Energy Efficiency Policies and Measures in the UK 2009

Monitoring of Energy Efficiency in EU 27, Norway and Croatia (ODYSSEE-MURE)

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Contacts:

Anne Wagner (Project Manager)
AEA
Central House
14 Upper Woburn Place
London, WC1H 0JN
United Kingdom
Tel: +44 (0)870 190 2963/Fax: +44 (0)870 190 5545
E-Mail: anne.wagner@aeat.co.uk /Web: www.aeat.co.uk

Heather Haydock (Project Director)
AEA
Gemini Building, Fermi Avenue
Harwell, Didcot, OX11 0QR
United Kingdom
Tel: +44 (0)870 190 6487 / Fax: +44 (0)870 190 6318
E-Mail: heather.haydock@aeat.co.uk / Web: www.aeat.co.uk

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1 Executive Summary

This report represents the United Kingdom national case study for the Intelligent Energy Europe project “Monitoring of energy efficiency trends in Europe”. It presents recent energy efficiency trends in the UK on the basis of indicators from the ODYSSEE database and gives an overview of energy efficiency policies and measures based on information in the MURE tool.

Section 2 of the report presents the general context in terms of the overall economic situation, energy consumption developments and recent energy efficiency/environmental policy measures. An overview of the overall energy efficiency trends by sector is given in Section 3, followed by an overview of the UK energy efficiency policies and measures in section 4. Finally, Section 5 looks at National Developments under the EU Energy Services Directive and the 20% Energy Efficiency Target of the EU.

General Context

After enduring some economic difficulties in the late 1980’s and early 1990’s the UK enjoyed a sustained period of growth between 1993 and 2007. The households sector mirrored this trend but the greatest growth was seen in the tertiary sector, which averaged 4.4% per year from 1993 to 2004. In contrast, at an average of 1.3% the growth in the industrial sector was weaker than the economy as a whole between 1993 and 2004. This is in line with the widely observed shift in the UK towards a service economy as manufacturing and heavy industry tend to move to countries with lower labour costs.

The UK is committed to reducing greenhouse gas emissions to fulfill its Kyoto obligations, and has also adopted a domestic CO_2 emissions target. Apart from some slight variations total CO_2 emissions have not changed significantly in the 2000’s since the gradual decline in CO_2 emissions from the Industry sector has been cancelled out by rises in emissions from the transport and households sectors. This is a trend replicated in many other developed countries as well. While heavy industry is declining, and emissions performance from the power sector is improving, savings are negated by a strong desire from consumers to travel more, maintain their homes at a higher temperature and purchase more white goods and consumer electronics.

Total UK energy consumption increased throughout the 1990s but decreased in the 2000’s by 1.9%, with an increase of 4.2% between 1990-2007.

Energy consumption per sector showed that the transport sector is currently the biggest final energy user in the UK, accounting for approximately 40% of the total in 2007. Households account for 28% of final energy use, industry 21%, tertiary 12% and agriculture approximately 0.6%. Energy consumption increased in all major sectors between 1990 and 2007, with the exceptions of industry and agriculture, which fell by 18.4 % and 35.1% respectively. However energy consumption decreased in all sectors except transport in the 2000’s suggesting that energy efficiency measures are contributing to these changes.

Energy consumption in the transport sector has risen significantly (23%) since 1990 due mainly to increases in road and air sub-sectors. The overall trend of increasing energy consumption in the transport sector is mainly due to long periods of sustained economic growth.

Energy efficiency trends

The UK exhibited a downward trend in both primary and final energy intensities over the period 1990-2007. This suggests improvements in energy efficiency, but there may be other underlying effects contributing to the changes. These include, changes in the structure of the economy with a shift towards less energy intensive services, an overall growth in the economy, fuel switching and uses that do not increase in line with economic output (such as space heating), which may all contribute to the observed decreases in intensity.

There has been a reduction in the energy intensity of industry and manufacturing sectors, which can be explained by a reduction in energy intensive heavy industry and more recently by improved energy efficiency driven by the Climate Change Agreements.

Household's energy intensity has been reduced over 29% between 1990 and 2006 the ODEX also shows a reduction. However there was little change in the UK's performance on the unit consumption of households per dwelling and energy use in the household sector has only reduced by 5.8%. This can be explained, in part at least, by the variety of factors acting in conflict in households. Factors acting to improve energy efficiency include: widespread introduction of efficient condensing boilers, initiatives such as energy labeling and the Energy Efficiency Commitment/Carbon Emissions Reduction Target. While factors acting against include: the preference for higher household temperatures, the proliferation of 'luxury' appliances and the moves towards small (people choosing to live on their own) household units..

The energy intensity of the tertiary services sector has fluctuated between1990-2007 with little change overall.

The UK's transport energy efficiency has been significantly improved between 1990 and 2006 and that is reflected by an overall reduction of 17.5 % of the sector's energy intensity over the same period. After a small increase in 1991, energy intensity in the transport sector has followed a downward trend with exception being the period 1995-1996 when it slightly increased by 1%. Improvements can be attributed to a variety of factors including a desire on the part of consumers for more fuel efficient (and hence cheaper cars) against a background of higher fuel prices, the voluntary agreement between ACEA (the European Automobile Manufacturers Association) and the EC to improve the fuel efficiency of cars and the introduction by the UK Government of graduated Vehicle Excise Duty based on carbon emissions.

Since 1990 all sectors ODEX (an aggregate indicator of energy efficiency) exhibit two periods of improving energy efficiency (in the early to mid-nineties and the early part of this century) separated by a period of stagnation in the late nineties. Except for the transport sector this trend is replicated in each of the sectors.

Recent Energy Efficiency Policies and Measures

The UK Government is keen to continue its drive to improve energy efficiency by both introducing several new measures and reinforcing existing ones. For instance, the Government is investigating the scope for more sophisticated monitoring of domestic energy use, and its costs and benefits, via the trials of domestic smart meters, improved domestic energy bills and other forms of energy consumption feedback.

In the household sector energy efficiency will continue to be addressed by tightening building regulations and the introduction of schemes like the Energy Efficiency Commitment, the Home Energy Saving Programme and the Community Energy Savings Programme. Household energy efficiency will also benefit from the Government's actions on sustainable products under the Market Transformation Programme and the standards developed by the EU and fiscal measures like reduced VAT.

In the transport sector the main measure has been the graduated vehicle excise duty. In the Industrial sector the climate change agreements continue with no new policies and measures.

In the Tertiary sector the new Carbon Reduction Commitment is a mandatory cap and trade scheme. CRC focuses on large organisations in the private and public sector and is expected to achieve emissions reductions of at least 4MtCO_2 per year by 2020. The sectors being targeted include among others retail organisations, banks, universities, hotels, local authorities and government departments. Organisations are eligible for CRC if they (and their subsidiaries) have at least one half-hourly electricity meter (HHM) settled on the half-hourly market. They also qualify if their total half-hourly electricity consumption exceeded 6,000 megawatt-hours (MWh) during 2008 and not covered by the EU-ETS. It is discussed in detail in Section 4.3.

Developments under EU ESD and 20% target

The Energy Services Directive came into force on 17 May 2006, with the objective to enhance end-use energy efficiency across the EU. Member States had until 17 May 2008 to implement the Directive's requirements. DECC has overall responsibility for this and is co-ordinating the implementation for the UK.

The UK already had a number of measures in place to promote energy efficiency, however some compliance gaps were identified and 3 options are being considered.

The Government also has a comprehensive strategy outlined in its 2007 National Energy Efficiency Action Plan (NEEAP) which aims to ensure that energy efficiency improvements play their part in meeting the UKs carbon reduction targets and the 20% energy efficiency target of the EU.

Low Carbon Transition Plan

The Government published the UK Low Carbon Transition Plan in July 2009, which is a route map to a low carbon country. This White Paper plots out how the UK will meet the cut in emissions of 34% on 1990 levels by 2020. It is the first ever comprehensive low carbon transition plan to 2020.

Key steps include:

- The UK Government has put in place the world's first ever legally binding target to cut emissions 80% by 2050 and a set of five-year "carbon budgets" to 2022 to keep the UK on track.
- For the first time, all major UK Government departments have been allocated their own carbon budget and must produce their own plan.
- Getting 40% of our electricity from low carbon sources by 2020
- Making homes greener by extending the current programme, rolling out smart meters and other measures.
- Helping the most vulnerable
- Helping make the UK a centre of green industry by supporting the development and use of clean technologies
- Transforming transport by cutting average carbon dioxide emissions from new cars across the EU by 40% on 2007 levels, supporting the largest demonstration project in the world for new electric cars, and sourcing 10% of UK transport energy from sustainable renewable sources by 2020.
- The first ever formal framework for tackling emissions from farming.
- Producing a longer term roadmap for the transition to a low carbon UK for the period 2020 to 2050 by next spring and a vision for a smart grid.
- Setting out the Government's assessment of the outlook for energy security.

