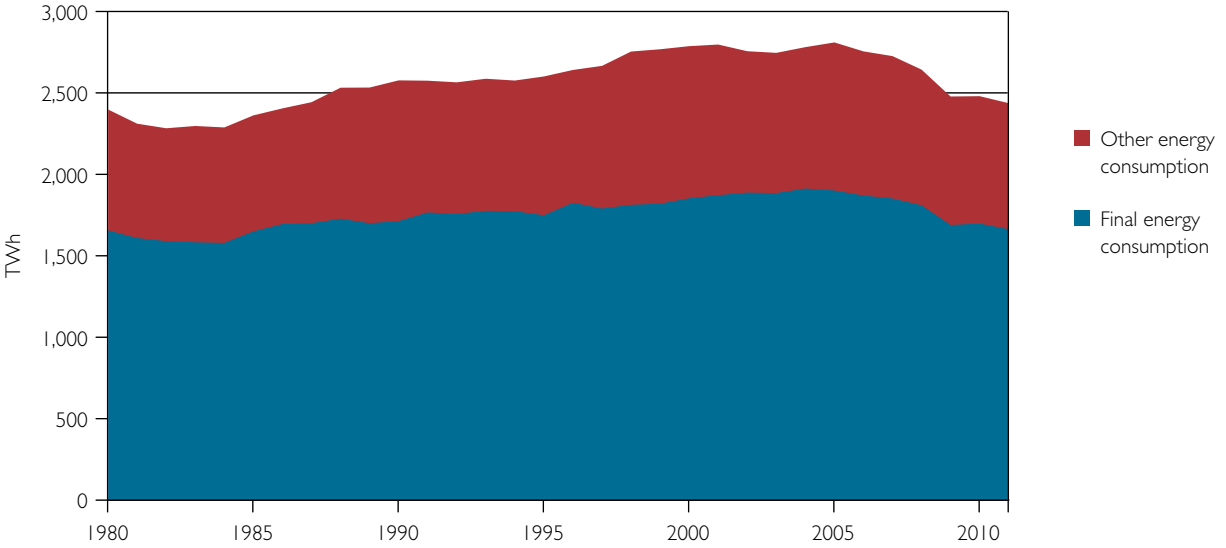


Source: DECC Energy Projections 2012

2.7 The 2012 projections show that without new energy efficiency policies since the 2009 Low Carbon Transition Plan[3], final energy consumption was projected to rise by 168 TWh (10 per cent) between 2010 and 2030.

2.8 The current policy package is due to deliver savings relative to business as usual of 163 TWh (9 per cent) in 2020 and 217 TWh (11 per cent) in 2030.

Chart 2.2 UK Primary energy consumption: 1980-2011[4]



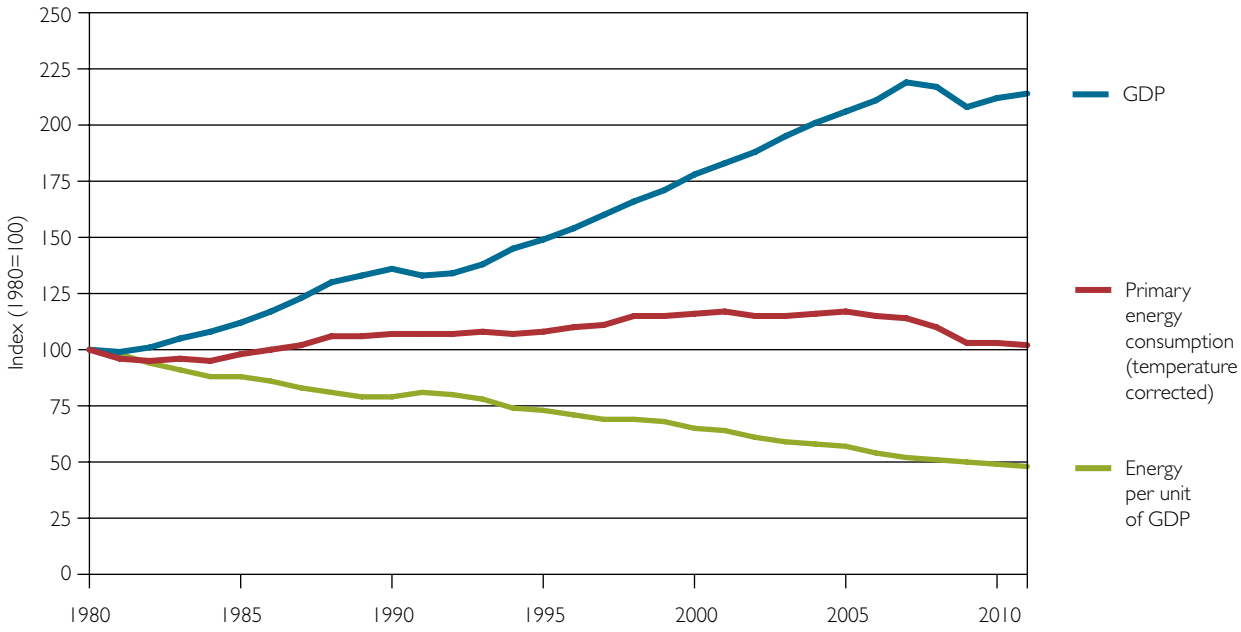
Source: Energy Consumption in the UK, tables 1.1 & 1.4[5]

2 Excludes energy used for non-energy purposes (e.g. chemical lubricants and road making material)
3 UK Low Carbon Transition Plan 2009, http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/lctp/lctp.aspx
4 Excludes energy used for non-energy purposes
5 DECC Energy Consumption in the UK – a National Statistics publication produced by DECC. http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

2.9 UK primary energy consumption increased by 17 per cent between 1980 and 2005 but since 2005 the combined impact of energy efficiency and the recession have reduced consumption back just 2 per cent above the 1980 level.

2.10 Over the whole period since 1980, final energy consumption has consistently accounted for approximately two thirds of primary energy consumption. Non-final energy consumption accounts for energy used in transformation of fuels (for example in electricity generation) and energy used within the energy sector (for example in the extraction of oil and gas).

Chart 2.3: UK Primary energy consumption per unit of GDP (real terms): 1980-2011



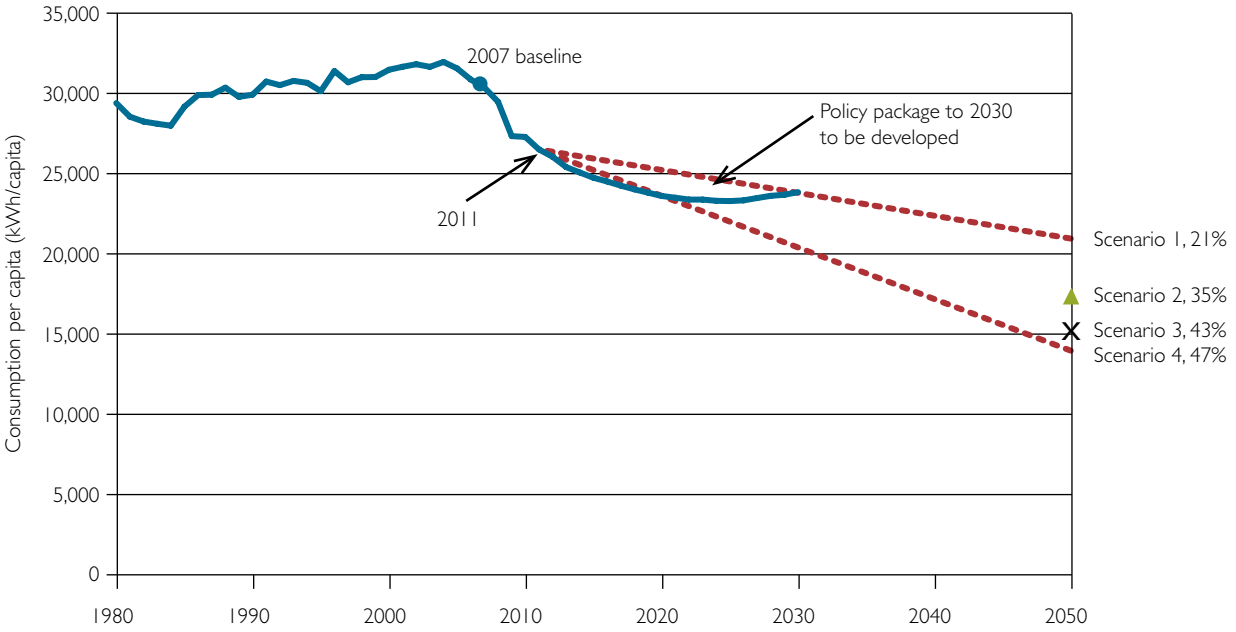
Source: Energy Consumption in the UK, tables 1.1 & 1.6

2.11 Since 1980, UK GDP has more than doubled. Over the same period there has been a 2 per cent increase in primary energy consumption. This means that UK energy intensity has fallen by 52 per cent over this period.

2.12 During the 1990s, energy intensity fell on average by 1.6 per cent per annum. Since 2000 the rate of improvement has increased to 2.9 per cent per annum.

2.13 The UK is one of the least energy intensive economies in the developed world reflecting the structure of the economy. Section 7 on international comparisons shows that while overall energy intensity is low for some energy intensive industries (e.g. cement) many energy intensive industries in the UK use more energy per unit production than their EU competitors.

Chart 2.4: UK final energy consumption per capita: 1980-2050[6]



Source: DECC Energy Projections & Digest of UK Energy Statistics[7]

2.14 The DECC 2050 scenarios, set out in the Carbon Plan, demonstrate alternative pathways to reduce greenhouse gas emissions by 80 per cent between 1990 and 2050[8]. All scenarios include a contribution of energy efficiency measured as final energy consumption per capita. The central scenario requires a 50 per cent reduction in final energy consumption per capita between 2007 and 2050 with alternative scenarios requiring savings between 31 and 54 per cent. These translate to per capita savings of between 21 and 47 per cent from 2011.

2.15 This indicator peaked in 2004 at 32,000 kWh per capita, before falling on average by 2 per cent per annum until 2008, followed by a 7 per cent reduction in 2009 as the UK went into recession. Based on current economic projections and policy measures, savings of 1 per cent per annum are expected until 2020 before flat-lining to 2030. It should be noted that the DECC energy projections only include the current policy package[9]. These policies continue to provide savings beyond 2020 but our analysis shows that there are further savings to be captured.

6 Excludes energy used for non-energy purposes

7 The Digest of UK Energy Statistics – a National Statistics publication produced by DECC, http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/total/total.aspx

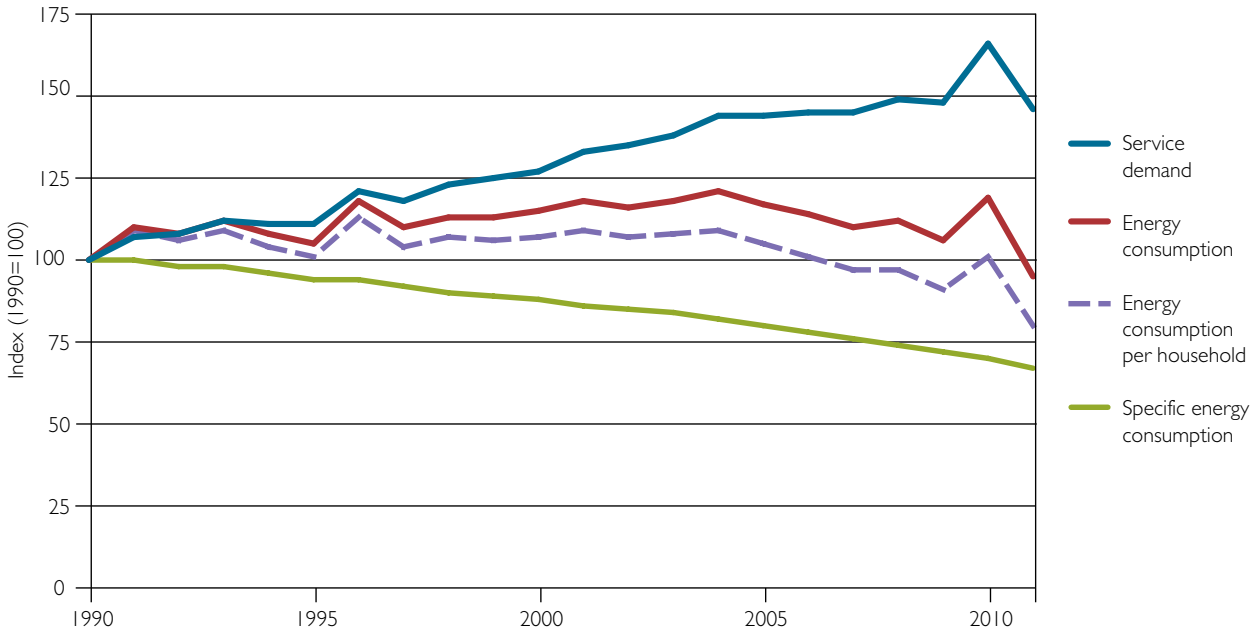
8 Carbon Plan 2011 Analytical Annex, http://www.decc.gov.uk/assets/decc/11/tackling-climate-change/carbon-plan/3748-carbon-plan-annex-a-dec-2011.pdf

9 The DECC energy and emissions projections only take account of policies for which funding has been agreed and that are sufficiently well developed to allow robust estimates of future savings to be provided. Therefore the projections for the 4th carbon budget (2023 – 2027) onwards represent a baseline scenario in which the government takes no further action to reduce energy demand or increase take up of renewables outside the power sector. Therefore the projections for 2030 do not do not represent the government's view of what we expect to happen. The government does plan to take further action to reduce energy demand and remains fully committed to meeting its carbon targets.

Sectoral indicators

2.16 It is not possible to reliably measure improvement in energy efficiency using only the macro indicators set out above. Changes in energy intensity can shift due to changes in economic structure, or recession, therefore looking at individual sectors of the economy provide additional insight. Sectoral indicators have the advantage of being less diverse, are driven by a narrower range of energy uses and have stronger links to the drivers of energy use and efficiency.

Chart 2.5: Domestic energy consumption, consumption per household and energy service demand 1990-2011



Source: Energy Consumption in the UK, table 3.19

2.17 Domestic energy consumption per household rose by 9 per cent between 1990 and 2004 but has since fallen such that consumption in 2011 was 5 per cent below 1990 levels. There have been some peaks in the series, for example in 2010 due to the cold weather.

2.18 Service demand is an indicator which captures the benefits of energy use. The indicator models energy usage, which is affected by external and internal temperatures achieved and the number of households. Additional output from lighting and appliances will also increase service demand.

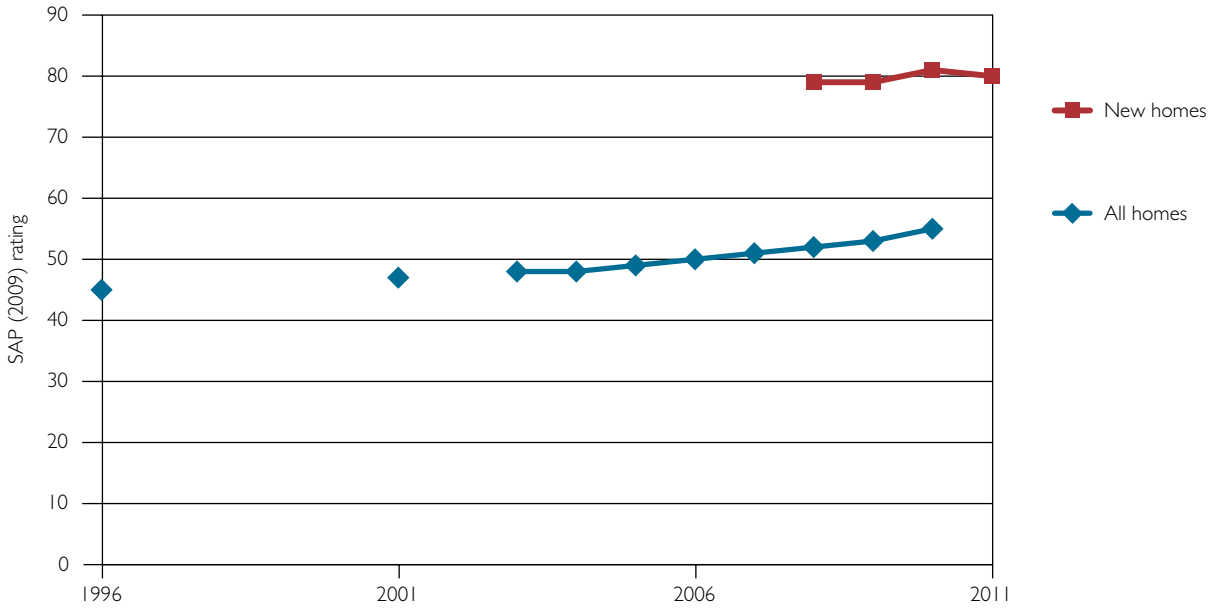
2.19 Specific energy consumption is defined as the level of energy consumption needed for a unit of service demand. It gives a very good indication of technical energy efficiency and accounts for improvements in building standards, the efficiency of heating systems, lighting and appliances. For example, since 1990 the number of home computers has seen more than a 6 fold increase[10]. While the energy consumption has increased, service demand has increase faster leading to a reduction in specific energy consumption.

2.20 While service demand is modelled to have risen by 50 per cent since 1990, energy consumption has fallen by 5 per cent, driving a reduction in specific energy consumption of one third. This equates to an average saving of 2 per cent per annum.

10 Energy consumption in the United Kingdom, table 3.11

2.21 The definition of specific energy consumption is closely aligned to the definition of energy efficiency. However, it should be noted that this indicator measures technical energy efficiency savings. This does not accurately capture savings due to changing behaviour, for example turning of lights in unoccupied rooms, reducing internal temperatures or not boiling excess water in a kettle.

Chart 2.6: Energy efficiency rating of homes in England 1996-2011

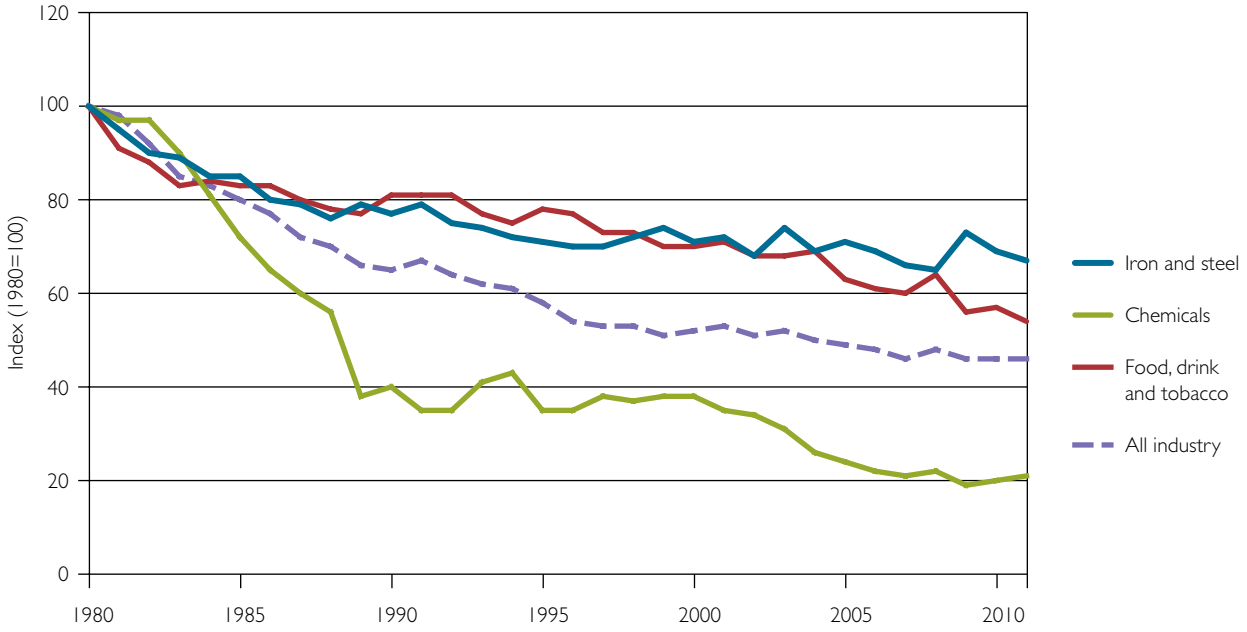


Source: English Housing Survey (all homes), EPC Register (new homes)

2.22 The Standard Assessment Procedure (SAP) is an energy efficiency rating based on how much energy is needed to provide a set standard of heating, hot water and lighting to a building based on its physical properties. A SAP rating of 100 implies zero net cost of energy use for heating, hot water and lighting.

2.23 Since 1996 the average SAP rating for all homes has increased from 45 (EPC band E) to 55 (bottom of EPC band D). This improvement equates to a reduction in modelled energy use of about 20 per cent. This improvement has been achieved through improvements in the efficiency of heating systems, insulation including double glazing and efficient lighting. Since 2007, a slight increase in the rate of improvement can be seen. A number of policies started around this time including new amended buildings regulations requiring all new boilers to be A-rated high efficiency condensing boilers, the Carbon Emissions Reduction Target (CERT) and the introduction of Energy Performance Certificates (EPCs).

Chart 2.7: Industrial energy intensity 1980-2011 (final energy consumption per unit of production)[11]



Source: Energy Consumption in the UK, table 4.5

2.24 Energy efficiency in manufacturing industry is about maximising the amount of production which can be achieved from each unit of energy. Energy is a key input and cost for many industries.

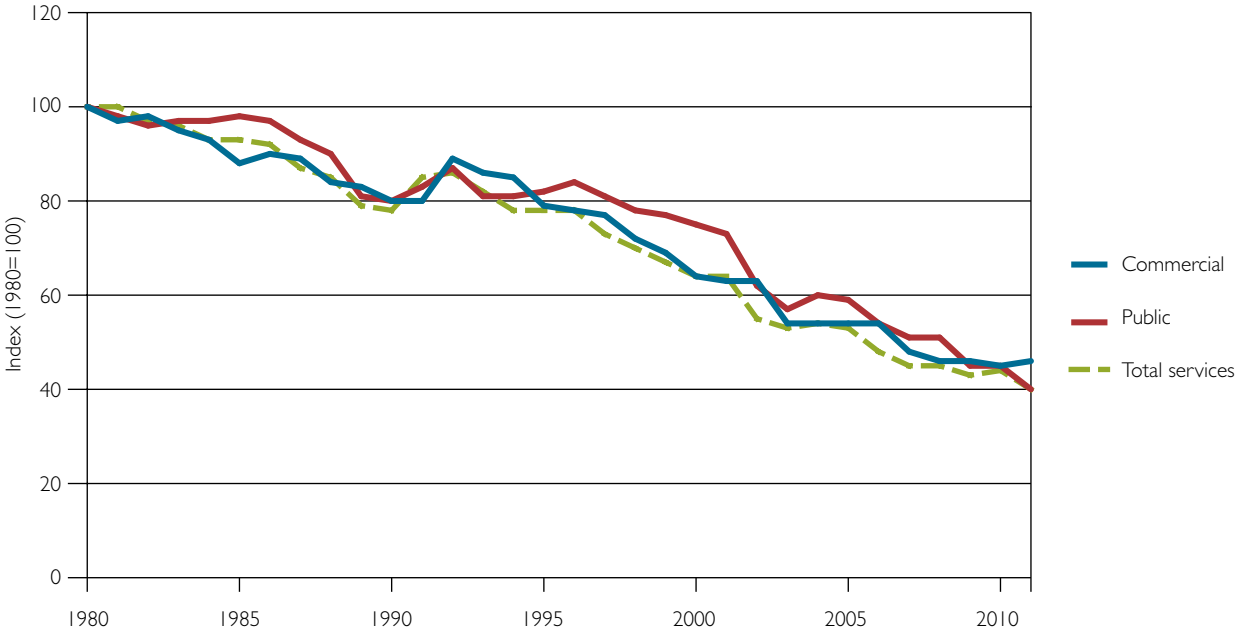
2.25 Overall, industrial energy intensity, as measured by energy consumption per unit of production, has fallen by 54 per cent since 1980. The largest contributor to this fall was the chemicals industry where intensity fell by 60 per cent during the 1980s. Since the mid 1990s the rate that energy intensity has fallen has slowed.

2.26 The industrial sector is a diverse energy user with different trends in sub-sectoral industries having a significant effect on the overall indicator. Since 1980, energy intensity has fallen in iron and steel by 33 per cent, food, drink and tobacco by 46 per cent and chemicals by 79 per cent.

2.27 Industrial energy intensity can be affected by changes in the volume of output. Increases in energy intensity can been seen in many industries during the recession as the volume of output fell faster than the energy use.

11 Measured using the ONS Index of Production, except for Iron & Steel which is measures as tonnes of steel produced

Chart 2.8: Service sector energy intensity: 1980-2011 (energy consumption per unit of gross value added)



Source: Energy Consumption in the UK, table 5.4

2.28 Energy intensity in the service sector is defined as the value of goods or services produced relative to the energy used to produce them. Energy intensity in the services sector has fallen by 60 per cent since 1980. This equates to a 3 per cent per annum saving although with a few spikes such as the recession in the early 1990s.

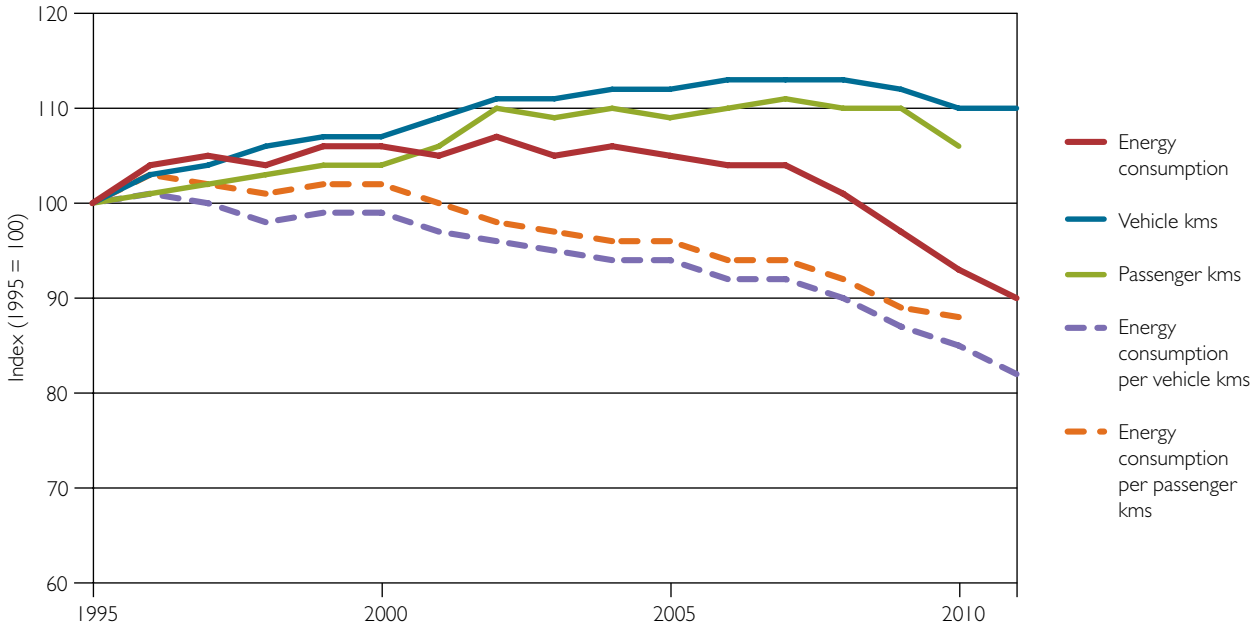
2.29 Overall the commercial and public sectors have followed similar trends over the last 30 years. The energy intensity of the public sector fell by 12 per cent between 2010 and 2011, the third largest annual fall.

2.30 There is currently no representative data series measuring the energy efficiency of the non-domestic building stock. In 2011, 80 per cent of energy use in this sector was used for heating, cooling and lighting and therefore energy use of buildings is the main driver of this trend.

2.31 In 2011, cars consumed 59 per cent of the energy used in road transport and 42 per cent of all transport fuel purchased in the UK (including aviation fuel)[12]. Car efficiency is therefore a key indicator for the sector.

12 Figures reported in terms of energy. These differ from volume metrics due to the different calorific values of petroleum products.

Chart 2.9: Car energy use and efficiency indicators: 1995-2011[13]



Source: Transport Statistics Great Britain

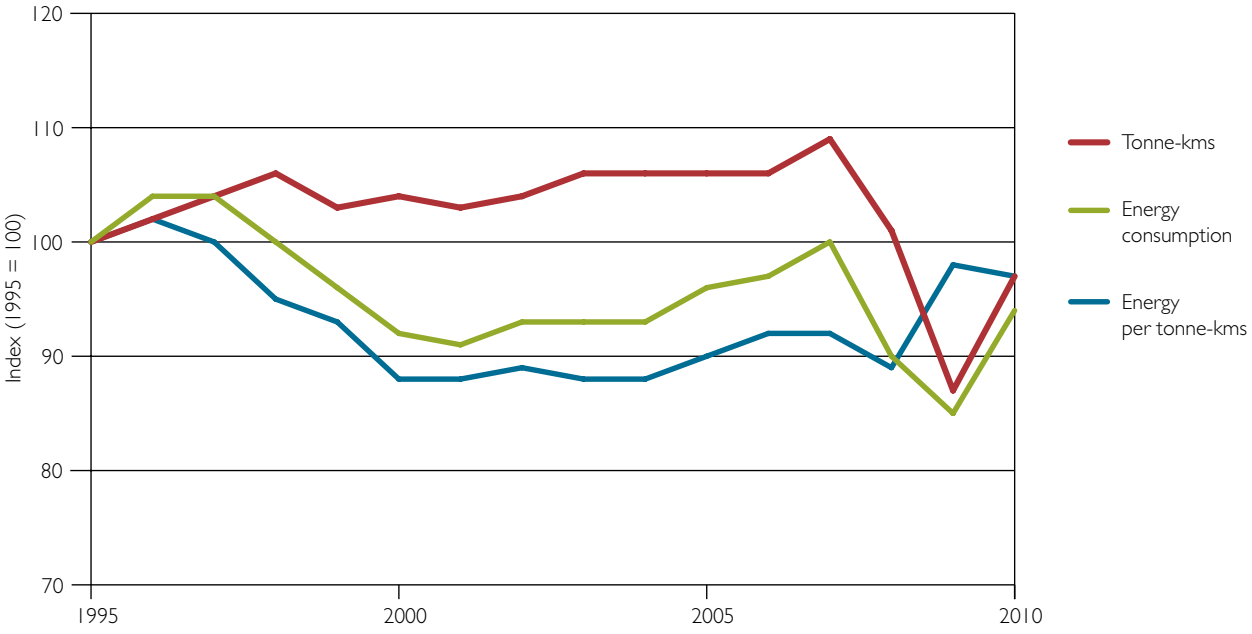
2.32 The energy used by cars in 2011 was 10 per cent lower than in 1995 and 16 per cent lower than the peak in 2002. Over the same period, the distance travelled by cars in Great Britain increased by 10 per cent leading to a reduction in energy consumption per vehicle km of 18 per cent. This indicator measures the *technical* performance of the vehicles and the efficiency of driving.

2.33 The increase in passenger kilometres travelled since 1995 has been slightly lower than vehicle kilometres as car occupancy rates have fallen by 4 per cent to 1.7 people per car. A more complete measure of overall *car use efficiency* would be energy consumption per passenger km which takes into account the occupancy of a car. Using this indicator the reduction in energy use per passenger km is 12 per cent between 1995 and 2010.

2.34 The best measure of activity in the road freight sector is tonne-kilometres which values the output of the weight of goods transported multiplied by the distance hauled.

13 Energy consumption series is for United Kingdom, vehicle and passenger kms are for Great Britain

Chart 2.10: Road freight indicator (consumption per tonne-km): 1995-2010[14]



Source: Transport Statistics Great Britain. Energy data modelled by AEA Technology

2.35 Between 1995 and 2007 there was a slight increase in tonne-kilometres of less than 1 per cent per annum. Between 1995 and 2000, modelled energy consumption fell by 8 per cent but then rose back to 1995 levels by 2007. Overall this led to an 8 per cent reduction in energy consumption per tonne-kilometre between 1995 and 2007.

2.36 Following the impact of the recession, there were significant reductions in both tonne-kilometres and energy consumption but as the fall in tonne-kilometres was greater and therefore shows an increase the energy intensity of road freight implying efficiencies in freight logistics have fallen.

14 Coverage of Heavy Goods Vehicles (HGV) > 3.5 tonnes in UK

Chapter 3: Energy Use

Introduction

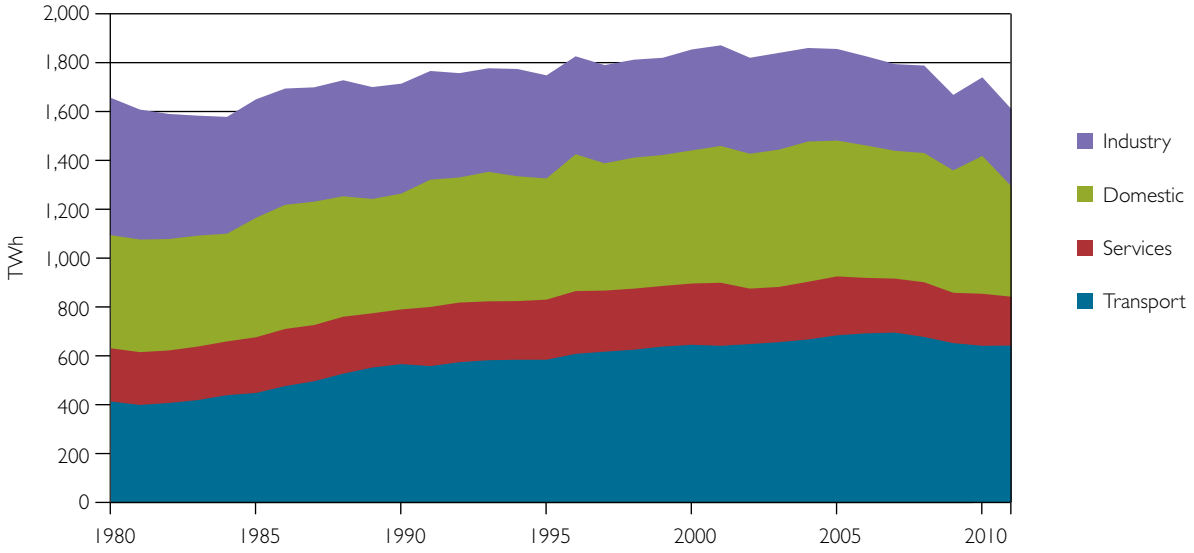
3.1 Energy has a wide variety of uses across all sectors of the economy. Over the last 30 years there have been significant changes in the sources of energy used and the amount consumed by each sector. Understanding these trends and the drivers behind them are key to identifying the further potential to improve energy efficiency.

Overview of UK energy use

3.2 This section provides a high level breakdown of how the UK consumes energy.

3.3 Chart 3.1 provides an overview of the sectors where energy is used in the UK[15]. In 2011, final energy consumption was about 40 per cent transport, 30 per cent domestic, 20 per cent industry and 10 per cent services.

Chart 3.1: UK final energy consumption by sector, 1980-2011



Source: Digest of UK Energy Statistics, table 1.1.5

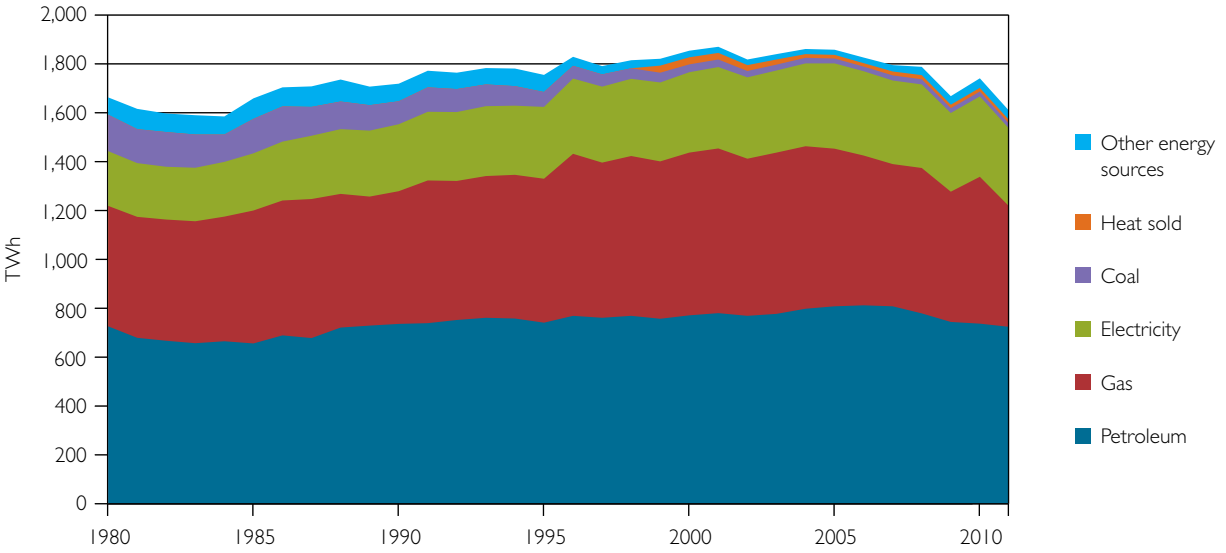
15 Final energy consumption including all aviation fuel but excluding non-energy use

3.4 Since 1980, final consumption in transport has increased by 55 per cent due to increased petroleum use in road and air travel. In contrast final consumption in industry decreased by 44 per cent since 1980, which reflects the shift towards less energy intensive industries as well as improvements in energy efficiency.

3.5 In the domestic sector, final consumption decreased by 3 per cent between 1980 and 2011. Over the same period, the UK population has increased by more than 10 per cent, the number of UK households has increased by more than 30 per cent and real disposable income has more than doubled[16]. Energy efficiency improvement in homes has helped mitigate the increase in domestic energy demand over this period.