2 The Background to Energy Efficiency

2.1 Overall economic context

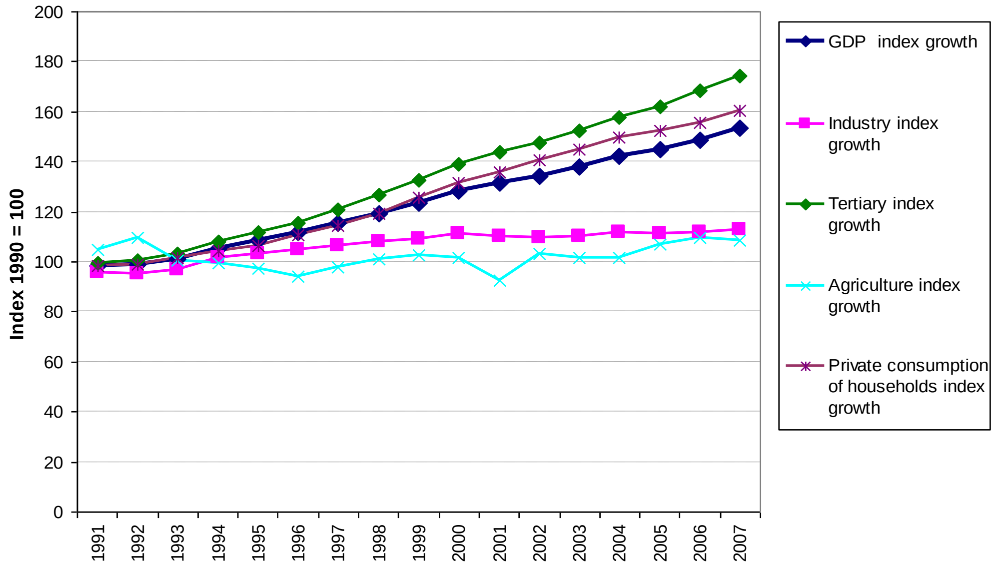
In 2007, the economic growth was 3.1%, against 2.8% the year before. The macroeconomic trends in the UK over the period 1990-2007 are presented in Table 1 and Figure 1. All figures are calculated at 2000 prices and then indexed against 1990 values.

A fall in GDP in 1991 has been proceeded by growth over the period 1993 to 2007. The average growth rate between 1990 and 2007 has been around 3.1%. Industrial sector growth followed a similar trend, but industrial growth was significantly slower when averaged over the entire period 0.8%. The greatest growth was seen in the tertiary sector, which averaged 4.4% per year from 1990 to 2004. This is in line with the widely observed shift in the UK towards a service economy as manufacturing and heavy industry tend to move to countries with lower labour costs. The last 17 years have also been very challenging for the agriculture sector in the UK with an average net increase of just 0.5% per year. The sudden dip in agricultural output in 2001 was caused by a widespread foot and mouth epidemic that resulted in a cull of livestock and restrictions on movements in affected areas.

Table 1: GDP growth and sector value added in the UK (% per year)

% Per year	1990-1993	1993-2007	1990-2007
GDP	0.3%	4.7%	3.1%
VA Industry	-1.1%	1.6%	0.8%
VA Households	0.5%	5.3%	3.5%
VA Tertiary	1.1%	6.3%	4.4%
VA Agriculture	0.2%	0.7%	0.5%

Figure 1: Macroeconomic developments in the UK, 1990-2007



Source: Odyssee 2007

2.2 Energy consumption trends: by fuel and by sector

In 2007, total final energy consumption in the UK was 147 Mtoe, this is above the level in 1990 but slightly lower than in 2000. Total final energy consumption in the UK in 1990, 2000 and 2007 by fuel and sector is shown in Figures 2 and 3.

Final energy consumption increased in the 1990's but has decreased in the 2000's, with an overall increase of 4.2 % between 1990-2007 (see Table 2). Energy use increased in all major sectors between 1990 and 2007 (see Figure 2), with the exception of industry and agriculture, which fell by 18.4% and 35.1% respectively. However energy consumption decreased in all sectors except transport in the 2000's suggesting that energy efficiency measures are contributing to these changes.

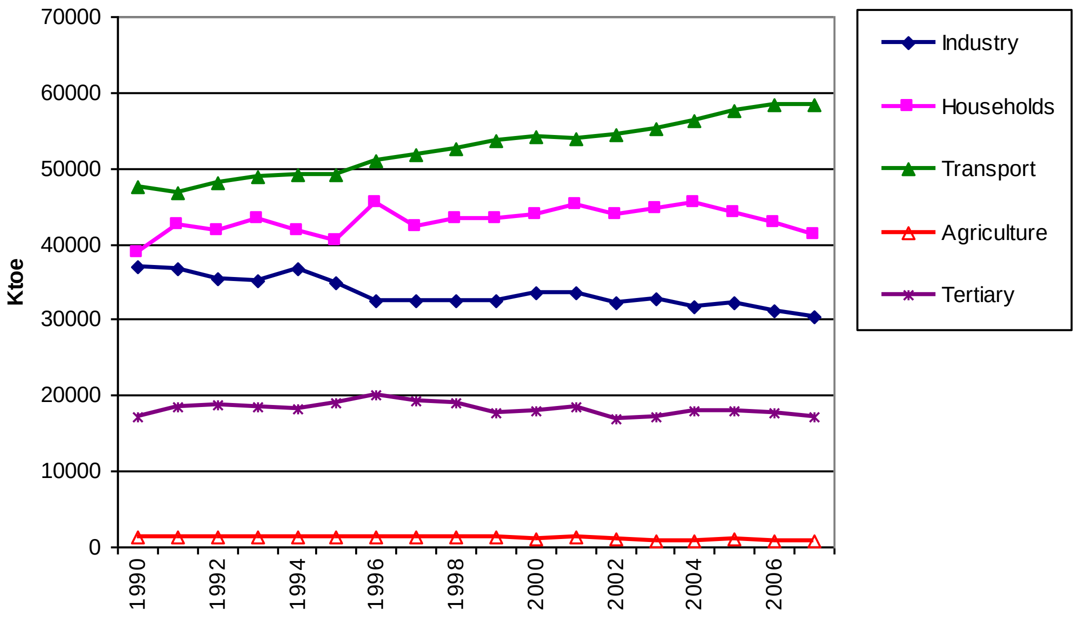
Energy consumption in the households sector increased by 5.8% between 1990 and 2007, peaking in 1996 before falling in 1997. Between 1997 to 2004 energy consumption was fairly static and has begun to decline in the last few years.

Transport energy consumption increased by 23% during the period 1990-2007, increasing throughout with the largest increase between 1990 and 1997. Energy consumption in the Tertiary sector has increased by 13% between1990 and 1997 and declined thereafter .

Table 2: Final energy consumption

% Changes in energy consumption	1990-1997	1997-2000	2000-2007	1990-2007
Total Energy Consumption	3.7%	2.5%	-1.9%	4.2%
Industry	-12.2%	2.9%	-9.6%	-18.4%
Households	8.4%	4.3%	-6.5%	5.8%
Tertiary	13%	-6.8%	-4.3%	0.9%
Agriculture	2.0%	-10.9%	-28.6%	-35.1%
Transport	9.2%	4.5%	7.8%	23%

Figure 2: Final energy consumption by sector



As illustrated in Figure 2 the transport sector is currently the biggest final energy user in the UK, accounting for 39% of the total in 2007. Households account for 28% of final energy use, industry 20%, tertiary 12% and agriculture approximately 1%. This sector split has remained roughly the same since 1990.

Figure 3 illustrates energy consumption by fuel in 1990, 2000, and 2007. Gas use has remained constant at about 30%, while electricity has slightly increase from 17% in 1990 to 20% in 2020. Solid fuels were 9% in 1990 but have fallen to 2% of final energy consumption by 2007. Oil remains the predominant fuel at around 45%.