3.6 Final consumption in the services sector was 8 per cent lower in 2011 than in 1980, despite the real Gross Value Added doubling in this sector[17].

Chart 3.2: UK final energy consumption by fuel, 1980-2011[18]



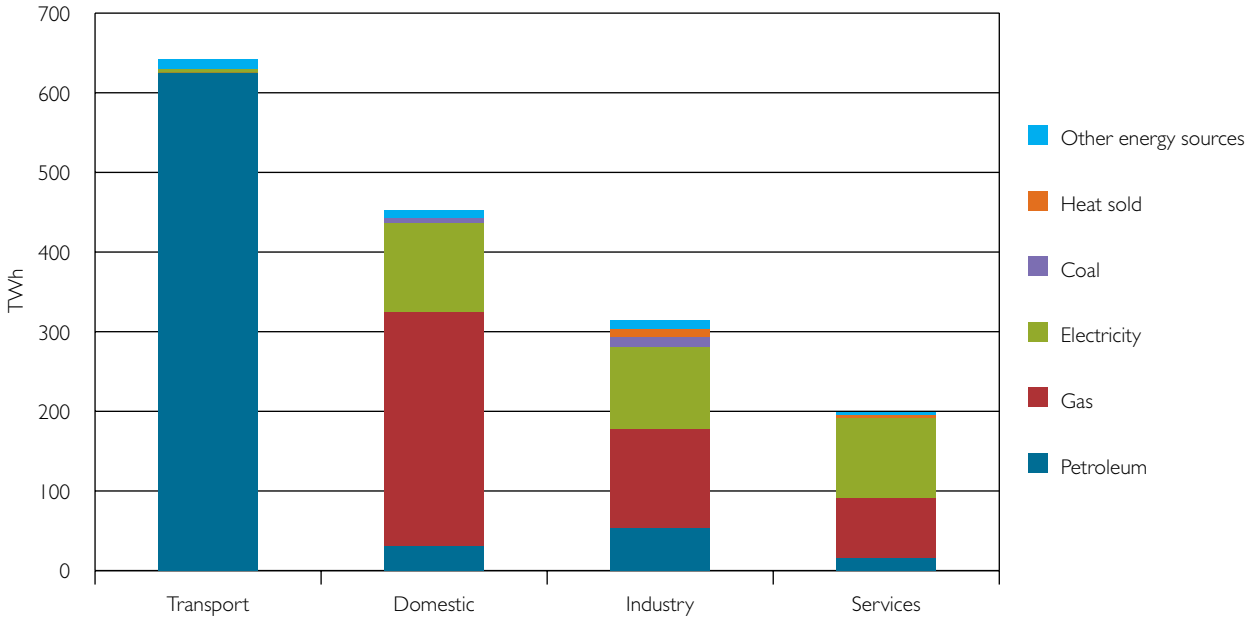
Source: Digest of UK Energy Statistics, table 1.1.5

3.7 The source of fuels used to meet energy demand has changed significantly since 1980. In 2011, petroleum use accounted for 45 per cent of final consumption, gas use for about 30 per cent, electricity use for 20 per cent and all other fuels for 5 per cent.

3.8 Coal, coke, breeze, coke oven gas and town gas accounted for 12 per cent final consumption in 1980, and only 1 per cent final consumption in 2011. The decline in use of these fuels has been substituted by a 42 per cent increase in the use of electricity. Petroleum use was at similar levels in 2011 and 1980. The reduction of petroleum consumption in industry has been compensated by the increased use of it in road and air transport.

16 Energy Consumption in the United Kingdom, table 3.3
17 Energy Consumption in the United Kingdom, table 5.3
18 Heat sold is defined as heat produced and sold under a contract. It covers Combined Heat and Power (CHP) plants and community heating schemes. Data exists for heat sold from 1999 onwards. Other energy sources includes coke, breeze, bio-energy, waster and other solid fuels

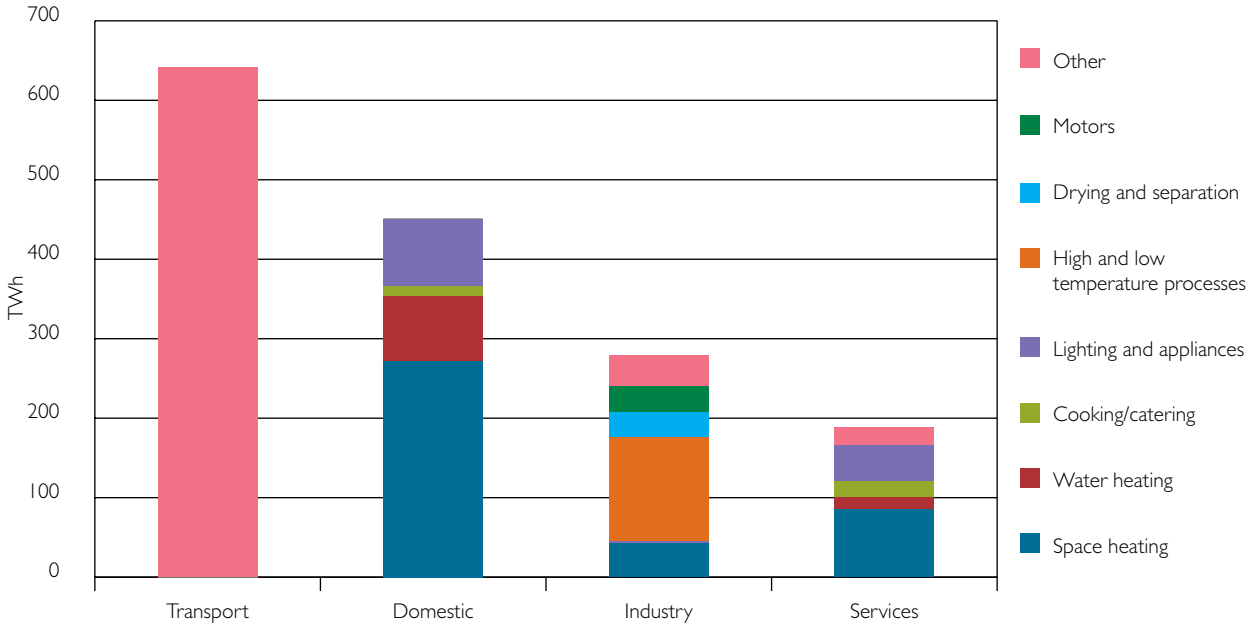
Chart 3.3: UK final energy consumption by sector and fuel, 2011



Source: Digest of UK Energy Statistics, table 1.1.5

3.9 Chart 3.3 shows the fuel use breakdown by sector. Transport energy use is dominated by petroleum. All other sectors take most of their energy from gas and electricity. Gas use accounts for 65 per cent of domestic consumption, 40 per cent of industry consumption and about 40 per cent of services consumption. Electricity use accounts for a quarter of domestic consumption, a third of industry consumption and half of services consumption.

Chart 3.4 UK final energy consumption by sector and end use, 2011[19]



Source: Energy Consumption in the UK, table 1.14a, based on modelling by Cambridge Architectural Research

19 The figures for 2011 are provisional

3.10 Chart 3.4 shows the fuel use breakdown by sector of the economy and end use. Space heating and water heating account for over three quarters of domestic consumption and over 50 per cent of consumption in the services sector. Lighting and appliance use accounts for almost one fifth of domestic consumption and almost one quarter of services consumption.

3.11 Energy consumption for industrial processes (defined as high and low temperature processes, drying and separation, and motors) accounts for 70 per cent of industrial energy consumption.

3.12 Transport end use is dominated by the energy requirements of engines used in road vehicles (72%), aeroplanes (23%), inland waterways (3%) and trains (2%)[20].

Energy use in the domestic sector

3.13 There is an extensive amount of evidence regarding energy use in the domestic sector.

3.14 Heating is the major energy requirement of UK homes. In 2011, 78 per cent of energy use in homes was used for space and water heating. Gas accounted for 80 per cent of the heat demand, oil for another 9 per cent, electricity for another 5 per cent, and other sources the remaining 6 per cent[21]. Gas is the dominant fuel used in the domestic sector, however there is a large amount of variation in the level of gas use by individual households.

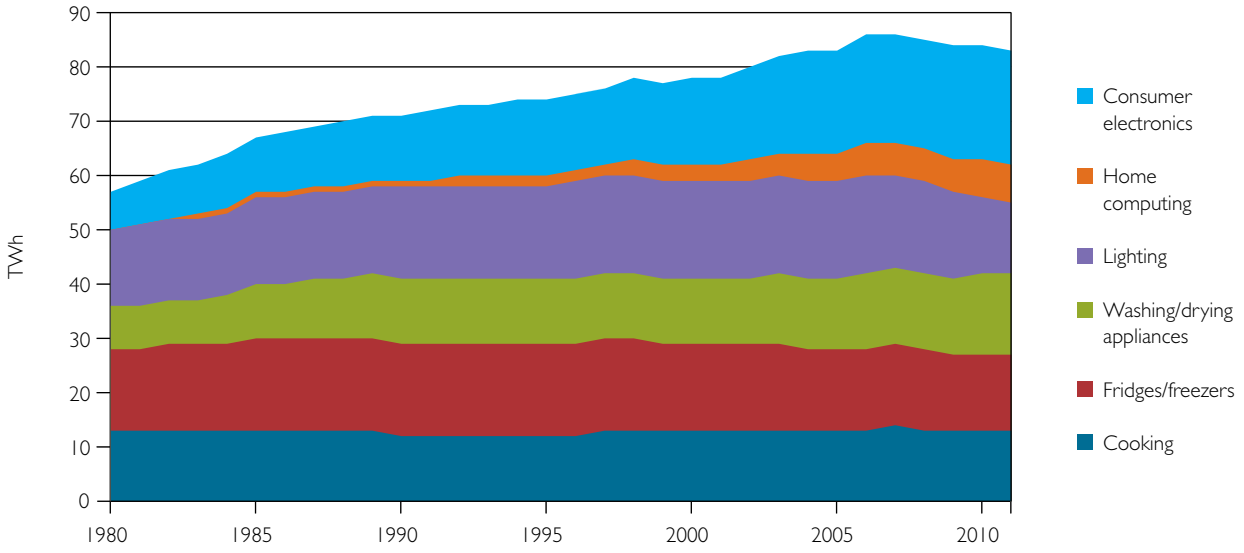
3.15 The National Energy Efficiency Data framework (NEED) links energy consumption data to household attribute data and data on energy efficiency measures in place. Summary analysis of energy consumption in different types of homes has been published by DECC. Analysis of NEED found that less than 40 per cent of the variation in gas consumption could be determined by the household demographic and the physical properties of the premise (the most influential variables were number of bedrooms, household income, tenure and property size)[22].

3.16 This finding prompted the Domestic Energy Use study, run by DECC in 2012[23]. The study included 70 households found to be in the highest 10 per cent or lowest 10 per cent of gas consumption relative to other 3 bedroom semi-detached houses. DECC analysis shows that in 2008 the highest 10 per cent of homes used at least 4 times more gas than the lowest 10 per cent. The study identified a number of themes that could explain the remaining variation in domestic gas use. These include temperature management skills and behaviour, the composition of the home in terms of people, and other physical properties of the home previously unaccounted for.

3.17 Electricity is the other key source of energy used in the home and it has been growing in significance. In 2011, the domestic consumption of all other fuels was 10 per cent lower than in 1980, whereas electricity consumption in this sector increased by 30 per cent over this period. In 2011, cooking, lighting and appliances account for over 80 per cent of electricity use in UK households. The remainder is used for space and water heating.

20 Digest of UK Energy Statistics, table 1.1
21 Energy consumption in the United Kingdom, table 3.7
22 National Energy Efficiency Data-framework 2012
http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/need/need.aspx
23 Domestic energy use study to understand why comparable households use different amounts of energy
http://www.decc.gov.uk/eedo

Chart 3.5: Electricity consumption of home appliances in the UK, 1980-2011[24]



Source: Energy Consumption in the UK, table 3.10, based on modelled data from the Market Transformation Programme

3.18 Chart 3.5 shows the trend in electricity consumption of home appliances in UK households since 1980. In 1980, consumer electronics are modelled to have accounted for 13 per cent of non-heating domestic electricity use. In 2011, along with home computing, it now accounts for over one third. The other two thirds are almost evenly split between lighting, washing/drying, fridges/freezers and cooking appliance use.

3.19 Since 1988 fridge/freezer consumption has reduced each year, showing a one per cent reduction on average per year. Since 1998 lighting consumption has reduced each year, showing a two per cent reduction on average per year. This reduction has been due to the improved energy efficiency of each of these products.

3.20 Electricity consumption due to washing/drying appliances increased on average by 5 per cent per year between 1980 and 1990. From 1990 onwards the growth in consumption was more modest, at only 1 per cent a year on average. The increase in consumption for these appliances suggests any improvements in energy efficiency have been offset by the increase in demand. In 2010, over 95 per cent of UK homes owned a washing machine, over 55 per cent owned a tumble drier and 40 per cent owned a dishwasher, suggesting that there is still scope for growth in demand for these appliances[25].

3.21 The Household Electricity Survey was run in 2010/11 by DECC, DEFRA and the Energy Saving Trust (EST). It provided an in depth look into how a sample of 251 owner occupied homes use electricity[26].

3.22 The study found that the average home contained 41 electrical appliances but some homes own as few as 13 or as many as 85. Between 1980 and 2011 the average number of consumer

24 Excludes electricity used for space and water heating
25 Energy Consumption in the UK, table 3.12
26 Household Electricity Survey: http://www.energysavingtrust.org.uk/Publications2/Corporate/Research-and-insights/Powering-the-nation-household-electricity-using-habits-revealed

electronics and home computing products per UK household increased by more than a factor of 6[27]. This emphasises the growing significance of electrical appliances in the home.

Table 3.1: Number of electrical appliances owned in the study households, 2010

Number of appliances in households/ percentage owning them		Average number of appliances owned	Minimum number of appliances owned	Maximum number of appliances
1–30	24%	41	13	85
31–40	29%			
41–50	26%			
51+	21%			

Source: DECC, DEFRA, EST – The Household Electricity Survey

3.23 The study also suggests that the energy used by leaving appliances on standby can account for between 9 and 16 per cent of domestic electricity demand[28]. For the average household in the study this standby consumption equates to between £50 and £86 in terms of annual electricity bills. This highlights some of the potential energy savings that can be achieved through changing behaviour.

3.24 Another key study into energy use in the home is due for publication next year. The Energy Follow Up Survey is a survey of energy use in about 2,600 representative households from the 2011 English Housing Survey. The analysis will provide insight into the energy used in conservatories, thermal comfort in the home (including overheating and cooling), and domestic lighting. This study will provide high quality information on areas of domestic energy use which DECC currently has little evidence on.

Energy use in the non-domestic sector

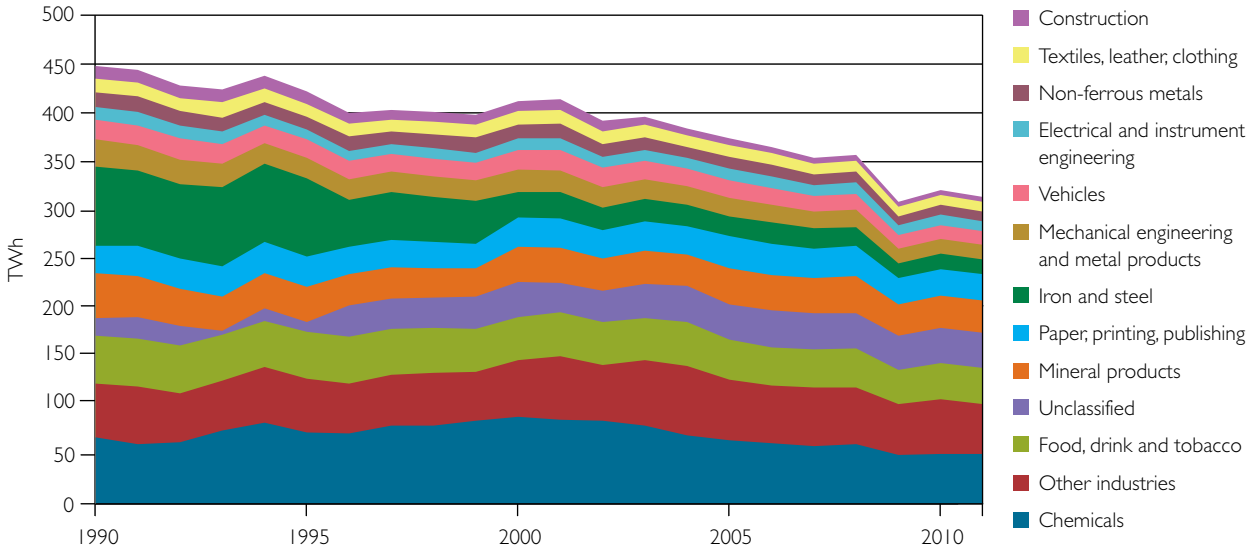
3.25 Compared to the domestic sector, there is currently less detailed information on energy consumption in the non-domestic sector which, covers energy use by industry, commercial and public services. These figures are taken from high level data sources.

3.26 Chart 3.6 shows consumption data for the industrial sector. The subsectors which observed the largest reduction in consumption between 1990 and 2011 were iron and steel with an 80 per cent reduction, construction with a 60 per cent reduction, and mechanical engineering/metal products with almost a 50 per cent reduction.

27 Energy consumption in the United Kingdom, table 3.11

28 Including both background standby, the typically unavoidable electricity use inherent in a number of household products, and avoidable standby consumption, e.g. turning products and gadgets off at the switch

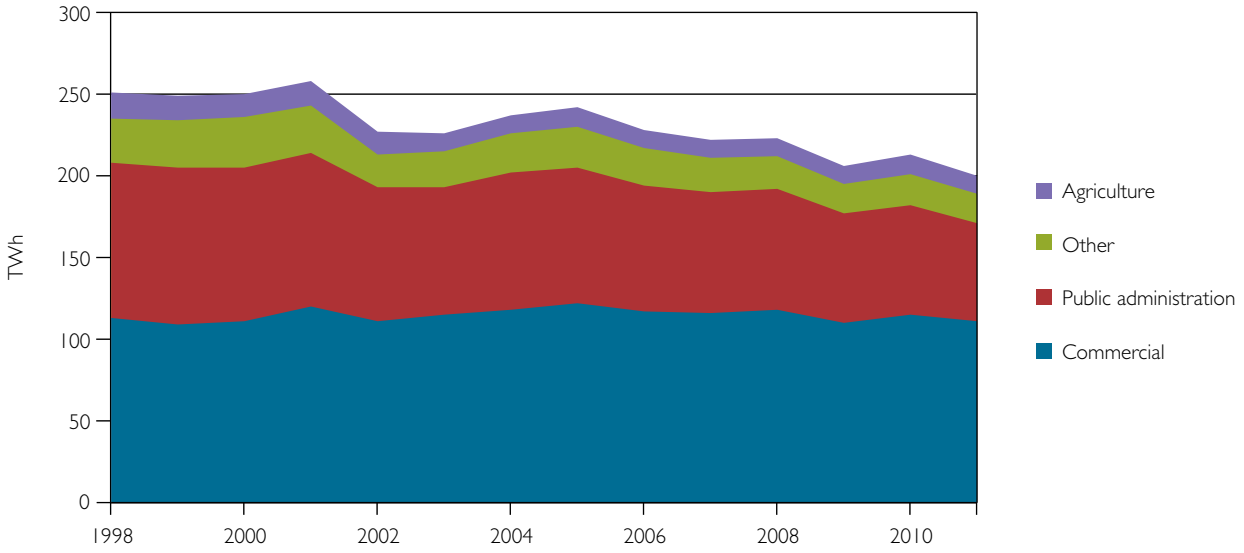
Chart 3.6: UK industrial final energy consumption, by subsector: 1990-2011



Source: Energy Consumption in the UK, table 4.3

3.27 Chart 3.7 shows the consumption data for the services sector. In 2011, the commercial sector accounted for 55 per cent of services consumption, public administration accounted for 30 per cent and agriculture accounted for 6 per cent. Between 1998 and 2011 energy use in public administration fell by over one third whereas energy use in the commercial sector almost remained unchanged.