Figure 3: Final energy consumption by sector 1990, 2000 and 2007

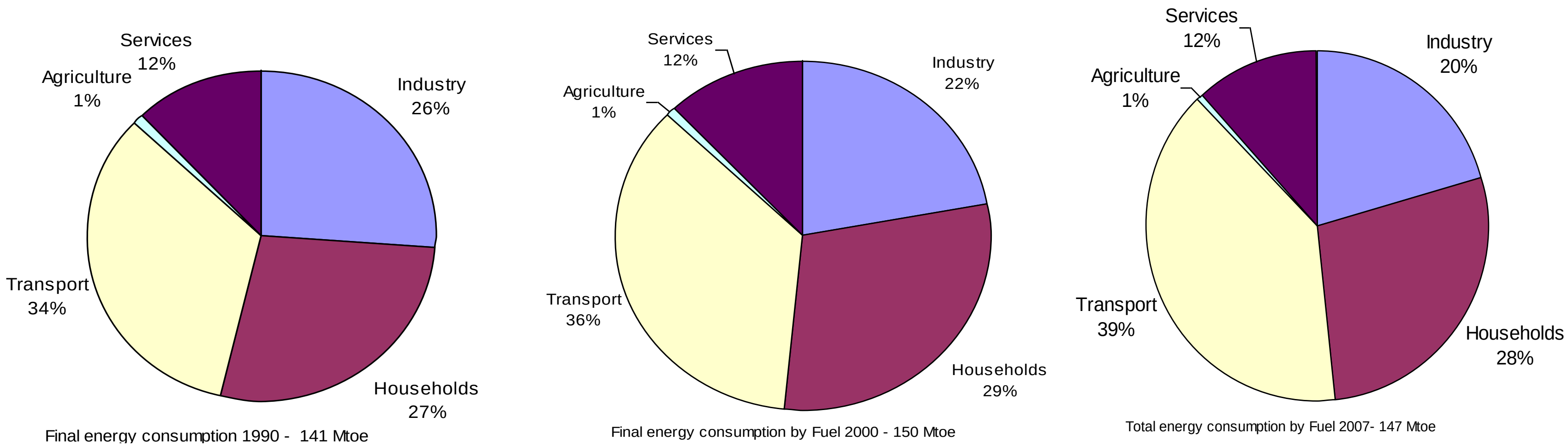
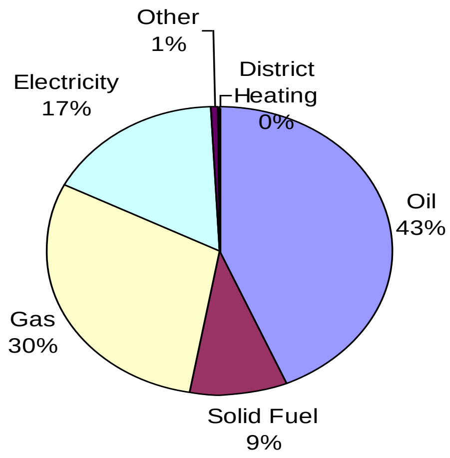
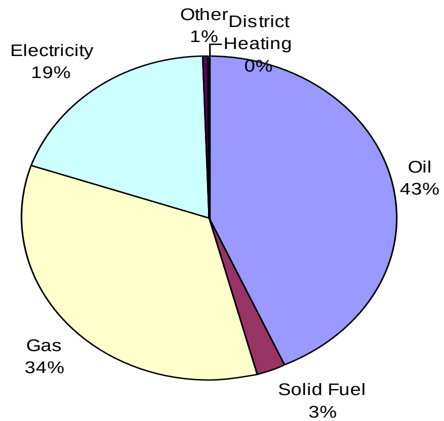


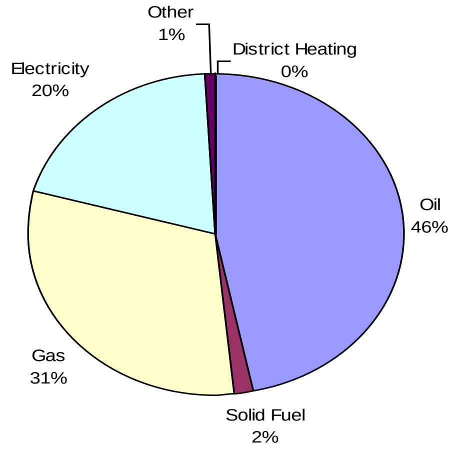
Figure 4: Final energy consumption by fuel 1990, 2000 and 2007



Final energy consumption 1990 - 141 Mtoe



Final energy consumption by Fuel 2000 - 150 Mtoe



Total energy consumption by Fuel 2007- 147 Mtoe

Source: Digest of Energy Statistics 2008, DECC

2.3 The policy background to energy efficiency

3.3.1 Institutions

The main responsibility for energy policy issues within UK Government were split between with BIS - the Department for Business, Innovation & Skills (previously Department for Business Enterprise and Regulatory Reform (BERR) and Department for Trade and Industry (DTI)) which lead responsibility for supply-side energy policy, including renewable energy and microgeneration, and the Department for Environment, Food and Rural Affairs (Defra) who had lead responsibility for policies and measures to reduce energy demand in the UK.

In October 2008 the UK Government created the Department of Energy and Climate Change (DECC). This new department brings together the responsibilities for energy policy (previously with BIS), and the climate change mitigation policy (previously with Defra). With two thirds of UK emissions coming from energy consumption that reflects recognition by UK Government that climate change and energy policies are linked,

The three overall objectives of the department are to:

- Ensure our energy is secure, affordable and efficient
- Bring about the transition to a low-carbon Britain
- Achieve an international agreement on climate change at Copenhagen in December 2009.

3.3.2 Measures and Programmes

The UK has a legally binding target under the Kyoto Protocol to reduce its greenhouse gas emissions to 12.5% below 1990 levels by 2008-2012 and a domestic legally binding target as set by the Climate Change Committee of 34% by 2020 and 80% by 2050 below 1990 levels The Climate Change Programme built on many of the policies and measures outlined in the 2004 Energy Efficiency Plan for Action and a separate CHP Strategy. In these earlier documents it was estimated that improvements in energy efficiency could generate energy savings of approximately 30% across the economy as a whole.

EU Targets

The EU's energy priorities are set out in the European Energy Action Plan, published by the European Commission in 2007 and endorsed by European leaders and the European Parliament. It focused on the three main elements of EU energy policy:

- Sustainability and climate change action, working in conjunction with international partners
- Achieving a liberalised electricity and gas market, as a means of enhancing security of supply and increasing business competitiveness in the EU
- Improving Europe's energy security.

Reduction of emissions and increased use of renewable energy in the EU have been addressed by the recently adopted European Energy and Climate Change Package (December 2008) that introduces three ambitious climate targets for the EU:

- A legally binding reduction in the EU's greenhouse gas emissions to 20 percent below 1990 levels, by 2020; this would rise to 30% in the case of an international climate change deal.
- A legally binding 20% increase (by 2020) in the amount of renewable energy consumed in the EU.
- A 20 percent reduction in the EU's energy consumption by 2020.

EU core objectives like sustainability, competitiveness and security of supply are introduced in the Second Strategic Energy Review agreed in 2008. This political agenda will focus on building up the EU internal energy networks, securing energy supplies and further enhancing energy efficiency by making energy savings in key sectors.

UK Targets

Climate Change Programme

The Climate Change Programme, published in 2006, sets out the policies and priorities for action in the UK and internationally to reduce carbon emissions. The Climate Change and Sustainable Energy Act 2006 placed an obligation on the UK Government to report to Parliament on greenhouse gas emissions in the UK and action taken by Government to reduce these emissions

Energy Act 2008 and Energy White Paper 2007

The Energy Act 2008was given Royal Assent on 26 November 2008. The Act implements the legislative aspects of the Energy White Paper 2007.

The Energy Act updates energy legislation to:

- Reflect the availability of new technologies (such as Carbon Capture and Storage and emerging renewable technologies
- Correspond with the UK's changing requirements for secure energy supply (such as offshore gas storage)
- Protect the environment and the tax payer adequately as our energy market changes.

Along with the Climate Change Act and Planning Act, these Acts ensure that the UK's legislation underpins long term climate change targets.

Climate Change Act

The Climate Change Bill became law on 26 November 2008, it created a new approach to managing and responding to climate change in the UK, by setting ambitious, legally binding targets, taking powers to help meet those targets, strengthening the institutional framework, enhancing the UK's ability to adapt to the impact of climate change, and establishing clear and regular accountability to the UK Parliament and to the devolved legislatures.

There two key aims underpinning the Act, which are:

- To improve carbon management and help the transition towards a low-carbon economy in the UK;
- To demonstrate UK leadership internationally, signalling that we are committed to taking our share of responsibility for reducing global emissions in the context of developing negotiations on a post-2012 global agreement at Copenhagen in December 2009.