Chart 3.7: UK services final energy consumption, by subsector: 1998-2011



Source: Energy Consumption in the UK, tables 5.1, 5.1a, 5.1b, 5.1c

3.28 DECC is seeking to develop more detailed evidence of energy use in the non-domestic sector. This project aims to link metered energy consumption data to property attribute data (including public and private sectors) and business data about the occupier. The purpose of the project is to add a non-domestic dimension to the National Energy Efficiency Data framework. The value from

this project would be to have detailed information about energy consumption by non-domestic subsector. This project is still in the quality assurance phase and DECC plans to publish some analysis next year. A brief summary of work so far is published in the 2012 report of National Energy Efficiency Data framework[29].

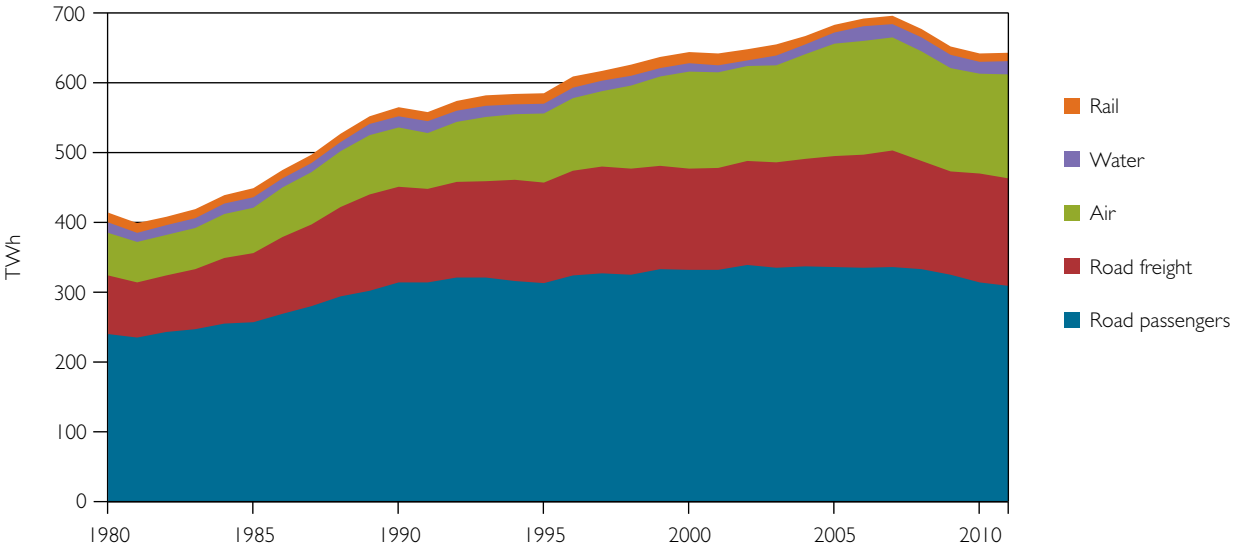
3.29 Work is also in progress to expand the evidence of energy end use in the non-domestic building sector. A pilot has been conducted in the food and mixed retail sector and initial results will available in shortly.

Energy use in the transport sector

3.30 Chart 3.8 shows high level consumption data for the transport sector. Energy consumption due to road transport increased by 43 per cent between 1980 and 2011 whereas energy consumption due to air transport was almost two and a half times larger in 2011 than 1980.

3.31 To set this in context, over the same period the number of road passenger kilometres increased by over 50 per cent, and landings and take offs at UK airports have more than doubled, suggesting that an increase in demand drove this change increase in consumption[30].

Chart 3.8: UK transport final energy consumption, by mode of transport: 1980-2011



Source: Energy Consumption in the UK, table 2.1

3.32 In 2011, road passengers accounted for 48 per cent of energy consumption in transport, road freight accounted for 24 per cent, air transport accounted for 23 per cent, water transport accounted for 3 per cent and rail transport accounted for 2 per cent.

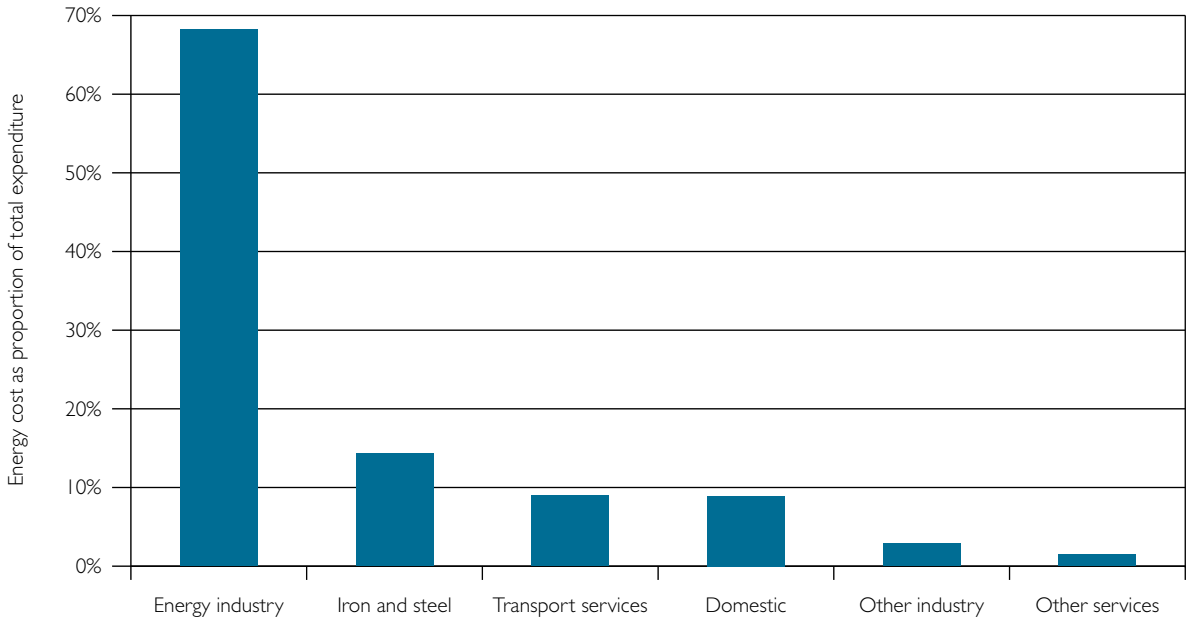
3.33 In 2011, biofuels accounted for 3 per cent of energy consumption on roads with a negligible amount of electricity consumption. In 2011, 34 per cent of rail transport energy consumption was accounted for by electricity compared to 21 per cent in 1980.

29 National Energy Efficiency Data-framework 2012
http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/need/need.aspx
30 Energy Consumption in the UK table 2.2 and Department for Transport data:
http://www.dft.gov.uk/statistics/tables/avi0101/

Energy costs by sector

3.34 Energy use in each sector of the economy translates into energy costs. Against the context of rising energy prices, energy costs can influence the demand for energy efficiency.

Chart 3.9: Estimated energy cost as proportion of total expenditure, by UK sector, 2009[31]



Source: DECC secondary analysis of Office for National Statistics data

3.35 Chart 3.9 shows estimated energy costs as a proportion of total expenditure for the UK in 2009. Energy costs in the energy industry are nearly 70 per cent of total expenditure. This is to be expected since oil, gas and electricity are significant operating costs for this sector. Iron and steel production is another energy intensive process, relying heavily on coke and electricity, and energy costs account for around 15 per cent of total expenditure for this industry. Other industry has a much lower energy cost of about 3 per cent of total expenditure.

3.36 Energy costs in the domestic sector run at about 9 per cent of total expenditure (when transport fuel is included) and are almost evenly split between transport fuel and electricity, gas and other household fuels.

3.37 Services which identify their primary activity as transportation also have an energy cost of about 9 per cent of total expenditure whereas for other services the energy cost is between 1 and 2 per cent.

31 Data for the non-domestic sector sourced from secondary analysis of the 2009 Supply Use Tables produced by the Office for National Statistics (ONS) as part of the National Accounts. Data for the domestic sector is sourced from the 2009 Living Costs and Food Survey. Private transportation is included in the domestic sector. The transport services sector is defined as organisations which identify their primary business activity as transportation. This is experimental analysis and as such each sector has an associated margin of error. Total expenditure for the non-domestic sector is defined as final consumption expenditure plus the compensation of employees and non deductable VAT. Gross capital formation has been excluded from this definition of expenditure. Total expenditure in the domestic sector includes VAT

Chapter 4: Savings from Energy Efficiency Measures

Introduction

4.1 Energy efficiency measures, such as insulation and condensing boilers, enable consumers to get more out of the energy they use. Adopting energy efficiency measures can achieve significant savings in terms of energy consumption and energy bills for both domestic and non-domestic consumers.

4.2 Energy efficiency measures can fall into two categories: technical and behavioural. A technical energy efficiency measure involves physically altering some aspect of the building or equipment to get more out of the energy used, for example, installing cavity wall insulation in a home or buying a more energy efficient washing machine. Adopting a behavioural energy efficiency measure involves a consumer changing their habitual behaviour to get more out of the energy used, for example, turning the heating down by one degree or turning of electrical equipment not in use[32].

4.3 This section outlines the savings that can be achieved through individual energy efficiency measures, in terms of energy and energy bills, for both individual households and the domestic sector as a whole, whilst noting that less data is available for savings from energy efficiency measures in the non-domestic sector.

Savings from domestic technical measures

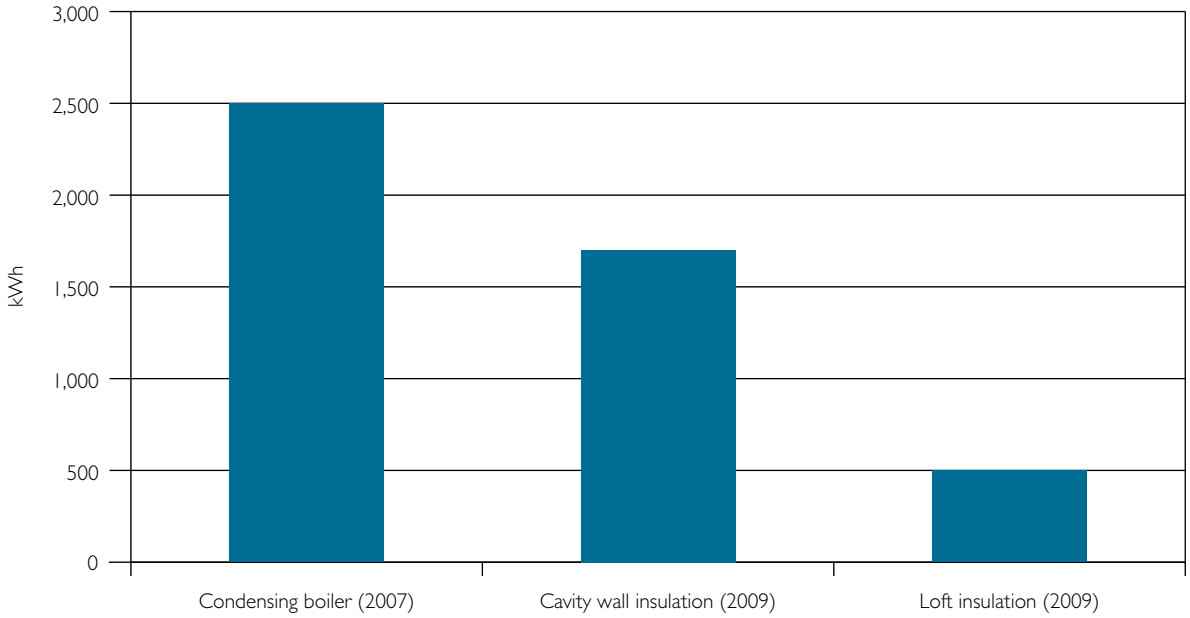
4.4 The National Energy Efficiency Data framework (NEED) links energy consumption data to household attribute data and data on energy efficiency measures in place. It has been used to calculate the energy savings from various energy efficiency measures in place in homes by comparing energy consumption before and after installation of a measure relative to changes in consumption observed in homes that did not receive measures[33]. As opposed to theoretical savings from energy efficiency measures, the figures derived from NEED represent actual energy savings achieved.

4.5 Chart 4.1 shows the median energy savings achieved by households installing some key energy efficiency measures in the domestic sector.

32 It is not possible to explicitly categorise these actions as technical or behavioural and in some cases will be connected, for example fitting thermostatic radiator valves (TRV) and using them to control specific room temperatures

33 National Energy Efficiency Data-framework 2012 http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/need/need.aspx

Chart 4.1: Median energy savings from domestic energy efficiency measures[34]



Source: National Energy Efficiency Data framework (NEED)

4.6 The analysis shows that there are real savings in gas use following these measures in a 3-bedroom semi detached[35]. Condensing boilers saved the most, 2,500 kWh (13 per cent), cavity wall insulation saving 1,700 kWh (10 per cent) and loft insulation installed in 2009 typically saved 500 kWh (3 per cent) but it should be noted that most houses have some loft insulation and there is high variation in observed savings depending on the amount the insulation depth is increased by.

4.7 NEED analysis of the impact of solid wall insulation should be treated with caution since it is based on a much smaller number of records than the other energy efficiency measures. The analysis covers measures installed over a four year period (2005-2008). The sample is not representative because, due to the policy under which most of these measures have been installed a high proportion of these households were in the EEC/CERT priority group and are therefore not typical of the population as a whole. The median saving for this sample was 2,200 kWh (12 per cent) but there are not enough observations to be able to draw reliable conclusions about the typical saving for all solid wall properties.

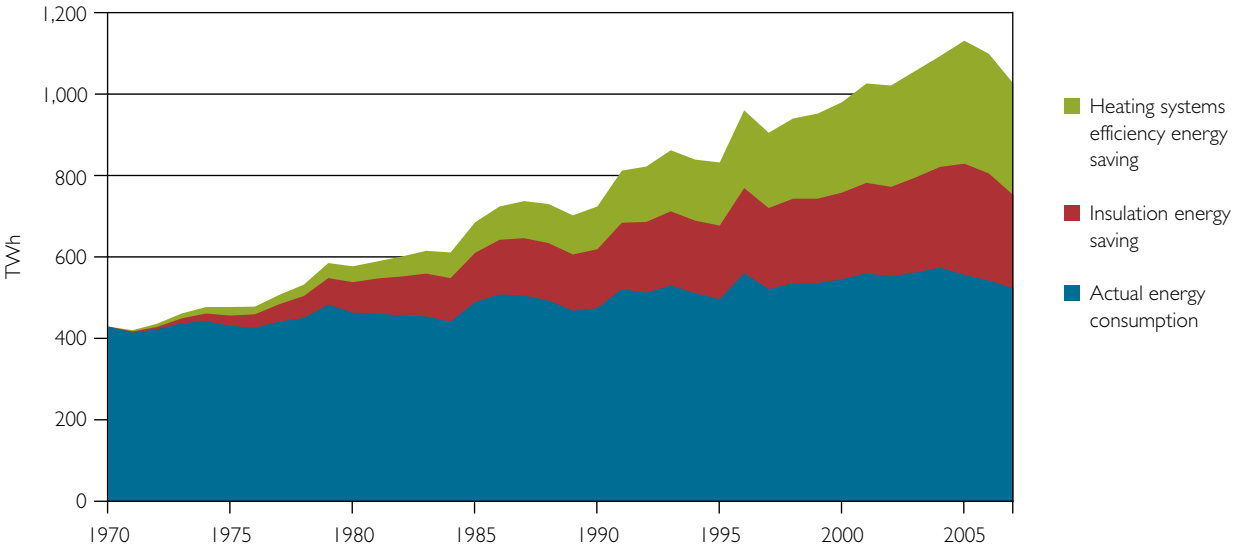
4.8 The savings gained from individual households installing energy efficiency measures can add up to achieve significant energy savings across the whole of the domestic sector. Chart 4.2 shows that improvements in domestic insulation and heating system efficiency have saved the UK significant amounts of energy over the last 40 years.

4.9 UK household energy consumption increased by 22 per cent between 1970 and 2007. The Building Research Establishment model estimates that if no new insulation and no new efficient heating measures had been installed since 1970, it would have more than doubled.

34 Analysis based on gas heated homes in England (excluding flats) for measures installed in the specified year(s) identified in the Homes Energy Efficiency Database, Energy Saving Trust

35 Due to a limited sample of homes receiving solid wall insulation this has been calculated based all house types/sizes that received the measure between 2005 and 2008

Chart 4.2: UK domestic energy savings due to energy efficiency improvements: 1970-2007



Source: Energy Consumption in the UK, table 3.18, based on modelling by the Buildings Research Establishment

4.10 The energy savings due to insulation installed between 1970 and 2007 were equivalent to 22 per cent of the projected consumption for 2007, whilst the energy savings due to heating system efficiency improvements over the same period were equivalent to 27 per cent of the projected consumption for 2007.

4.11 It is estimated that if energy efficiency improvements in heating and insulation had not taken place in homes since 1970, the average annual household energy bill in the UK would be about £1,000 higher[36].