The Chancellor announced the UK's first three 'carbon budgets' alongside his fiscal Budget in April 2009, and also set out new measures designed to help low carbon industries capitalise on the opportunities presented by the UK's legally binding target to cut greenhouse gas emissions to at least 80% below 1990 levels by 2050. The new measures include:

- Legally binding carbon budgets for the first three, five-year periods 2008-2012, 2013-2017 and 2018-2022.
- A revised target to reduce emissions to at least 34% below 1990 emissions by 2018-22.
- Aim to meet the carbon budgets announced through domestic action alone, and consistent with this, setting a zero limit in the non-traded sector on offsetting through international credits for the first budget period.

Energy Efficiency Action plan

UK’s Energy Efficiency Action Plan published in June 2007, presented the planned policies and measures to improve energy efficiency and meet the energy saving targets under the Energy End-Use Efficiency and Energy Services Directive. Together these measures should deliver energy savings of around 18% by 2016.

Low Carbon Transition Plan

The Government has published the UK Low Carbon Transition Plan in July 2009, which is a route map to a low carbon country. This White Paper plots out how the UK will meet the cut in emissions of 34% on 1990 levels by 2020. It is the first ever comprehensive low carbon transition plan to 2020.

Key steps are:

- More than 1.2 million people will be in green jobs
- 7 million homes will have benefited from whole house makeovers, and more than 1.5 million households will be supported to produce their own clean energy
- Around 40% of electricity will be from low carbon sources, from renewables, nuclear and clean coal
- We will be importing half the amount of gas that we otherwise would
- The average new car will emit 40% less carbon than now.

Renewable Energy Strategy (RES)

The UK has a target of 15% of energy from renewables by 2020. This target is equivalent to a seven-fold increase in UK renewable energy consumption from 2008 levels. The RES sets out a range of possible measures to promote renewable energy, to individuals, communities and businesses.

Heat and Energy Saving Strategy (HESS)

Following the targets set out in the Climate Change Act 2008, the UK Government issued the draft HESS proposal for consultation in spring 2009. . The document is a set of proposals that the Government are considering as part of their future strategy that should enable the UK to reduce energy consumption and carbon emissions significantly, in the period beyond 2012. This should allow the UK to meet its long-term energy and climate change goals . Key proposals include:

- A centralised energy efficiency delivery mechanism
- New ways to provide people with financial support for measures that have high up-front costs, including mechanisms that allow costs to be more than offset by energy bill savings
- New incentives for renewable heat and electricity technologies

Community Energy Saving Programme (CESP)

In September 2008 Government announced its intention for a new £350 million Community Energy Saving Programme. It will be launched in around 100 fuel-poor areas to go street-by-street through communities offering free and discounted central heating, energy efficiency measures and benefit checks. The broad policy proposals for the design of the programme include:

- Placing an obligation on energy suppliers and electricity generators to meet a CO_2 reduction target by providing energy efficiency measures to domestic consumers.
- Requiring that this obligation is met by providing these measures to households in areas with high levels of low incomes.
- To offer these measures as a package to homes, to deliver a 'whole house approach' - so that homes can receive all the major energy efficiency measures they need, which could also include district heating schemes.
- Specifying that only certain measures are eligible to count towards the CO_2 targets, focusing on those measures which can make a substantial difference to household emissions and fuel bills.

Carbon Emissions Reduction Target (CERT)

CERT was introduced in April 2008 as the successor to the Energy Efficiency Commitment. This measure also places an obligation on energy suppliers and electricity generators to promote energy savings measures in households.

CERT places a 3 year (to March 2011) obligation on energy suppliers to meet ambitious household carbon saving targets. Suppliers meet their targets by promoting (e.g. through subsidy) the take-up of energy saving measures, including loft and cavity wall insulation and high-efficiency lighting and appliances.

It is expected that more than 9 million households will benefit over the three years of the scheme. This represents around £3.2 billion of supplier investment in the energy efficiency of the UK housing stock from 2008 to 2011. The energy savings under CERT is also expected to deliver 185 million tonnes of CO_2 over the lifetime of the measures installed.

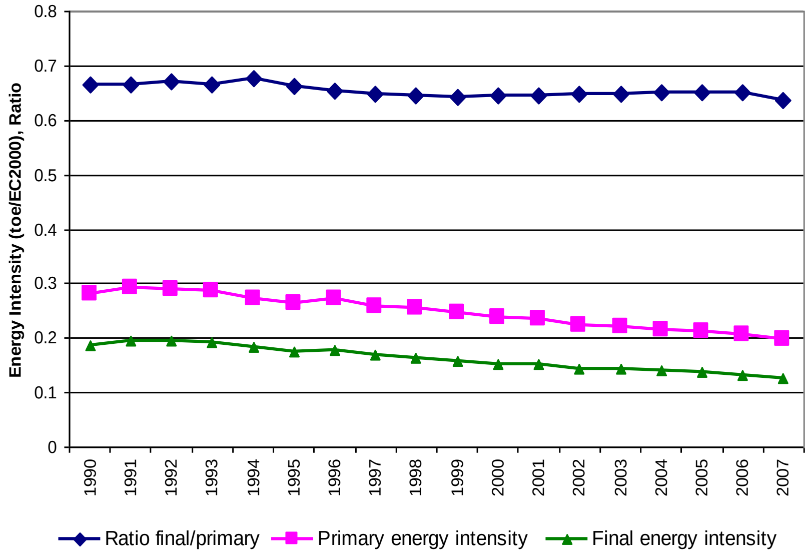
3 Overall Assessment of Energy Efficiency Trends

3.1 Overall trends in energy intensity

Two aggregate indicators are generally used to characterise overall energy efficiency trends: primary energy intensity (i.e. the ratio of primary energy consumption to GDP), and final energy intensity (ratio of final energy consumption to GDP). Primary energy intensity provides an assessment of the energy productivity of the whole economy. Final energy intensity characterises the energy productivity of final consumers only and so excludes losses in transformation and supply (e.g. of electricity). Final consumption, according to the ODYSSEE definition, also excludes non-energy uses.

Figure 5 shows a downward trend in both primary and final energy intensities over the period 1990-2007. The downward trend in energy intensity suggests improvements in energy efficiency, but there may be other underlying effects contributing to the changes. These include fuel switching, uses that do not increase in line with economic output (such as space heating), and changes in the structure of the economy, which may all contribute to the observed decreases in intensity.

Figure 5: Ratio of primary to final energy intensity



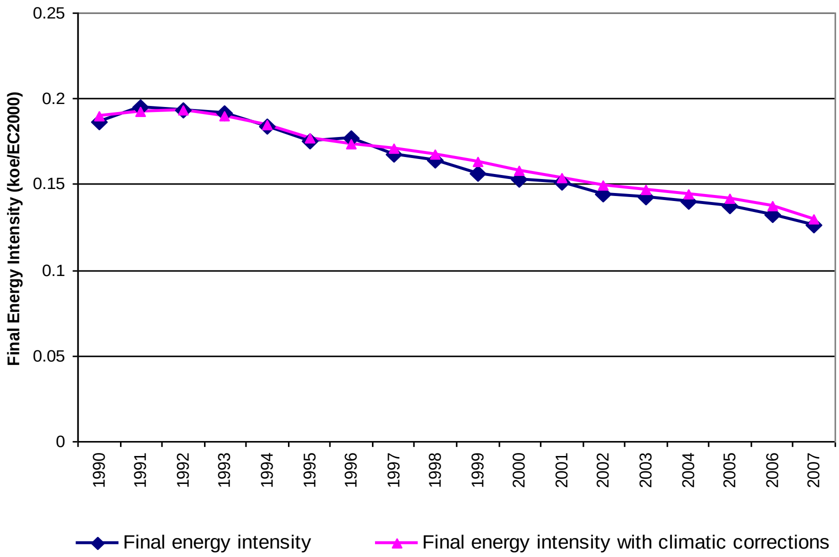
Primary energy consumption increased from 214 Mtoe in 1990 to 232 Mtoe in 2007, a 8.6% increase, while final energy consumption increased from 141 Mtoe in 1990 to 147 Mtoe in 2007, a 3.7% increase. The ratio of final to primary intensity captures the variations between the two separate intensities. This ratio has slightly decreased between 1990 and 2007, indicating that an increasing share of the primary energy consumption is consumed by energy transformations and not consumed by final consumers. This is due to an increasing share of electricity in final energy use, particularly in the Tertiary sector, which will increase the losses from the transformations sector. In the UK this has been partially offset by the introduction of combined cycle gas turbine plants, which have a higher efficiency than some other types of generation that consequently increases the ratio.