36 Secondary analysis of Energy Consumption in the UK table 3.18, Digest of UK Energy Statistics and Quarterly Energy Prices, a DECC publication. http://www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx

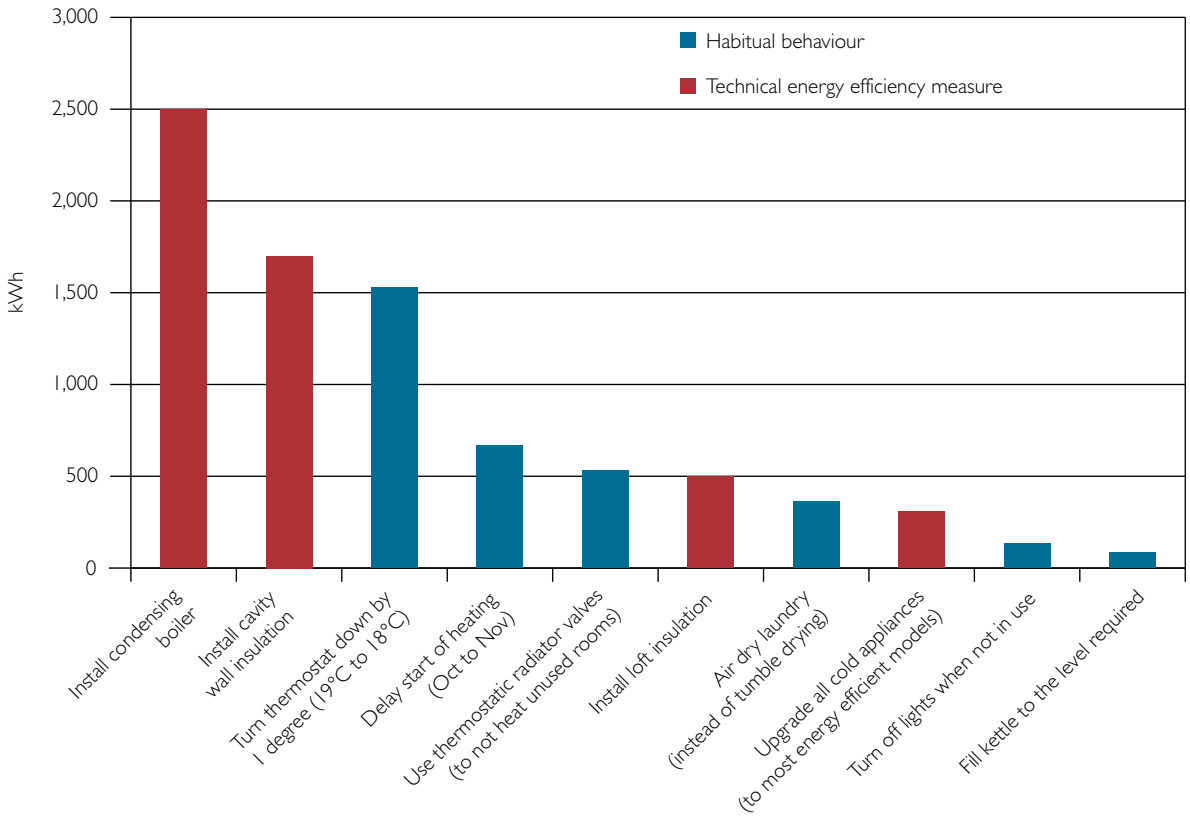
Savings from domestic behavioural measures

4.12 The Domestic Energy Behaviour Framework provides estimates for how much energy can be saved in a typical home by engaging in energy saving, behaviour changing measures[37].

4.13 Chart 4.3 compares the typical savings a home can achieve from behaviour changing measures, such as turning off heating in unused rooms, with the typical energy savings achieved from installing technical measures, such as installing cavity wall insulation.

4.14 The chart demonstrates that changing behaviour can be an inexpensive and immediate way of saving energy in the home, that yields savings comparable to installing technical energy efficiency measures. For example, using thermostatic radiator valves to turn off heating in unused rooms could achieve over 5 per cent more energy savings than the average loft insulation achieves. Similarly turning the thermostat down by one degree from 19C to 18C could achieve about 90 per cent of the energy savings that cavity wall insulation achieves.

Chart 4.3: Energy saved for a typical home through adopting physical and behavioural energy efficiency measures



Source: Domestic Energy Behaviours Framework, National Energy Efficiency Data framework

37 How much energy could be saved by making small changes to everyday household behaviours? http://www.decc.gov.uk/eedo

Savings from non-domestic measures

4.15 The non-domestic sector is more diverse than the household sector and even within subsectors, firms differ in their structure, size, activity and technology deployed. This contributes to the lack of comprehensive evidence with sufficient resolution to assess with certainty the energy efficiency savings that could be delivered by different measures eliciting technical or behavioural changes to energy use.

4.16 Evidence that does exist comprises a variety of 'top down' and 'bottom up' assessments. The unavailability of data sets of sufficient detail affects the ability to model accurately the diverse range of sub-sectors under consideration. In addition, there is limited information on 'bottom up' analysis which hinders the ability to identify opportunities for savings by sub-sector.

4.17 Both approaches have their strengths and limitations and yield significant variation in the results produced since they are based on different underlying data inputs and assess the impacts of different factors.

4.18 As a result, the Energy Efficiency Strategy highlights the need to improve the evidence base on the energy efficiency savings that could be achieved by different measures in the non-domestic sector.

Potential savings from energy efficiency measures

4.19 Individual energy efficiency measures can save appreciable amounts of energy in homes and organisations. Over the past 40 years the measures that have been installed have added up to save the UK significant amounts of energy. However, there is still potential for further uptake of energy efficiency measures, which could achieve large scale energy savings in the future.

4.20 The UK Energy Efficiency Marginal Abatement Cost Curve (EE-MACC) provides an overview of what measures and sectors these savings lie in, as well as the scale of the savings on offer and the cost-effectiveness of individual measures. Information and figures giving the scale of these potential savings can be found in Annex E of the Energy Efficiency Strategy[38].

Chapter 5: Uptake of Energy Efficiency Measures

Introduction

5.1 Energy savings can be achieved through a wide range of energy efficiency measures, such as insulation and more efficient consumer appliances, which enable consumers to get more from the energy they use. This section looks at some of the major energy efficiency measures that have been adopted, the level and trends in uptake, and what potential remains for additional uptake of these. This has been driven by improvements in energy efficiency technology and through action by households and businesses often with the support of Government schemes. The section concludes by looking at some evidence around what particular Government schemes have achieved.

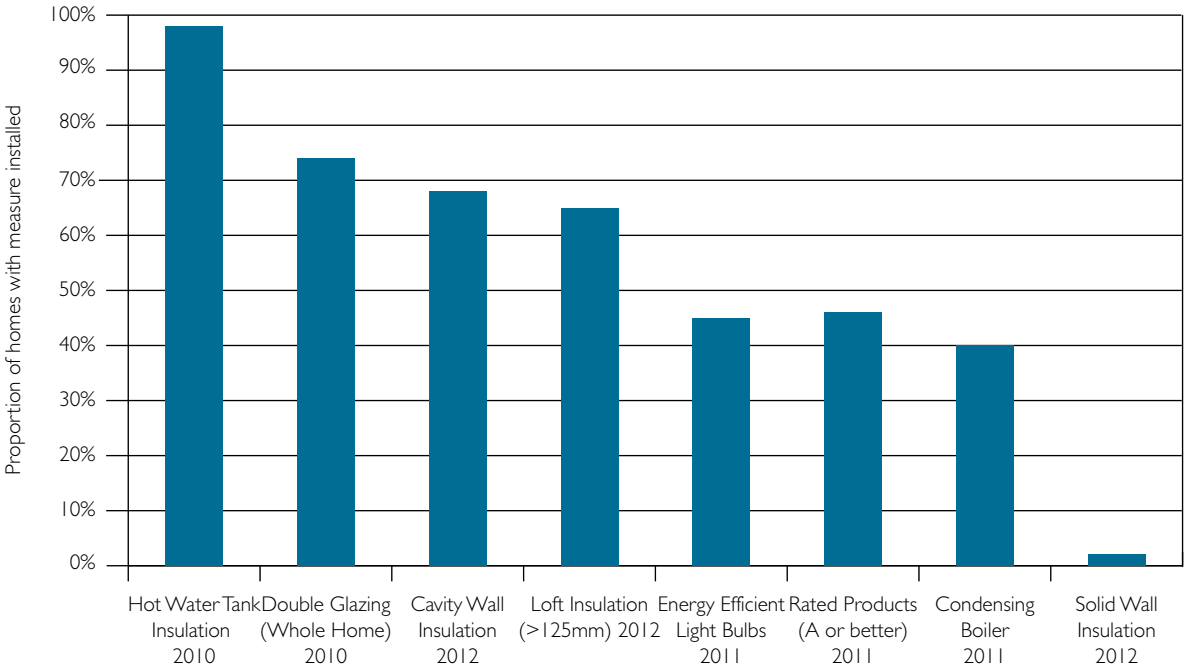
5.2 Evidence on energy efficiency measures is much stronger in the domestic sector and is taken from housing surveys, energy efficiency programmes information and the Homes Energy Efficiency Database[39]. Less is known about the non-domestic sector but new evidence will be available as more programmes, such as Green Deal, are rolled out and new sources of evidence are explored.

Installation level of domestic technical measures

5.3 Chart 5.1 shows the current installation levels of some key domestic energy efficiency measures, using the most recent data available.

39 Homes Energy Efficiency Database, http://www.energysavingtrust.org.uk/Organisations/Local-delivery/Free-resources-for-local-authorities/Homes-Energy-Efficiency-Database

Chart 5.1: Level of energy efficient measures in place in homes[40]



Source: Secondary analysis of a range of statistical sources

5.4 The most common energy efficiency measure shown is hot water tank insulation, with 98 per cent of suitable homes having the measure in place. Almost three quarters of homes have double glazing installed throughout the whole property. Cavity wall insulation is present in 68 per cent of homes with cavity walls. Loft insulation is the next most common measure, with 65 per cent of homes with lofts having at least 125mm in place.

5.5 In domestic properties it is estimated that 45 per cent of light bulbs are energy efficient light bulbs[41]. It is also estimated that 46 per cent of domestic appliances with an EU Energy Label are rated A or better[42]. Condensing boilers have a similar level of deployment, with only two out of five homes having the measure installed in place, although this is increasing rapidly. The least common energy efficiency measure shown is currently solid wall insulation, with only two per cent of solid wall homes having the measure in place.

5.6 The chart clearly shows that whilst significant progress has been made in the installation levels of some energy efficiency measures there is plenty of remaining potential in the domestic sector.

40 Percentages have been calculated based on the homes that could have the measure (e.g. only homes with lofts can have loft insulation). The geographical coverage and point in time varies for each measure and is determined by the sources used. Insulation measures apply to Great Britain only and show the level in place as of July 2012. All other measures apply to the UK. The building insulation figures are sourced from sourced from the Estimates of Home Insulation Levels in Great Britain, a DECC statistical publication. The hot water tank insulation figures originate from Energy Consumption in the UK (ECUK) table 3.15d, the double glazing figures originate from ECUK table 3.15c, the energy efficient light bulb data originates from ECUK table 3.11, the rated products figures originate from ECUK 3.11a, and the condensing boiler figures originate from SGBI/EST data, and the energy efficient light bulb data originates from ECUK 3.11

41 Figure quoted assumes that all light bulbs distributed are installed

42 The EU Energy Label rates the energy efficiency of products and appliances from A+++ to G

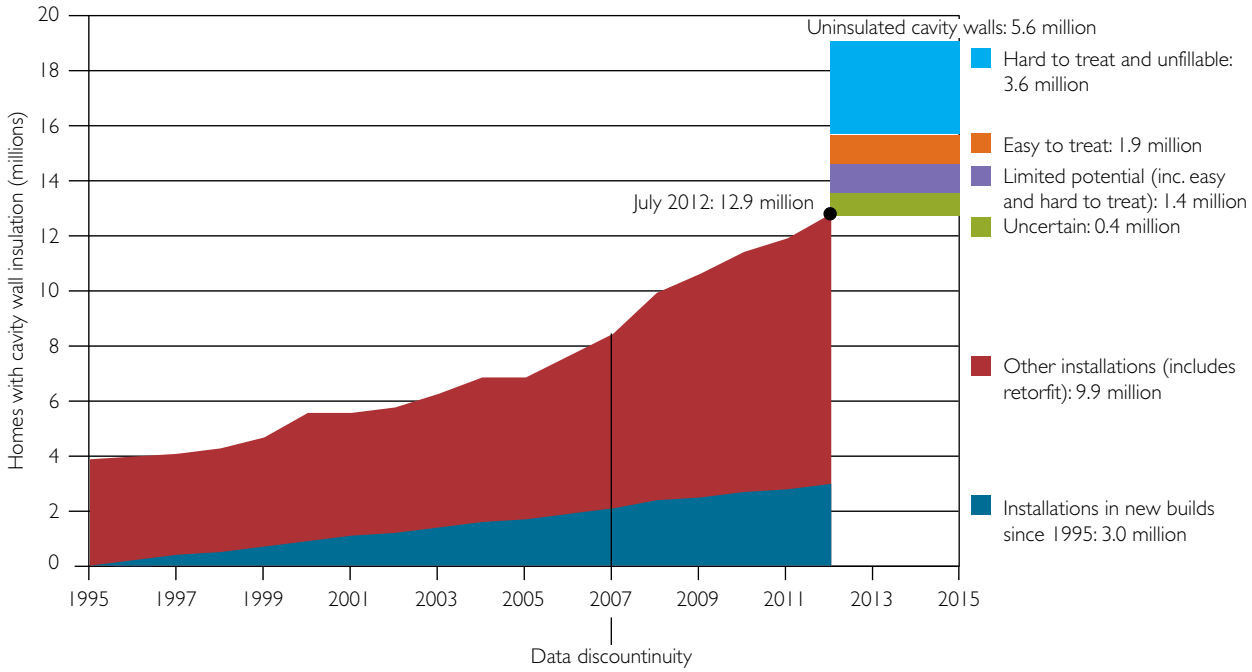
Trend in uptake of domestic technical measures

5.7 The installation level of any energy efficiency measure in homes is determined by a variety of factors, including the payback period of the measure, technological developments over time, support through Government schemes and the level of awareness of the measure. The trend in uptake of an energy efficiency measures shows how quickly that measure was able to penetrate the market and can provide an insight into how long it will take for the remaining potential to be realised.

5.8 Starting with the most common measure in recent years, hot water tank insulation was already widely used in 1980 with 86 per cent of all homes with hot water tanks having the measure in place[43]. This had increased to 94 per cent in 1990 and to 98 per cent in 2010.

5.9 Double glazing was less common in 1980, with at least 20 per cent of homes having some level of the measure in place[44]. This had risen to at least 48 per cent in 1990, at least 72 per cent in 2000, and 92 per cent in 2010. In 2010 there were 6.9 million homes that were not fully double glazed and almost one in three had no double glazing in place at all.

Chart 5.2: Estimated uptake of cavity wall insulation in homes in Great Britain: 1995-2012[45]



Source: Secondary analysis of a range of government sources

43 Energy Consumption in the UK, table 3.15d

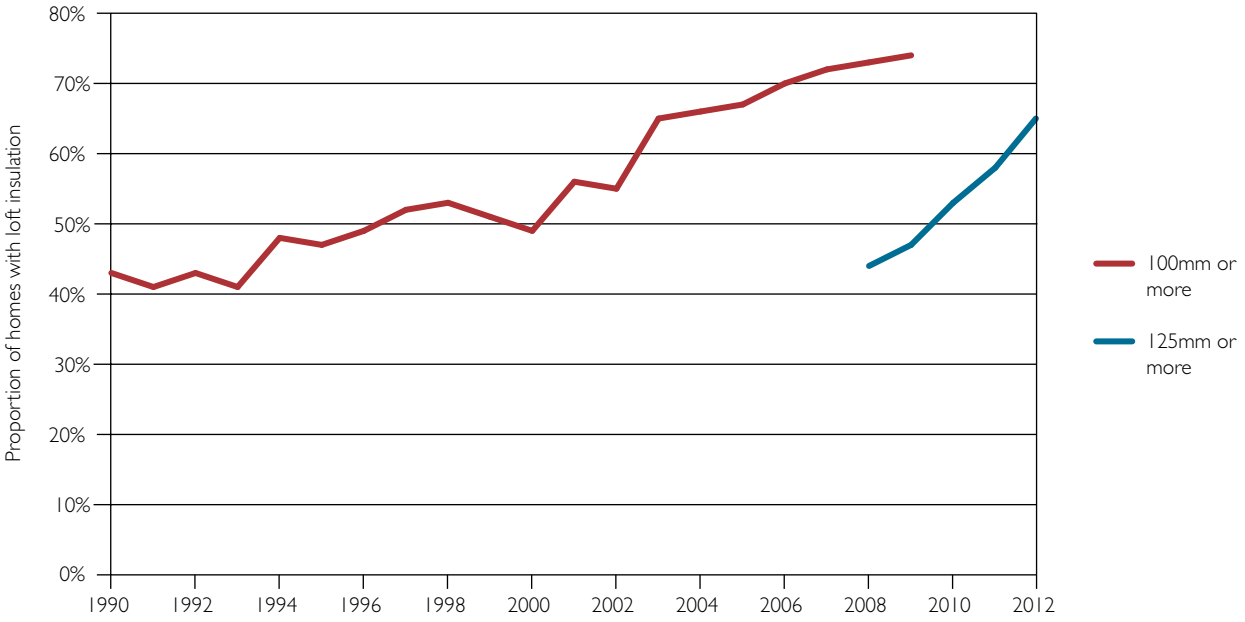
44 Energy Consumption in the UK, table 3.15c. This is derived from analysis of the English Housing Survey. In terms of double glazing some homes fell into the category 'not stated' (this was removed as a category from 2003 onwards). Consequently there is uncertainty surrounding this figure, which could be as high as 39 per cent

45 Data points represent values in April of the year displayed, apart from 2012 where July is displayed. Statistics on new build homes are taken from the Department of Communities and Local Government (DCLG) housing tables 213, 214, 215. The chart assumes that all new homes since April 1995 have cavity wall insulation, in line with more stringent building regulations introduced in that year. Data on other installations includes retrofits and new build properties with cavity wall insulation from before 1995. For 1995 to 2007 this is sourced from Energy Consumption in the UK table 3.15b, and for 2008 to 2012 this is sourced from the Estimates of Home Insulation Levels in Great Britain, a DECC statistical publication. The un-insulated cavity wall breakdown is also taken from this source

5.10 Chart 5.2 shows the trend in uptake of cavity wall insulation in Great Britain and the remaining un-insulated cavity walls. The number of homes with cavity wall insulation more than tripled between 1995 and 2012. It is estimated that almost a quarter of insulated cavity walls in July 2012 were insulated at construction in new homes built since 1995, to meet Building Regulations. By July 2012 at least 68 per cent of homes suitable for the measure had cavity wall insulation in place (it is uncertain whether a further 0.4 million homes with cavity walls have the insulation in place or not).

5.11 As of July 2012, there are at least 5.6 million homes with cavity walls that don't have insulation in place. The remaining potential is defined as all cavity walls that don't have cavity wall insulation, excluding uncertainty. The remaining potential is split between easy to treat cavity walls, accounting for 35 per cent of the remaining potential, and hard to treat and un-fillable cavity walls, accounting for 65 per cent. About a quarter of the remaining potential is classed as limited potential, since it is likely that these homes already have a relatively good thermal performance which means savings from having cavity wall insulation installed would be lower than the average[46].

Chart 5.3: Uptake of loft insulation in homes in Great Britain: 1990-2012[47]



Source: Estimates of Home Insulation Levels in Great Britain

5.12 Chart 5.3 shows the trend in uptake of loft insulation in homes in Great Britain. In 1990 only 43 per cent of homes had 100mm of loft insulation or more. This had risen to 74 per cent in 2009. Using the new reference depth of 125mm, used in DECC's official statistics, the percentage of suitable homes with loft insulation in place rose from 44 per cent in 2008 to 65 per cent in 2012.