Effect of climatic variations on final energy intensity

Energy intensity values will also be influenced by the climate, as more space heating is required in colder years. To 'clean' energy indicators, and in particular energy intensities, from the influence of climatic variations, energy indicators are calculated with climatic corrections. The final energy intensity with climatic corrections represents the theoretical value of the final energy intensity corresponding to a normal winter.

Figure 6 shows the long-term trend in final energy intensity corrected for climatic variations. With the exception of 1996, most winters in the last decade were warmer than the long-term average, and so final energy intensity increases when climate is taken into account.

Figure 6: Effect of climatic variations on final energy intensity



3.2 Industry

There has been a reduction in the energy intensity of industry and manufacturing sectors, which can be explained by a reduction in energy intensive heavy industry and more recently by improved energy efficiency driven by the Climate Change Agreements.

Figure 7: Energy intensity of industrial and manufacturing sectors

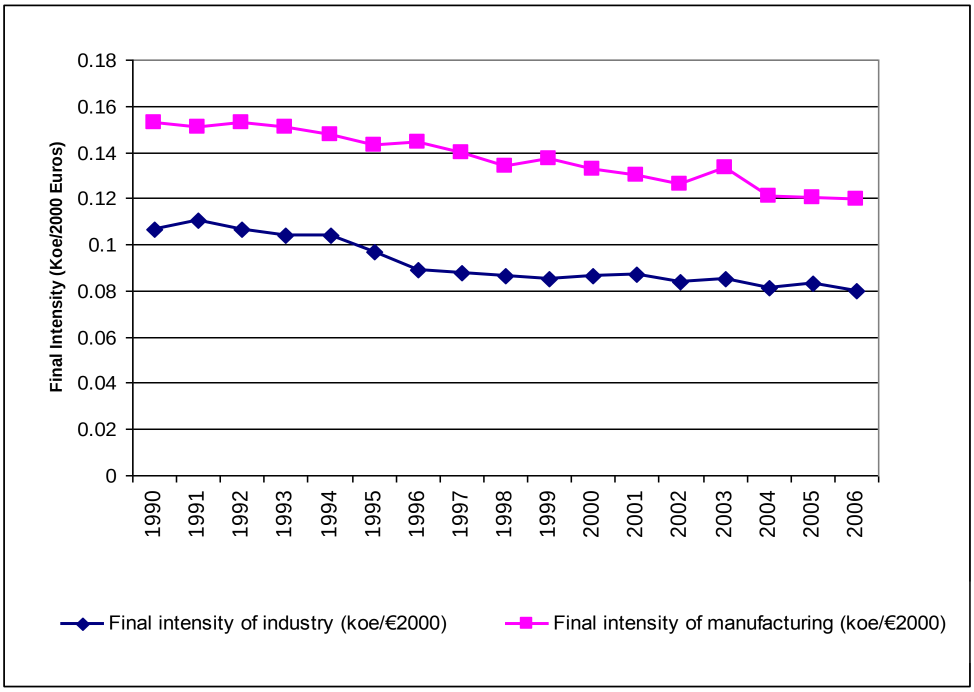
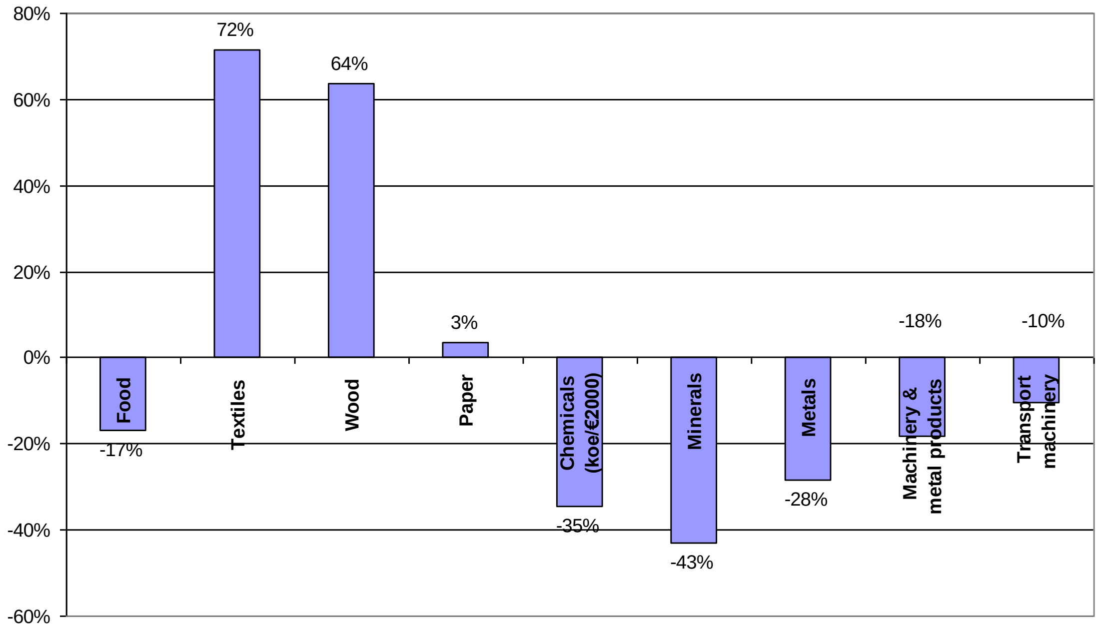


Figure 8 illustrates the energy intensity changes by sector, and shows that in most sectors there has been a reduction.

Figure 8: Energy Intensity changes since 1990



The UK has high energy consumption per unit in the energy intensive sectors compared to other EU counties. Figure 9 shows how unit consumption has fluctuated in the steel, cement, paper, and glass sectors.

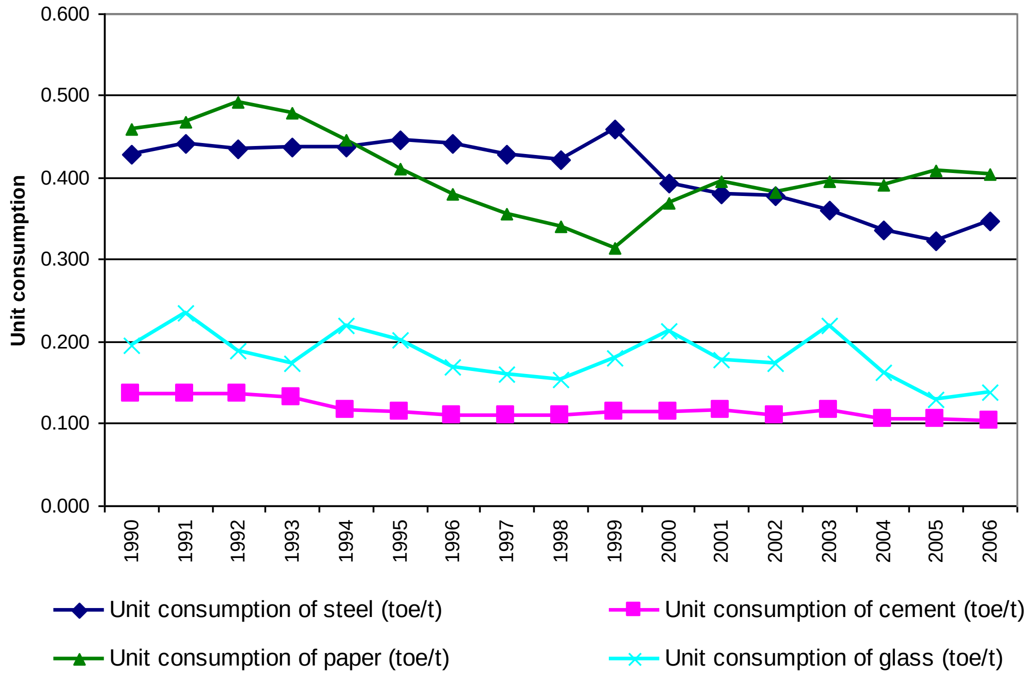
The UK has higher energy consumption per ton of steel than EU-27 average as most steel produced in the UK uses the Basic oxygen process which uses more energy than the electric arc process. In 2007 the UK produced 11.3 million tonnes using the basic oxygen process and only 3 million tonnes using the electric arc process.

The cement industry is energy intensive mainly because of the fuel requirements of kilns. Wet processes and long dry kilns use more energy because of the drying processes. As kilns were replaced energy efficiency has improved since 1960's but this has levelled off since 1990. However the recent commissioning of new kilns is expected to make improvements so this should be a trend that improves in the future.

The UK paper industry has high unit consumption, as the energy performance of the paper industry is linked to the share of pulp produced in the country in relation to the paper production: the higher this ratio, the higher the unit consumption.

The energy intensive sectors are a small part of the UK economy, perhaps more so than in other countries.

Figure 9: Unit consumption for energy intensive industry



3.3 Households

Since the late 1990's there has been a gradual decline in the energy intensity of households to private consumption see Figure 10.

Figure 10: Final intensity of households to private consumption (koe/€2005)

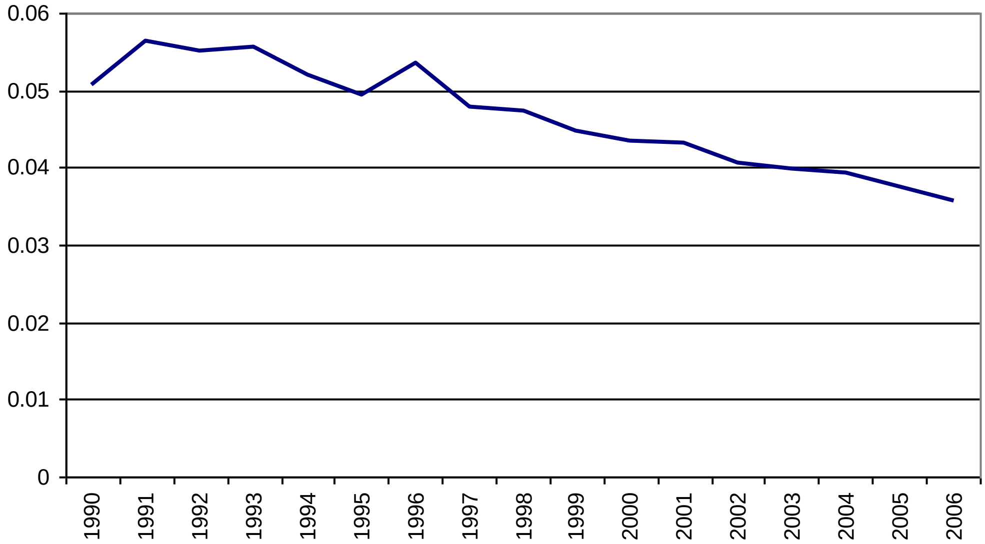
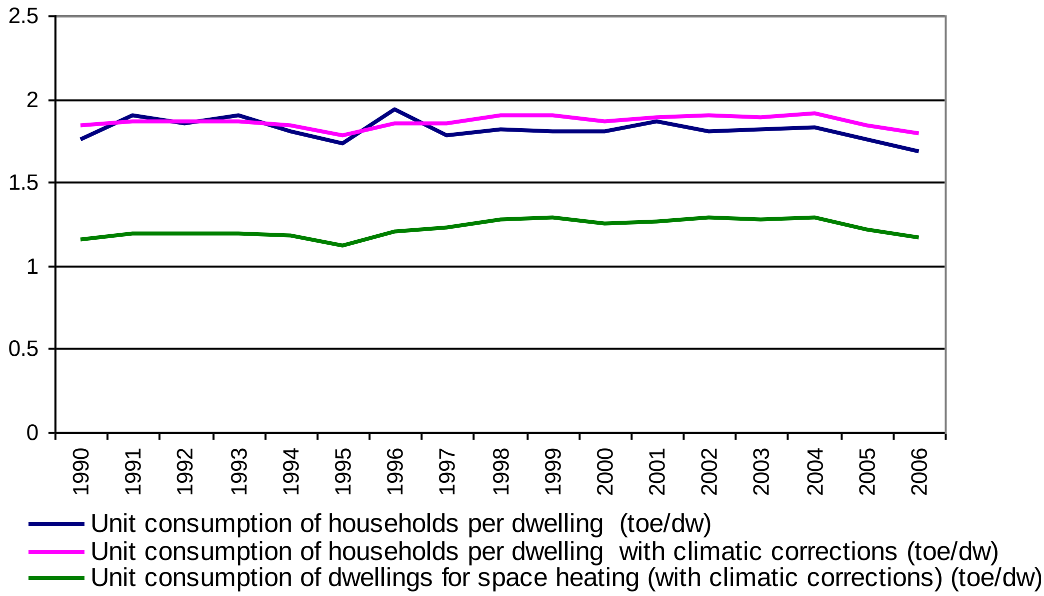


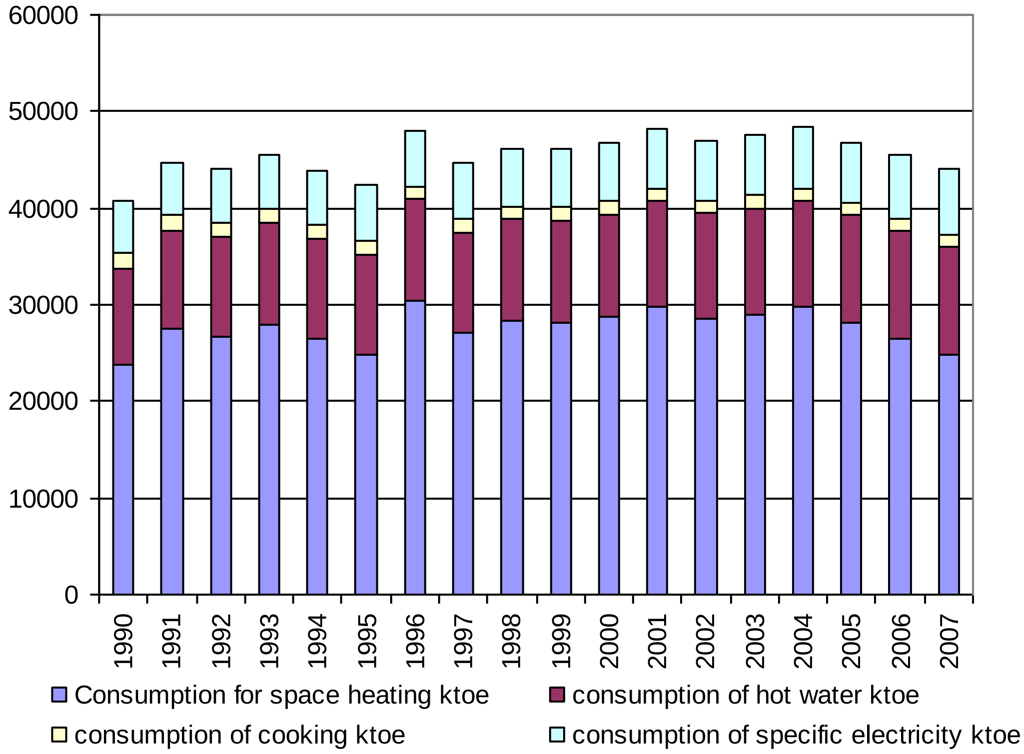
Figure 11 shows the unit consumption per dwelling. Consumption per dwelling compares the energy consumption of households per permanently occupied dwelling, whilst correcting for climatic variations between Member States. The fact that a dwelling requires more energy to heat it to a comfortable temperature in Norway, or far less to heat in Spain, is factored out of the indicator using the 'degree days' methodology. The unit for this indicator is tonnes of oil equivalent per dwelling (toe/dw). There was little change in the UK's performance on this indicator between 1990 and 2007.

Figure 11: Unit Consumption



The UK has made good progress in improving the efficiency of domestic boilers, including widespread replacement of defunct boilers with more efficient condensing boilers. However, these improvements have been slightly negated by a general increase in household energy consumption, which has resulted in the UK's static performance. Figure 12 shows that space heating and hot water remains the highest sources of energy consumption in the household sector.

Figure 12: Household Energy consumption



The fuels used in space heating in the household sector are given in Figure 13, gas remains the predominant fuel used for space heating throughout the time series.

Figure 13 shows that energy consumption for space heating has widely fluctuated over the period 1990 to 2007. A constant decrease, at a rate of 5.5% per annum, is however noticed since 2004. Gas remained the predominant fuel for space heating while coal has reduced over the years.