5.13 This indicates that 35 per cent of lofts in the UK have the potential to have loft insulation top ups or installations from depths below 125mm.

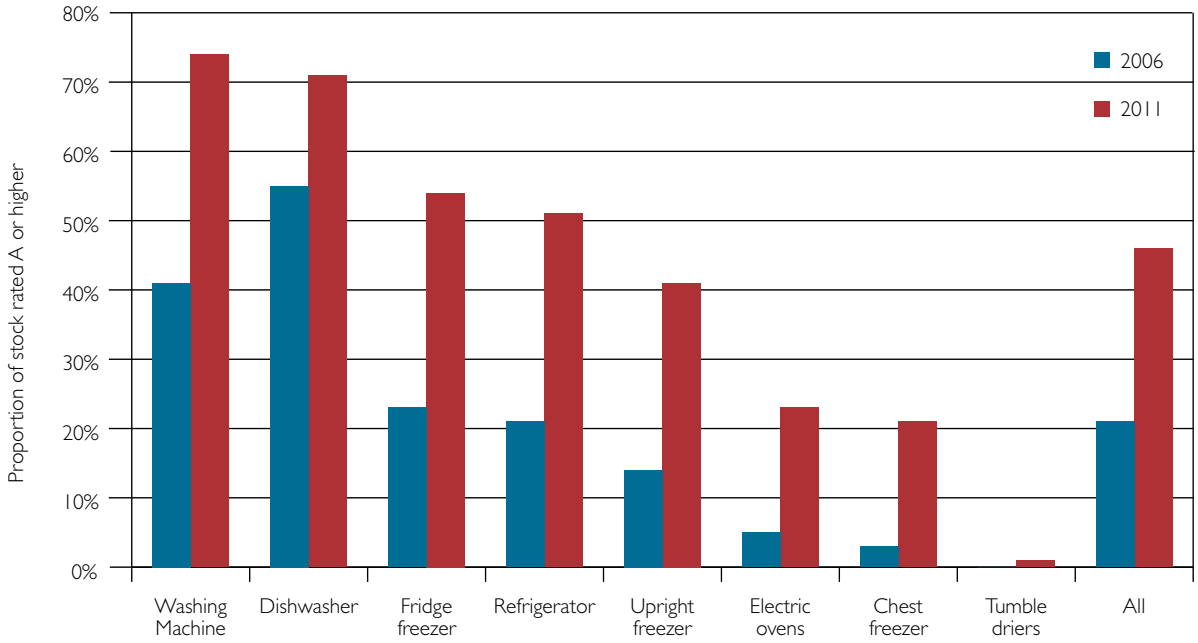
46 Estimates of Home Insulation Levels in Great Britain
http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/home_ins_est/home_ins_est.aspx

47 Percentages have been calculated based on homes that could have the measure (e.g. homes with lofts). Data for 100mm or more of loft insulation is sourced from Energy Sector Indicators chart 10.13. Data for 125mm or more of loft insulation is sourced from: Estimates of Home Insulation Levels in Great Britain. Data on loft insulation ceased to be measured in terms of 100mm or more in 2009 and started to be measured in terms of 125mm or more in 2007. The latest data point on this chart is for July 2012

5.14 The electricity consumption due to domestic appliances is 43 per cent higher than in 1980[48]. The increased significance of this energy use has lead to more stringent product standards policy and greater interest in the energy efficiency of products.

5.15 The number of energy efficient light bulbs deployed domestically has ramped up by significant amounts in recent years. Starting from 1990 whereby only 1 per cent of light bulbs were energy efficient, this had risen to 5 per cent in 2000, 35 per cent in 2010, and 45 per cent in 2011[49]. The surge in uptake in more recent years can be attributed to supplier obligations and EU regulation.

Chart 5.4: Proportion of UK domestic appliance stock with an energy rating A or above, at five year time intervals: 2006, 2011[50]



Source: Energy Consumption in the UK, table 3.11a

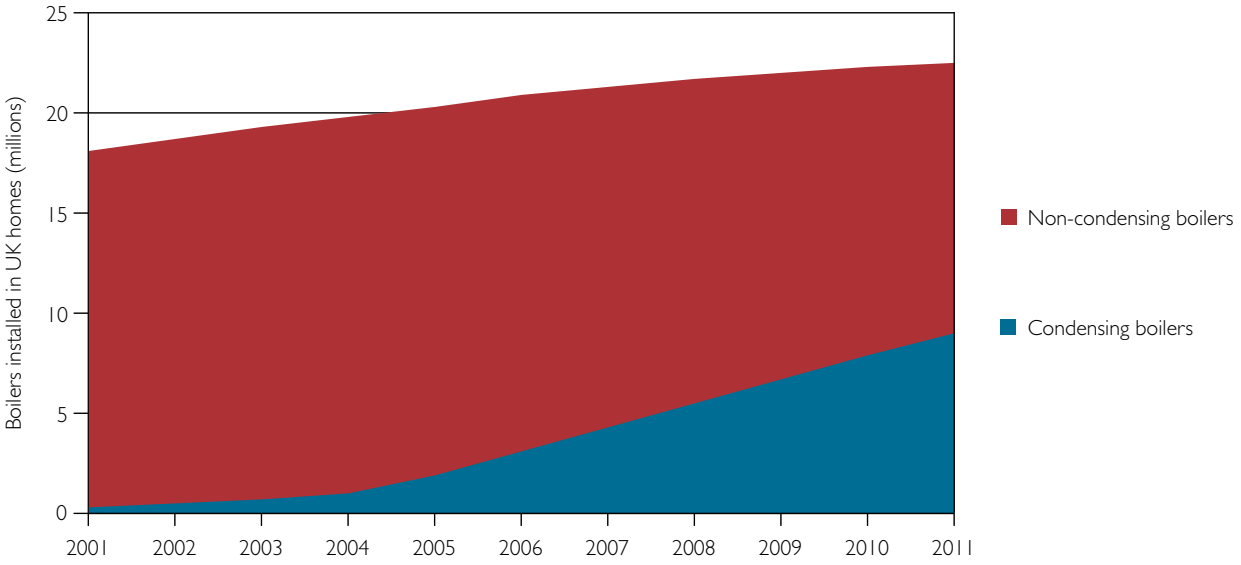
5.16 Chart 5.4 shows the proportion of stock which has an energy rating of A or better, for rated appliances. In 2001, none of the products displayed had stock with an energy rating of A or better, except for dishwashers and washing machines. By 2006 the proportion of appliances rated A or better had risen to 21 per cent. In the following five years this proportion had more than doubled, such that 46 per cent of rated appliances were rated A or better. This indicates that over the past ten years there has been a significant increase in the level of energy efficient products in place in the domestic sector.

5.17 In 2011, over 70 per cent of washing machines and dishwashers were rated A or above as compared to only about a quarter of electric ovens, 20 per cent of chest freezers, and two per cent of tumble dryers. This suggests that there is still the potential for more energy efficient products in the domestic sector, and this is reinforced by the fact that not all appliances fall under the EU Energy Labelling scheme.

48 Energy Consumption in the UK, table 3.10
49 Energy Consumption in the UK, table 3.11. Energy efficiency light bulbs include LEDs
50 Energy Consumption in the UK, table 3.11a. This applies only to products which fall into the EU Energy Labelling scheme

5.18 DECC has published some evidence on how the energy performance of non regulated appliances has varied since 1990[51].

Chart 5.5: Uptake of condensing boilers in UK homes: 2001-2011



Source: Secondary analysis of data from the Society of British Gas Industries and the Energy Saving Trust

5.19 Chart 5.5 shows the uptake of condensing boilers in UK homes. Condensing boilers are at least 86 per cent energy efficient. Ten years ago building regulations only required boilers to be 78 per cent efficient.

5.20 In 2001, only 2 per cent of domestic boilers were condensing boilers. By 2011 this had risen to 40 per cent, following an average increase of nearly 900 thousand condensing boilers per year. This implies that there is the potential remaining to install condensing boilers in 60 per cent of UK homes with boilers.

5.21 In July 2012, solid wall insulation was present in 2 per cent of solid wall homes, which was more than double the level in place four years previously. It is uncertain whether the measure is also in place in another 2 per cent of solid wall homes.

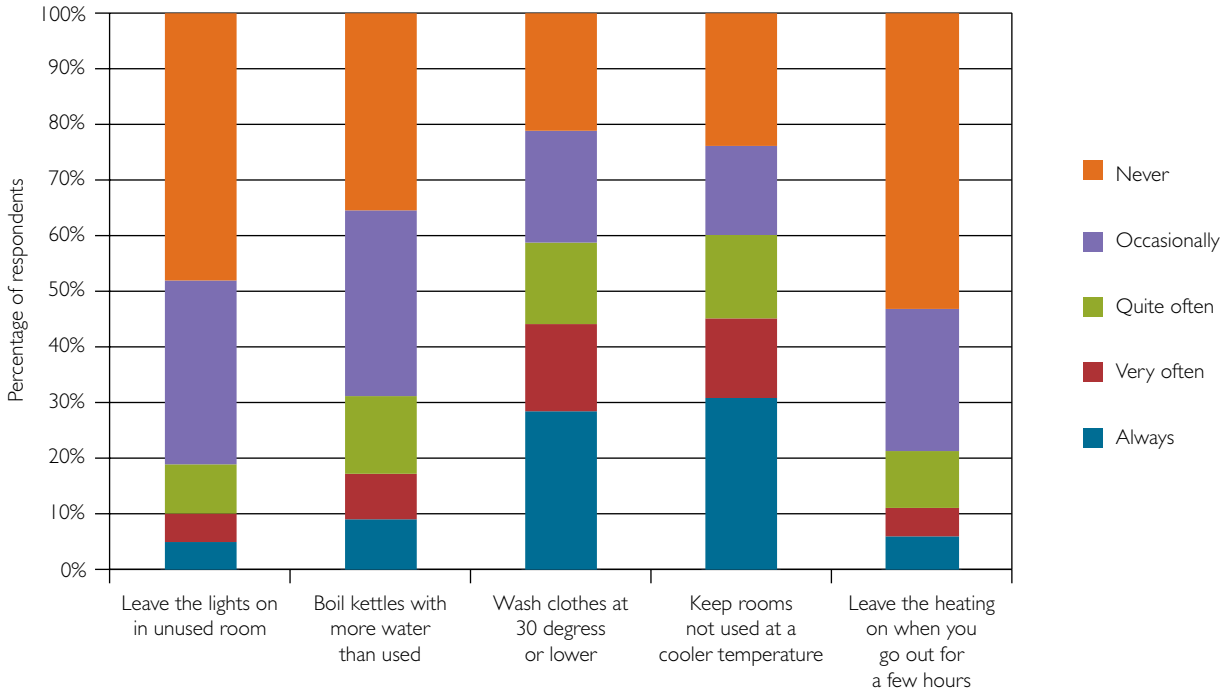
5.22 It is estimated that there is the potential for the remaining 7.7 million homes with solid wall to have the measure in place (although realistically not all solid wall properties will be eligible since some would likely be too costly to treat or be in a conservation area)[52].

Uptake of domestic behavioural measures

5.23 It is more challenging to measure the extent to which energy saving behaviours have been adopted in UK homes. DECC has set up a tracking survey to understand and monitor public attitudes to the Department's priorities including energy efficiency[53].

51 Energy Consumption in the UK, table 3.13. This shows how the energy use of new appliances has changed over time
52 Estimates of Home Insulation Levels in Great Britain
http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/home_ins_est/home_ins_est.aspx
53 DECC Public attitudes tracker http://www.decc.gov.uk/en/content/cms/statistics/public_att/public_att.aspx

Chart 5.6: Level of adoption for energy efficiency behaviours: March 2012



Source: DECC Public Attitudes Tracker (Wave 1 – March 2012)

5.24 In the initial wave in March 2012, approximately two thirds (64 per cent) of people said they boiled the kettle with more water than they are going to use at least occasionally, half (52 per cent) said they left the lights on when they were not in rooms at least occasionally. Just under half (47 per cent) said they ever left the heating on when going out for a few hours, over a quarter (27 per cent) said they always washed clothes at 30 degrees or lower, and three in ten (31 per cent) said that they always tried to keep rooms they were not using at a cooler temperature than those they were using.

5.25 Although this highlights some areas where there is energy saving potential, the evidence will become stronger as more waves of the tracker are completed.

Uptake through domestic energy efficiency schemes

5.26 The uptake of energy efficiency measures can be driven through Government schemes. Detailed evidence on particular energy efficiency schemes is published by Ofgem and is useful in gauging how significant different Government schemes are to the uptake of energy efficiency measures.

5.27 The Energy Efficiency Commitments (EEC) were energy company obligations that ran in two phases from 2002 to 2005 and 2005 to 2008. Phase two of EEC was succeeded by the Carbon Emissions Reduction Target (CERT) which ran its first phase from 2008 to 2011 and has been extended to December 2012[54].

5.28 Starting with the most common domestic energy efficiency measure in place, under EEC almost 428,000 hot water tanks were insulated in homes, which is equivalent to three per cent of homes with the measure in place in 2008[55].

54 Energy Consumption in the UK tables 3.20, 3.21 contain the figures for uptake of measures under these schemes
55 Energy Consumption in the UK table 3.15d

5.29 Together both EEC and CERT were responsible for installing cavity wall insulation in about 4.2 million homes, equivalent to about one third of homes in Great Britain with cavity wall insulation in place as of July 2012[56].

5.30 EEC and CERT accounted for the installation or top up of loft insulation in 4.9 million homes (excluding DIY loft insulation promoted through the schemes), equivalent to about one third of homes in Great Britain with loft insulation in place as of July 2012 (of 125mm depth minimum)[57].

5.31 EEC and CERT also accounted for the distribution of about 445 million energy efficient light bulbs, although they were not necessarily all installed.

5.32 EEC was responsible for the distribution of 14.9 million energy efficient cold and wet appliances. This was equivalent to 18 per cent of the stock of cold and wet appliances in homes in 2008[58].

5.33 Through EEC 2.4 million boilers were replaced with more efficient boilers, equivalent to ten per cent of homes with boilers in the UK in 2008[59].

5.34 Through CERT solid wall insulation was installed in about 47,000 homes, equivalent to between two in ten and three in ten homes in Great Britain with solid wall insulation in place (the uncertainty is due to the uncertainty in the level of solid wall insulation in place)[60].

5.35 At the start of April 2012, it is estimated that 9.7 million homes have benefitted from at least one major insulation measure under either EEC, CERT, or CESP (the Community Energy Saving Programme)[61]. This demonstrates that some Government schemes have contributed towards a significant proportion of the uptake of energy efficiency measures in the domestic sector.

Uptake of non-domestic energy efficiency measures

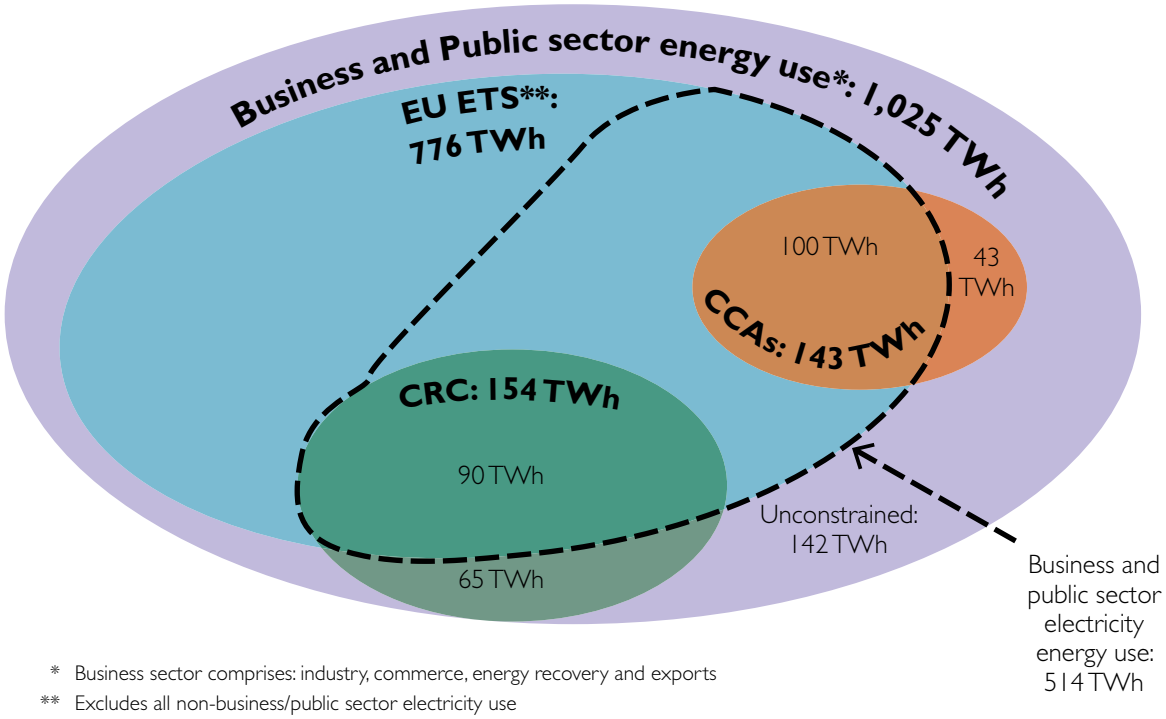
5.36 There is less detailed information available on the specific energy efficiency measures taken up in the non-domestic sector. This is in part driven by the design of Government policies targeting a very diverse range of firms in terms of their activities, industrial processes, structure and size. Consequently, policies aimed at the non-domestic sector provide a framework of incentives to influence behaviour rather than proscribe a specified set of measures to be adopted.

Uptake through non-domestic energy efficiency schemes

5.37 There are a range of policies in the non-domestic sector promoting the uptake of energy efficient measures. Three of the key ones are the EU Emissions Trading Scheme (EUETS), the CRC Energy Efficiency Scheme and Climate Change Agreements (CCA).

56 Estimates of Home Insulation Levels in Great Britain
57 Estimates of Home Insulation Levels in Great Britain
58 Energy Consumption in the UK table 3.11
59 Energy Consumption in the UK table 3.9
60 Estimates of Home Insulation Levels in Great Britain
61 Energy Trends, a quarterly statistics bulletin produced by DECC, http://www.decc.gov.uk/assets/decc/11/stats/publications/energy-trends/6479-energy-trends-sep-2012.pdf

Figure 5.1: Estimated energy coverage of energy efficiency schemes in the business and public sectors, 2010



* Business sector comprises: industry, commerce, energy recovery and exports

** Excludes all non-business/public sector electricity use

Source: DECC secondary analysis of a range of sources[62]

5.38 These schemes do not collect data on the energy efficiency measures, such as insulation, implemented by the sites and organisations they cover. However, analysis showing the coverage of the schemes provides an insight into how widespread they are in the business and public sectors. Figure 5.1 shows this coverage in terms of final energy consumption based on the coverage of the schemes in 2010[63].

5.39 In 2010, 14 per cent of energy use in the business and public sectors did not fall into the EUETS, CRC or CCA, and was effectively unconstrained by these schemes. This implies that 86 per cent of energy consumption is covered by at least one of the schemes, indicating that they have the broad coverage which is important for promoting energy efficiency throughout the business and public sectors.

5.40 The EUETS accounts for 76 per cent of energy use in these sectors. Almost one fifth of energy use in the business and public sectors is either captured in the EU-ETS/CRC overlap or the EU-ETS/CCA overlap.

62 Including: Digest of UK Energy Statistics, The UK Greenhouse Gas Inventory (a National Statistics publication produced by DECC), CRC data, CCA data, EUETS data. http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/gg_emissions.aspx

63 The coverage indicated does not reflect simplification proposals in ETS, CRC and CCA schemes published and consulted on in the course of 2011 which will come into effect in 2013 and beyond.

Chapter 6: Contribution of energy efficiency

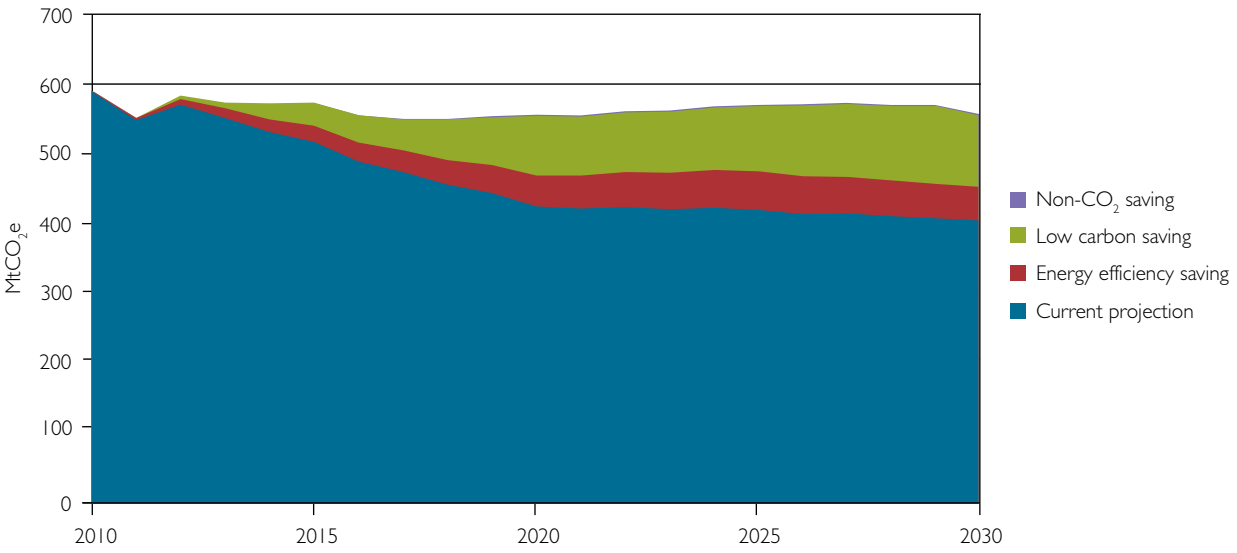
Introduction

6.1 There are multiple benefits of energy efficiency and this section highlights the important contribution it makes to wider objectives. These include:

- Reducing Greenhouse gas emissions that cause dangerous climate change;
- Protecting households and business from high energy bills by reducing energy consumption; and
- Improve the security of energy supply by reducing base demand.

Greenhouse gas emissions

Chart 6.1: Projected UK Greenhouse gas emissions with policy saving: 2010-2030[64, 65,66]



Source: DECC Energy & Emissions Projections 2012

64 DECC Energy & Emissions Projections 2012 http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx

65 UK Territorial emissions before trading of EU allowances

66 Energy efficiency policies have been defined as those aimed to reduce final energy consumption (for example product standards or installing insulation). Low carbon energy savings include switching to low carbon energy sources (e.g. renewable electricity, transport bio-fuels etc) and transformation sector energy savings

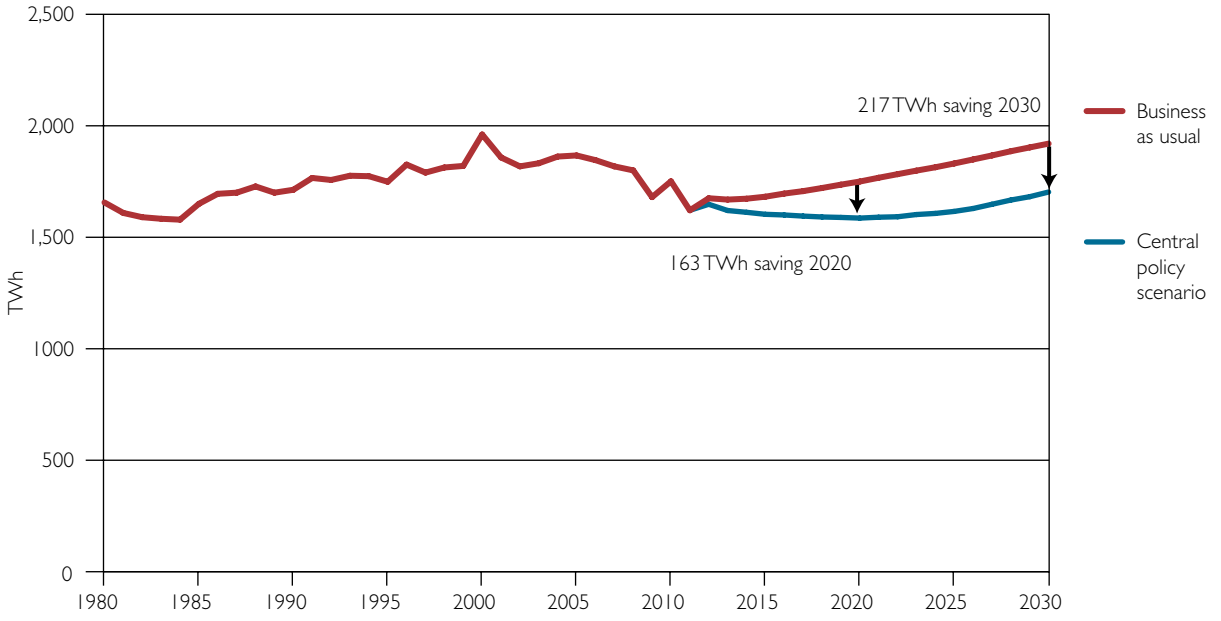
6.2 The UK has set a legally binding target to reduce Greenhouse gas emissions by 80 per cent between 1990 and 2050 with five year carbon budgets set since 2008 to determine the trajectory for this. While low carbon energy sources (e.g. renewables, nuclear, carbon capture and storage) are expected to make substantial increases over this period there is still a significant contribution for energy efficiency.

6.3 The existing policy package is due to deliver savings in Greenhouse gas emissions of 134 $MtCO_2e$ (24%) in 2020 and 161 $MtCO_2e$ (28%) in 2030, relative to business as usual. In 2020, 33 per cent of these savings are due to energy efficiency with the remaining coming from switching to low carbon energy sources for example nuclear power and road transport biofuels. By 2030 the share of energy efficiency policy impact falls to 31%. In the non-traded emissions sector, energy efficiency policies make up about 60% of the savings in 2020 and about 75% of the savings in 2030.

Energy saving measures

6.4 The 2012 projections show that, with no additional energy efficiency policies since 2009, final energy consumption is projected to rise from the 2010 level by 168 TWh over the next 20 years. However, the existing policy package is due to deliver savings of 163 TWh (9%) in 2020 and 217 TWh (11%) in 2030 relative to the business as usual projection. This means that by 2020, current energy efficiency policy should save the UK the amount of energy equivalent to that currently used by about nine million homes in a year or the output from 19 power stations[67].

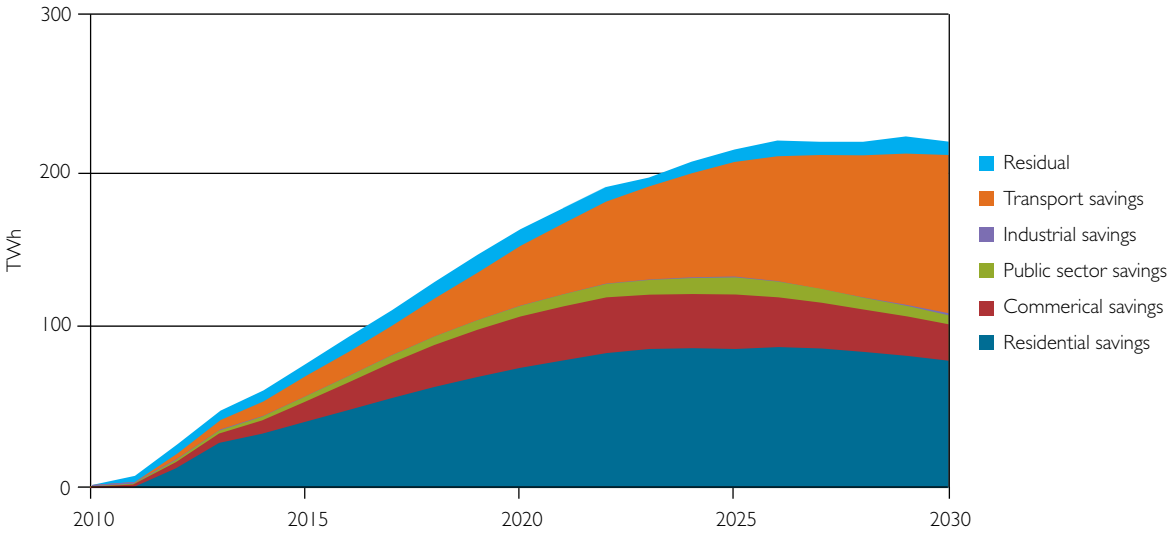
Chart 6.2: Projected UK final energy consumption: 2000-2030



Source: DECC Energy & Emissions Projections 2012

67 Assumption of a power station with 1 GW capacity operating full-time

Chart 6.3: Projected UK policy savings for final energy consumption: 2010-2030[68]



Source: DECC Energy & Emissions Projections 2012

6.5 Chart 6.3 shows the sectors where these energy savings are expected to come from.

6.6 In 2020, based on current policies, the residential sector contributes 46 per cent of the savings with a further 24 per cent from public and commercial services and 23 per cent from transport.

6.7 By 2030, based on current policies, the transport sector contributes 46 per cent of the savings with a further 37 per cent from residential and 13 per cent from public and commercial services.

68 Residual savings include the impact of electricity price changes from the generation mix

Chapter 7: International comparisons

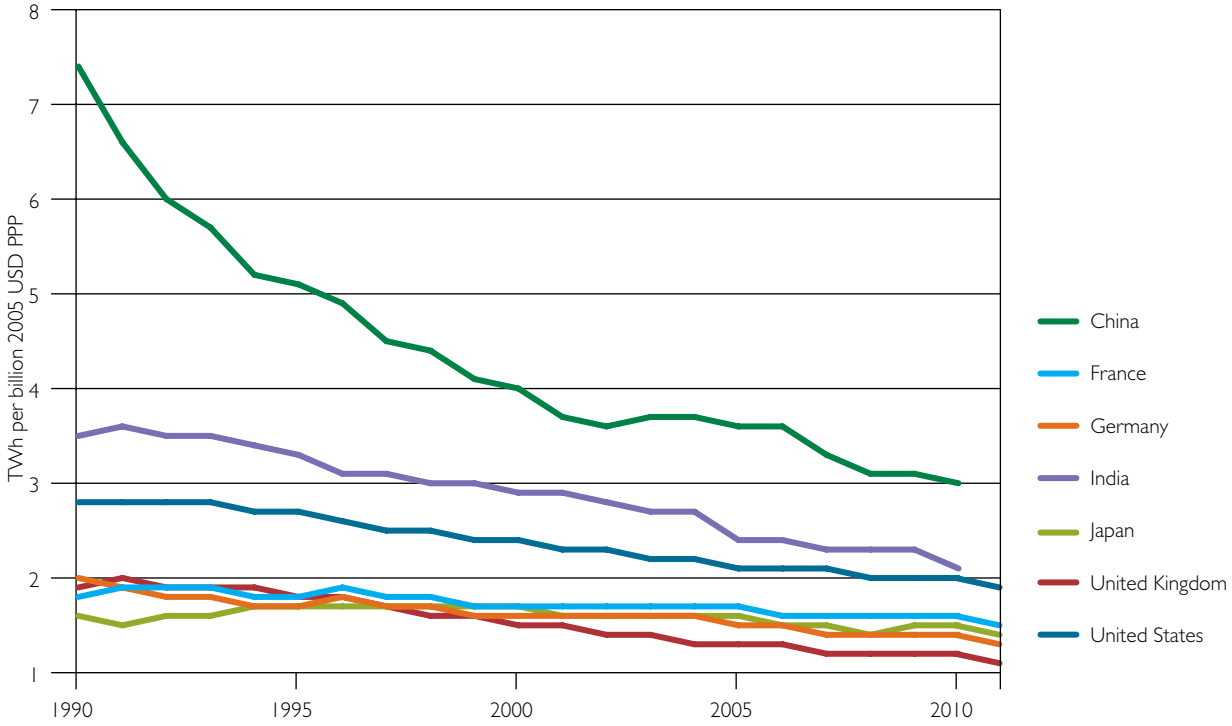
Introduction

7.1 International comparisons are a helpful way to measure the performance of the UK relative to other countries and understand the key energy demands of the UK economy. The indicators in this section show these comparisons but care should be taken when making comparisons regarding efficiency due to significant differences in the types of energy use made in different countries such as heating demand and structure of industry which cannot be fully controlled for.

7.2 Data are taken from two main sources. The International Energy Agency (IEA) who produce high level energy efficiency statistics for countries across the world and ODYSSEE, a project producing detailed energy efficiency indicators for European countries.

Overall energy intensity

Chart 7.1: Primary energy consumption per unit of GDP (PPP adjusted)



Source: International Energy Agency (IEA)

7.3 Energy intensity is measured as primary energy consumption per unit of Gross Domestic Product (GDP). To enable meaningful comparisons to be made between countries, the value of GDP has been adjusted using purchasing power parities (PPP) to reflect the value of goods and services in different economies.

7.4 After adjusting for PPP, the UK has the lowest energy intensity of countries selected in chart 7.1. In 2011 the UK energy intensity of 1.1 TWh per billion USD (2005 prices PPP adjusted) was 15 per cent lower than Germany, 22 per cent lower than Japan and 28 per cent lower than France. The United States consumed nearly twice as much energy per unit of GDP than the UK.

7.5 The non-OECD countries shown have much higher energy intensity than the UK, China three times and India double in 2010.

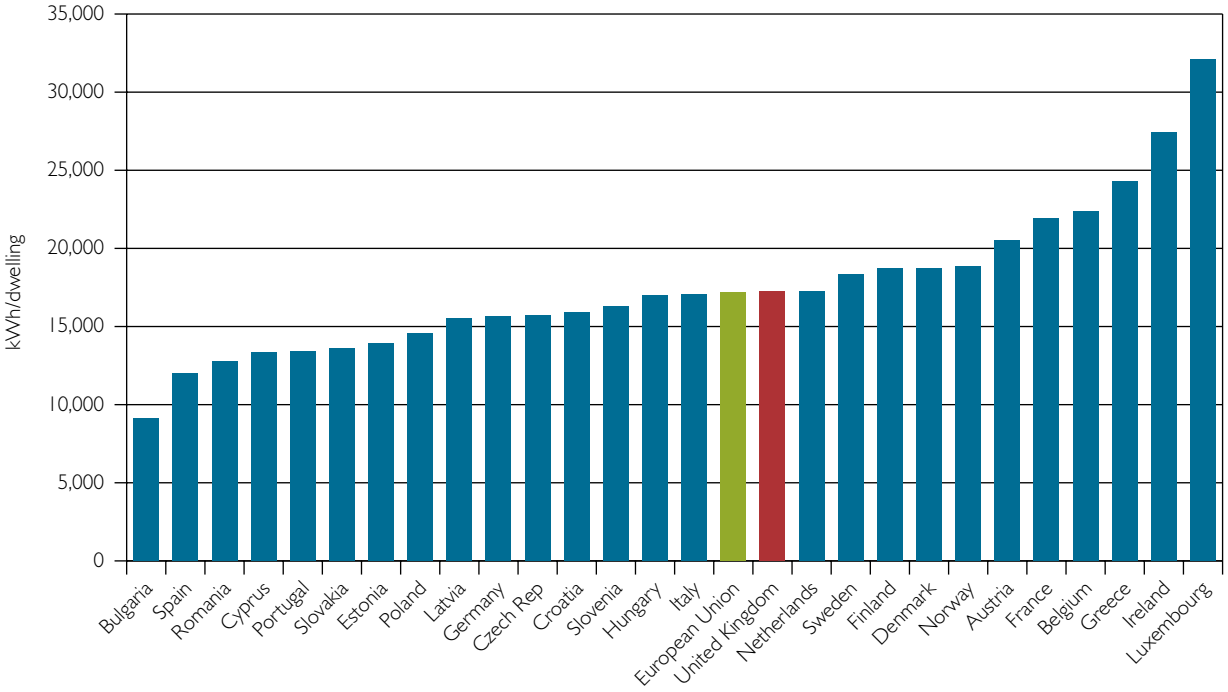
7.6 While some of this can be contributed to the structure of the UK economy, the trend in reducing energy intensity has also exceeded most other countries. Over the last 10 years UK energy intensity has fallen by 27 per cent, compared to 16 per cent in Japan and United States, 20 per cent in Germany and 14 per cent in France.

7.7 In July 2012, qualitative analysis by the American Council for an Energy Efficiency Economy (ACEEE)[69] showed that, of the 12 largest world economies, the UK is performing best overall on energy efficiency indicators but that there is still significant room for improvement.

Domestic

7.8 Since there is a strong correlation between domestic energy consumption and heating demand it is best to make comparisons after adjustments have been made for climatic differences.