Figure 13: Energy consumption of space heating

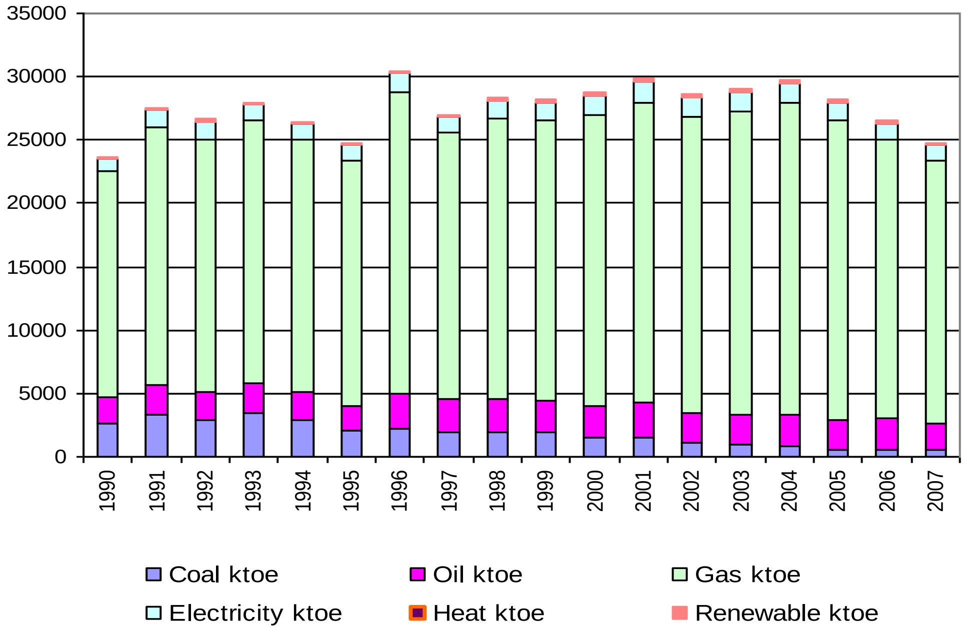
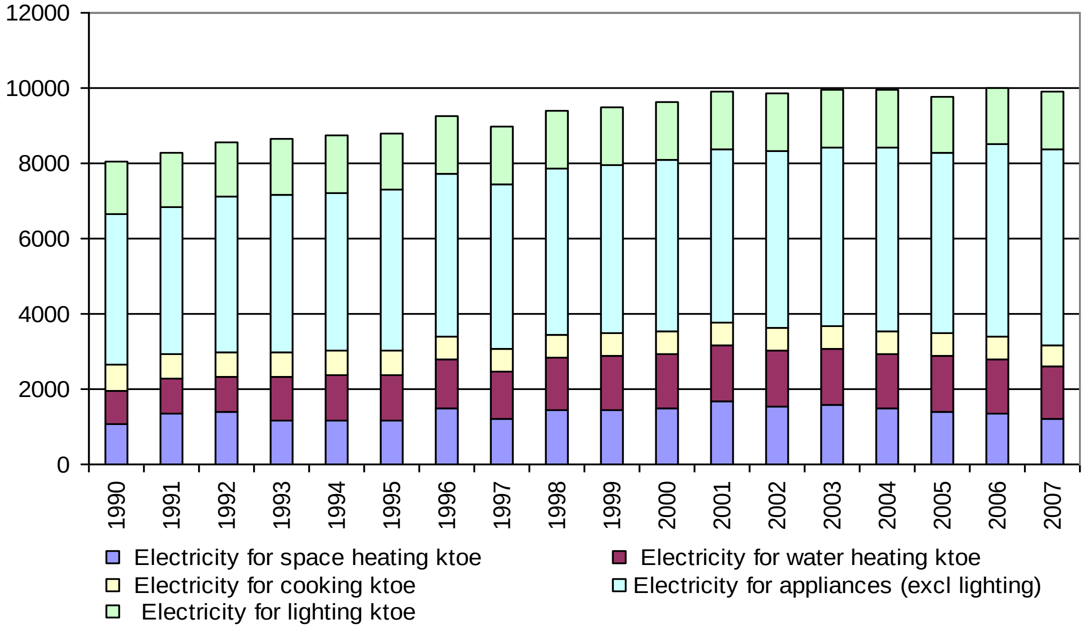


Figure 14 shows the electricity consumption of households, since 1990 this has increased in the UK. Although appliance efficiency has increased in the UK marketplace overall (due to activities such as the Market Transformation Programme), this improvement has been overshadowed by the increase in range, quality and affordability of domestic electrical appliances, and hence, the net effect over the 1990 – 2006 period has been negative.

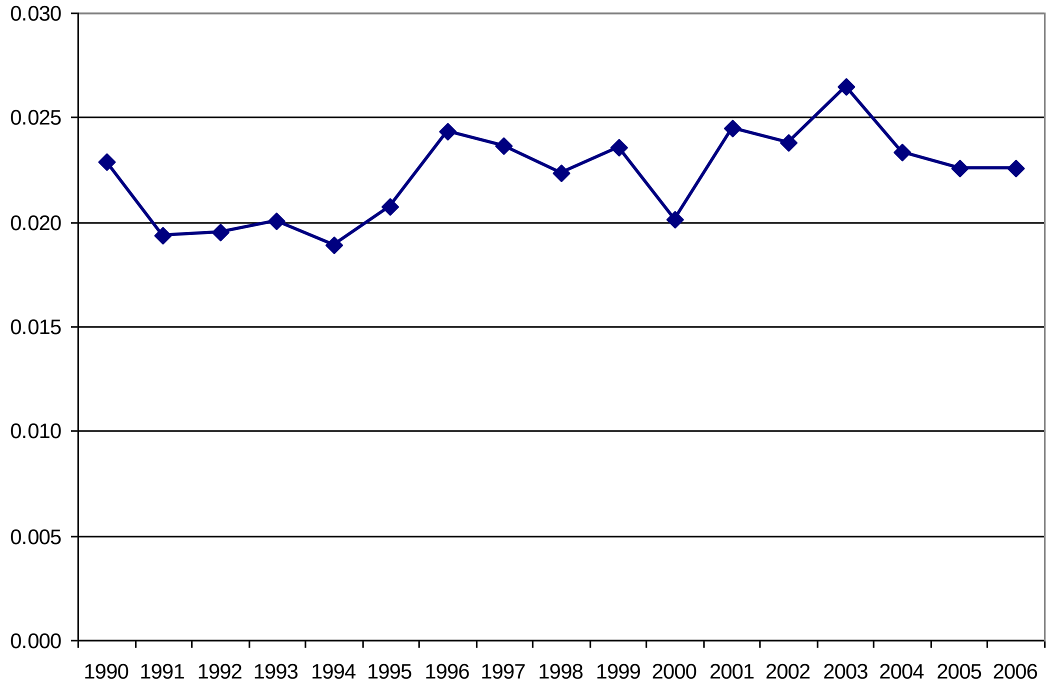
Figure 14: Electricity consumption of households



3.4 Tertiary

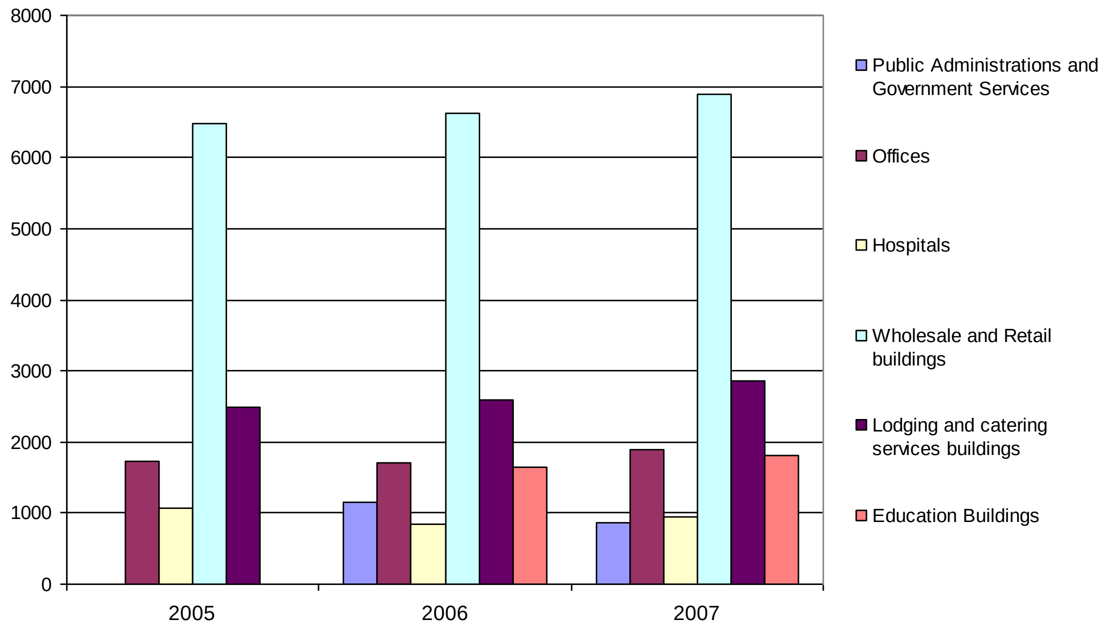
The energy intensity of the tertiary services sector has fluctuated between 1990-2007 with little change overall. This trend is illustrated in Figure 15, and since 2003 has started to decline.