Chart 7.2: Household energy consumption per dwelling, climate adjusted – 2009



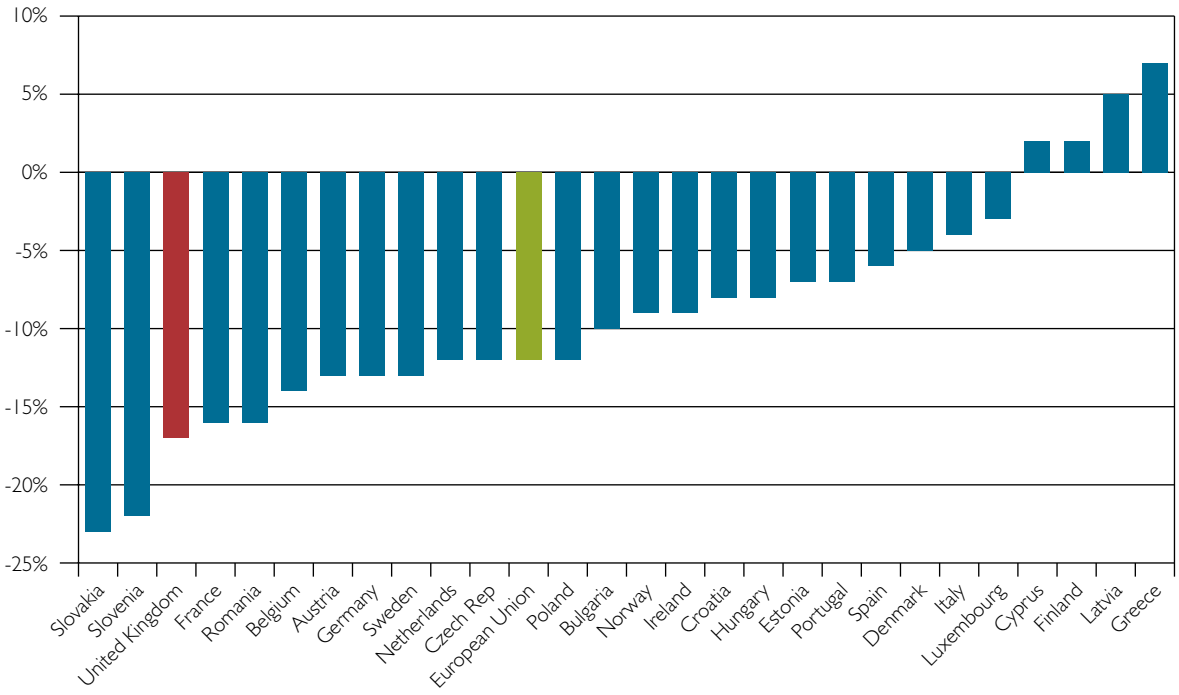
Source: ODYSSEE

69 http://www.aceee.org/sites/default/files/publications/researchreports/e12a.pdf

7.9 In 2009, UK average consumption was 17,200 kWh per dwelling, the same as the EU27 average. Energy consumption per household is highly correlated with the GDP per capita of a country reflecting the different levels of energy services. The UK has approximately the same GDP per capita as Germany but consumed 10% more energy per dwelling in 2009 than Germany after adjusting for climatic conditions.

7.10 A key difference between the UK and Germany is the age of the housing stock. The UK stock is considerably older with twice an many homes built before 1919 and two-thirds more homes built before 1945. Germany have 50% more homes built since 1980. In both countries the energy performance of buildings have improved over time[70].

Chart 7.3: Percentage change in household energy consumption per dwelling between 2000 and 2009



Source: ODYSSEE

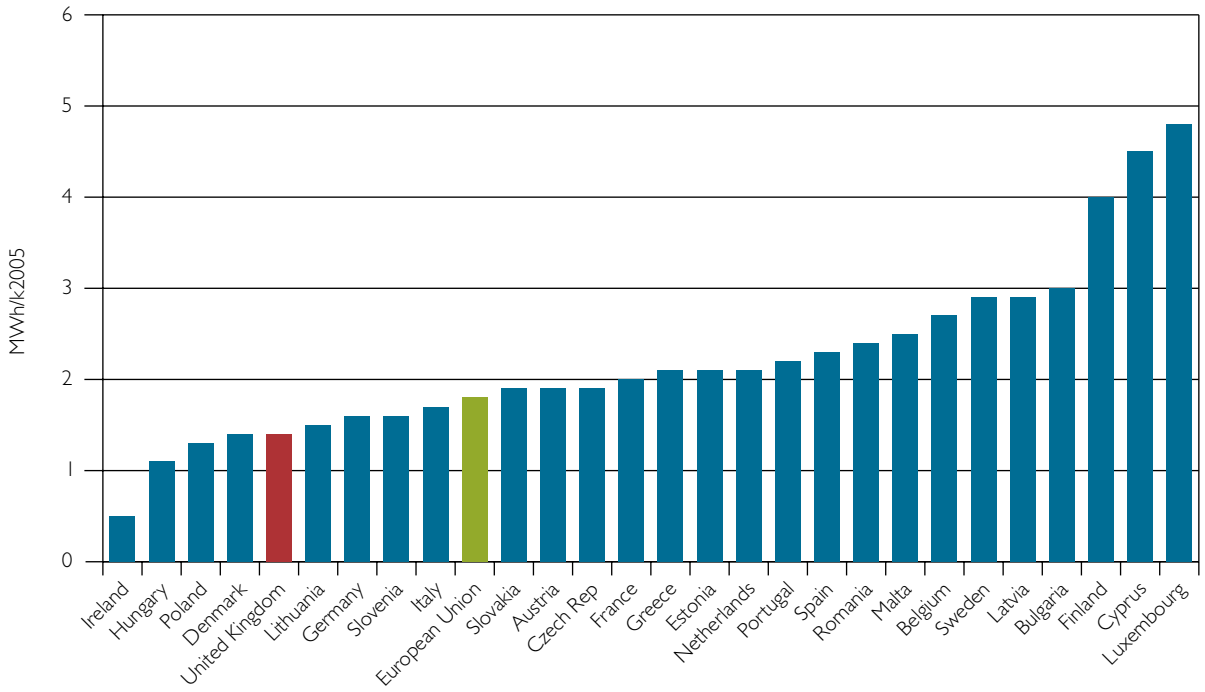
7.11 Overall, UK energy consumption per dwelling reduced by 17 per cent since 2000 levels, the third largest in Europe. By comparison, the EU27 average observed a decrease of 12 per cent over the same period. Energy consumption per dwelling has fallen in most EU countries over this period.

Non-domestic: Manufacturing

7.12 The UK has one of the lowest manufacturing energy intensities in Europe, 20 per cent below the EU27 average relative to GVA. While this does show that the UK has a low energy intensive manufacturing industry overall it is important to look at the sub-sectors within manufacturing to compare the relative efficiencies of countries.

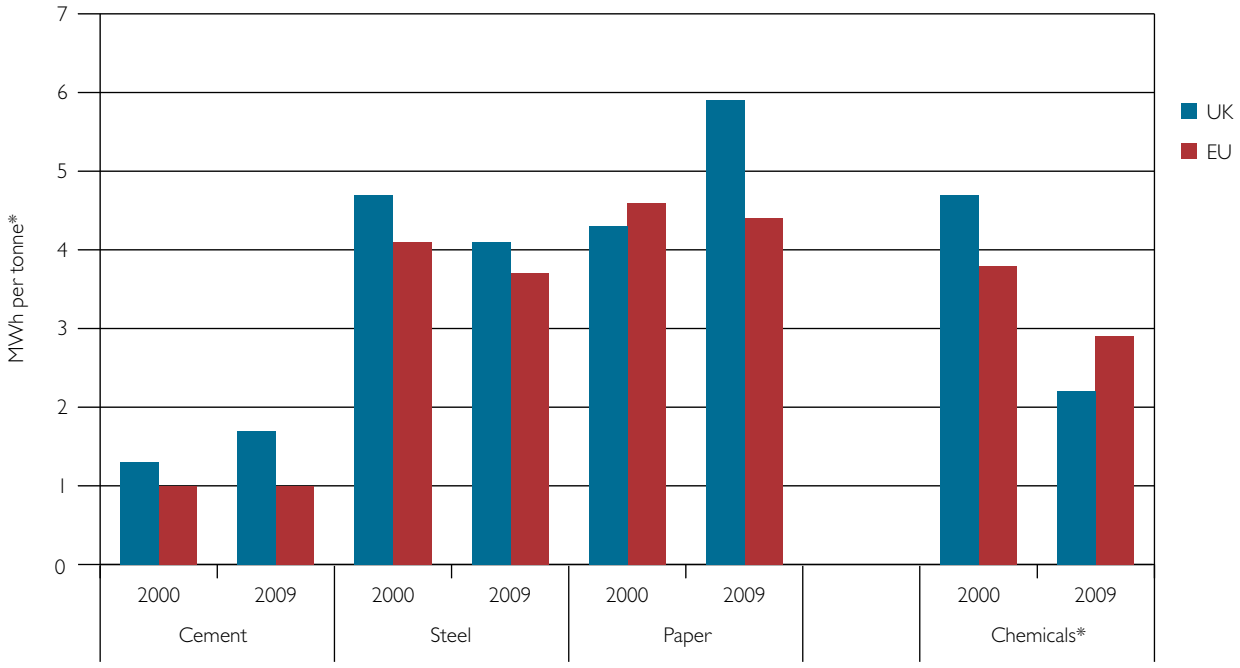
70 Based on analysis from the English Housing Survey and Bremen Energy Institute

Chart 7.4: Manufacturing energy consumption per unit of GVA: 2009 (PPP adjusted)[71]



Source: ODYSSEE

Chart 7.5: Energy intensity by manufacturing sector: UK & EU 2000 and 2009



** In the chemicals sector the indicator used is MWh per k€2005 GVA*

Source: ODYSSEE

71 Where 2009 data not available earlier figures have been used

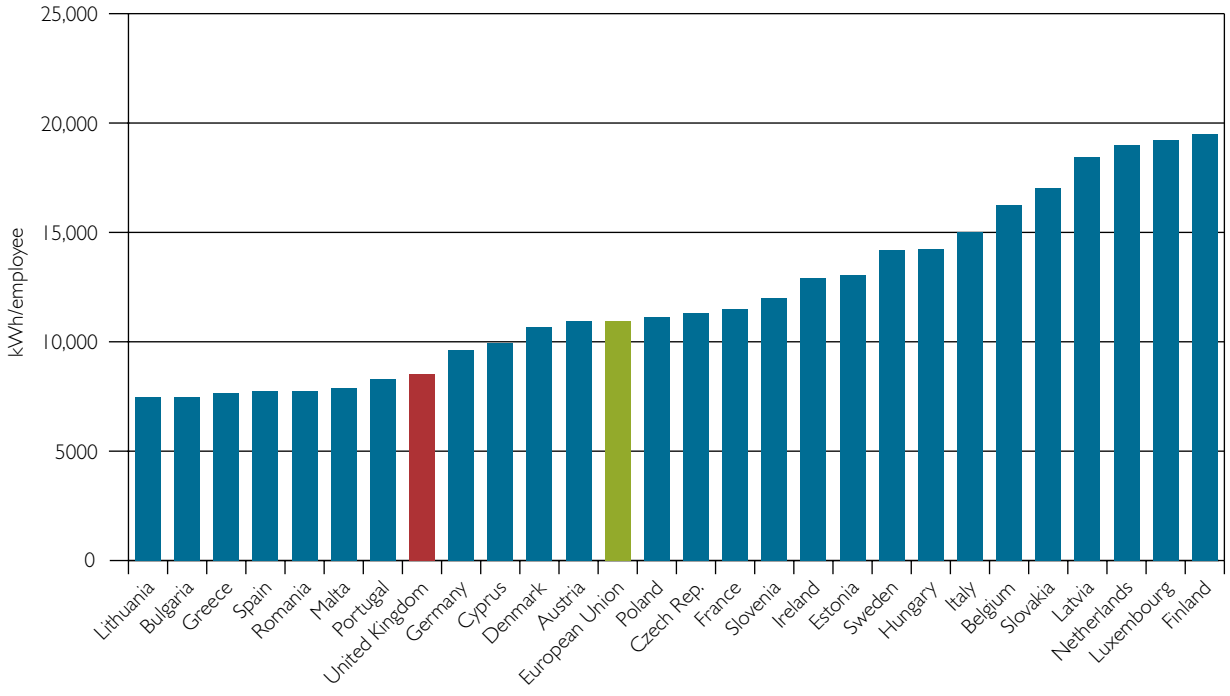
7.13 When industrial energy intensities are analysed on a more comparable basis the UK is shown generally to be more energy intensive than the EU as a whole. In 2009, the UK was more energy intensive than the EU in cement by 75 per cent, paper by 35 per cent and steel by 12 per cent[72].

7.14 Energy intensity in the chemical sector is measured by ODYSSEE relative to GVA. The UK is 25 per cent less energy intensive than the EU average. Between 2000 and 2009 the UK has reduced energy intensity by 53 per cent compared to the EU average of 23 per cent.

7.15 UK output in the all of the sectors shown fell significantly over the decade. This is likely to be a reason for the increase in energy intensity seen in production of cement and paper.

Non-domestic: Commercial and Public Sector services

Chart 7.6: Energy consumption in the service sector per unit of GVA 2009 (kWh/k€2005)



Source: ODYSSEE

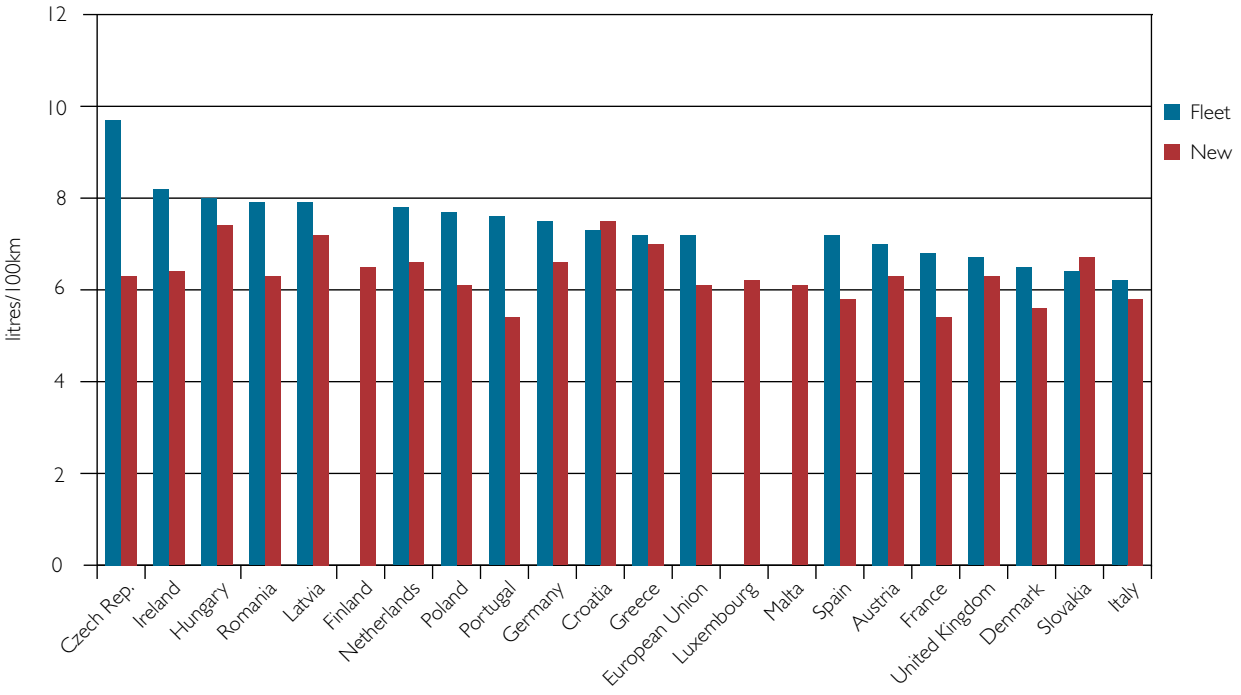
7.16 Chart 7.6 shows that the UK is one of the lowest consuming countries in this sector relative to the economic output from it. The only countries with lower demand than the UK are in southern Europe where heating demand is lower due to the warmer climate. UK service sector energy consumption per unit of GVA was 26 per cent lower than the EU average.

7.17 The UK performs particularly well on this indicator due to the high value professional services offered that generate high GVA for relatively low energy use.

72 There are differences in the types of product made within these industries between the UK and other EU countries. For example, in the cement industry many other EU cement plants produce 'blended cements', which contain less clinker, and supply them directly to the concrete market. In the UK, concrete producers buy high strength cement, containing more clinker which is more energy intensive.

Transport

Chart 7.7: Energy consumption of car fleet (l/100km): 2008

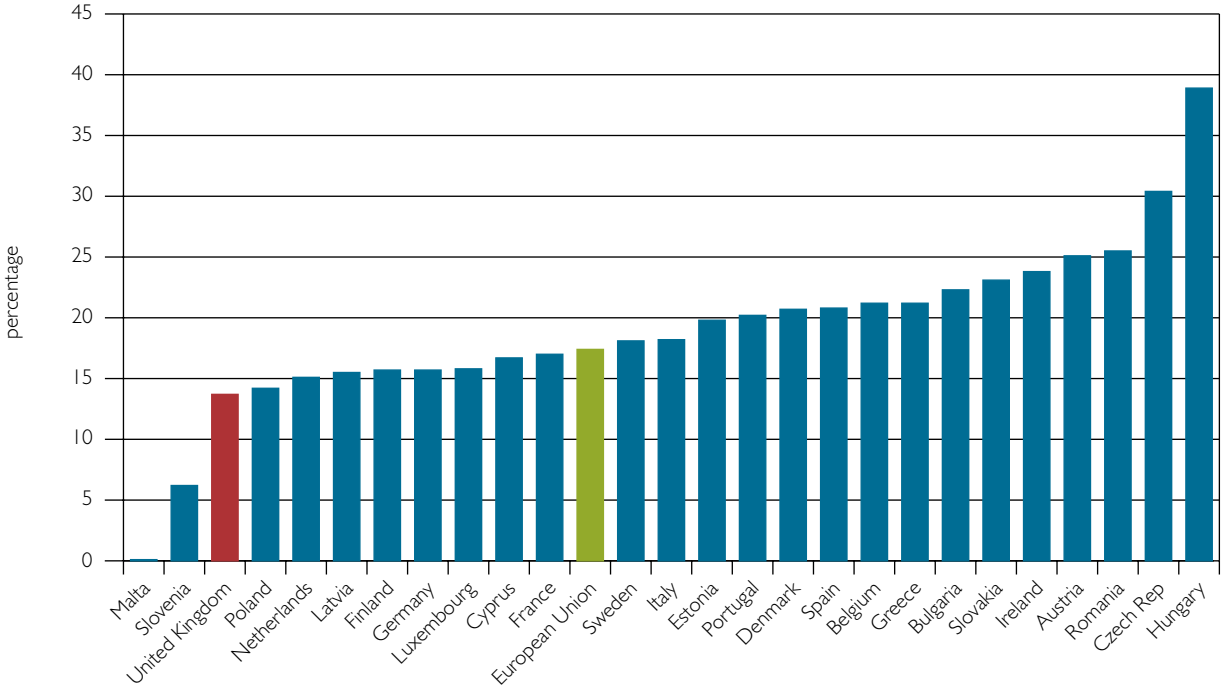


Source: ODYSSEE

7.18 Chart 7.7 shows the average energy consumption per distance travelled for cars in EU countries, where figures are available. For the vehicle fleet as a whole, the UK has the 4th lowest consumption per distance travelled of 6.7 litres/100km (equivalent to 42 miles per gallon). This is 7 per cent below the EU average. This is driven by the average vehicle fleet age being low in the UK compared to other EU countries.

7.19 The UK new car consumption per distance travelled is 6.3 litres/100km (equivalent to 45 miles per gallon) and is higher than the EU average of 6.1 litres/100km. This reflects demand for larger, higher energy consuming vehicles in the UK relative to the rest of Europe.

Chart 7.8: Percentage share of public transport in total land passenger transport: 2009



Source: ODYSSEE

7.20 In the UK, 64 per cent of passenger journeys over land are made by car[73]. Excluding Malta and Slovenia, the UK has the second lowest percentage share of public transport in the EU, just 14 per cent of all passenger journeys.

7.21 There would be considerable energy savings if more jouneys were made by public transport which is generally a much more energy efficient form of transport per passenger.

73 Source National Travel Survey 2010, DfT (coverage for Great Britain)

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