Figure 15: Energy intensity of tertiary services (koe/€2005)



Energy consumption information by branch in the tertiary sector is only available since 2005. Figure 16 presents the data which is available, it is clear at wholesale and retail buildings use significantly more energy in comparison to the other branches. There has been little change in the branches since 2005, with the exception of public administration and government services where there has been a slight reduction in energy consumption over the three years.

Figure 16: Energy Consumption by Branch



3.5 Transport

Energy intensity in the transport sector has decline by approximately 17.5% over the period 1990 to 2006 (Figure 17) This has occurred largely because of faster growth in the UK economy and hence GDP, which is used to calculate energy intensity in the transport sector. More recently a variety of other factors such as the EC voluntary agreement with ACEA, the UK Government's decision to introduce fuel efficiency labeling and graduated carbon based Vehicle Excise Duty and an increased consumer demand for more fuel efficient cars (against a background of higher fuel prices) have contributed to the decrease in energy intensity in the transport sector.

Figure 17: Transport Intensity

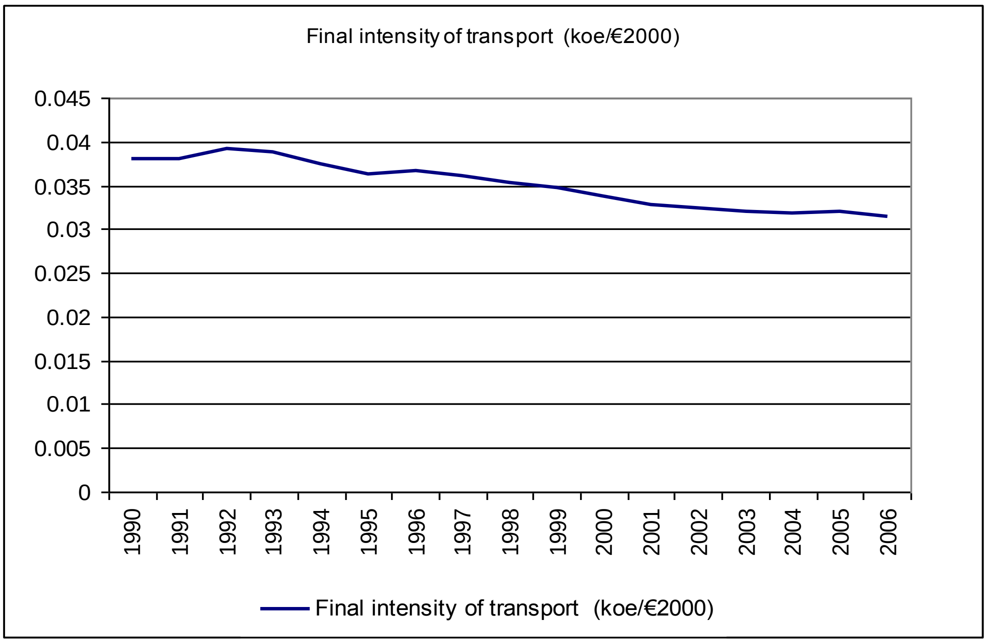


Figure 18 illustrates the energy consumption in each of the transport sub-sectors. Energy consumption in the road and air sub-sectors (by far the two greatest energy consuming sub-sectors) has risen significantly since 1990. In contrast, the energy consumption in the rail and water sub-sectors has decreased steadily and remained relatively constant, respectively. The overall trend of increasing energy consumption in the transport sector is mainly due to long periods of sustained economic growth.

Energy consumption in the air sub-sector has risen particularly rapidly because of strong demand to travel further and more frequently fuelled by the growth of low-cost airlines offering cheap fares to European destinations. This is of particular concern given the high energy usage per km for air compared to other modes.

Figure 18: Energy consumption by mode

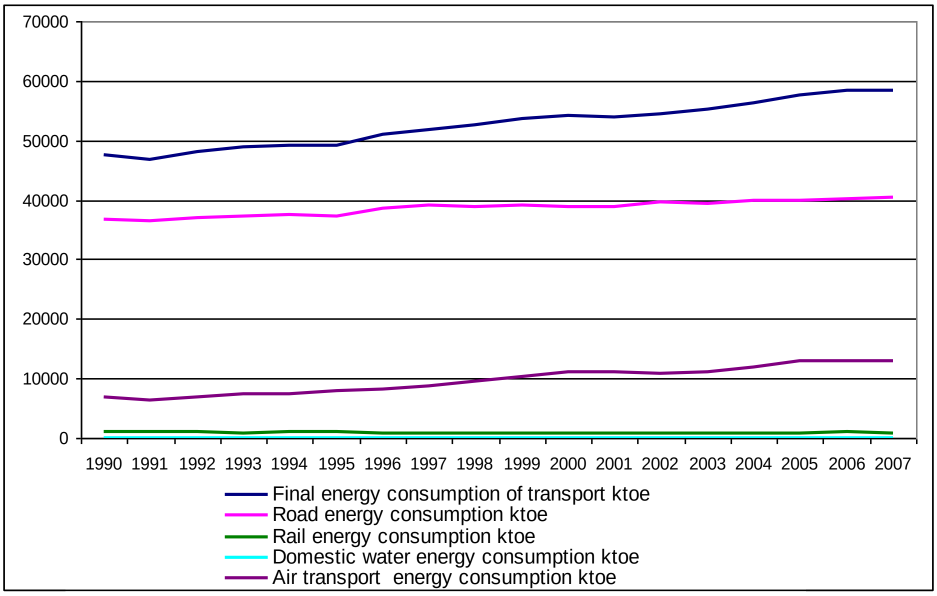


Figure 19 shows that there have been improvements in energy consumption per unit in the rail and air sub-sectors but not in the road sub-sector.

Figure 19: Unit Consumption

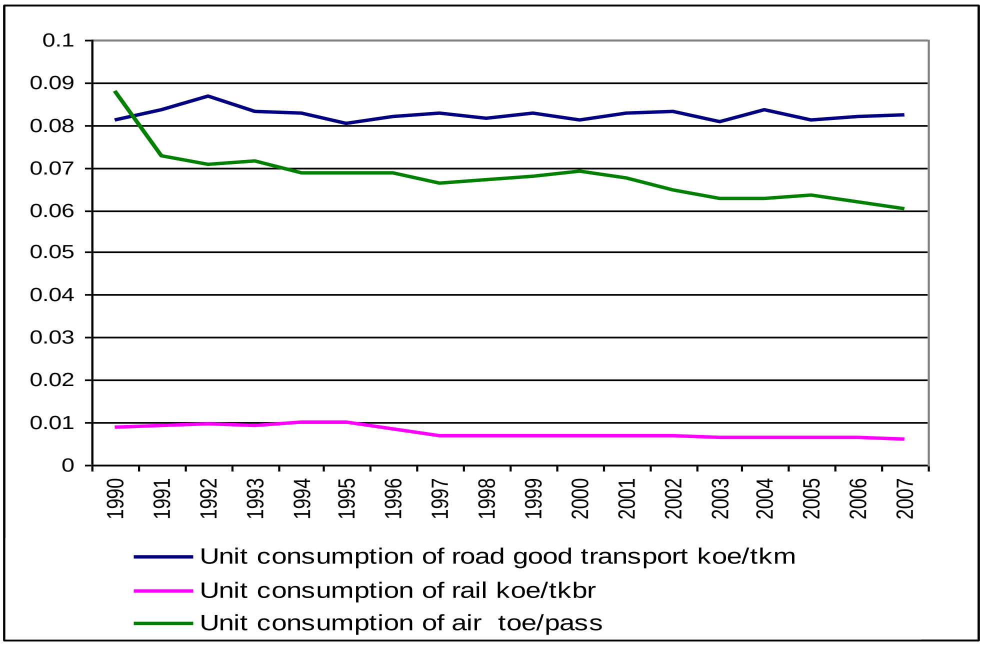
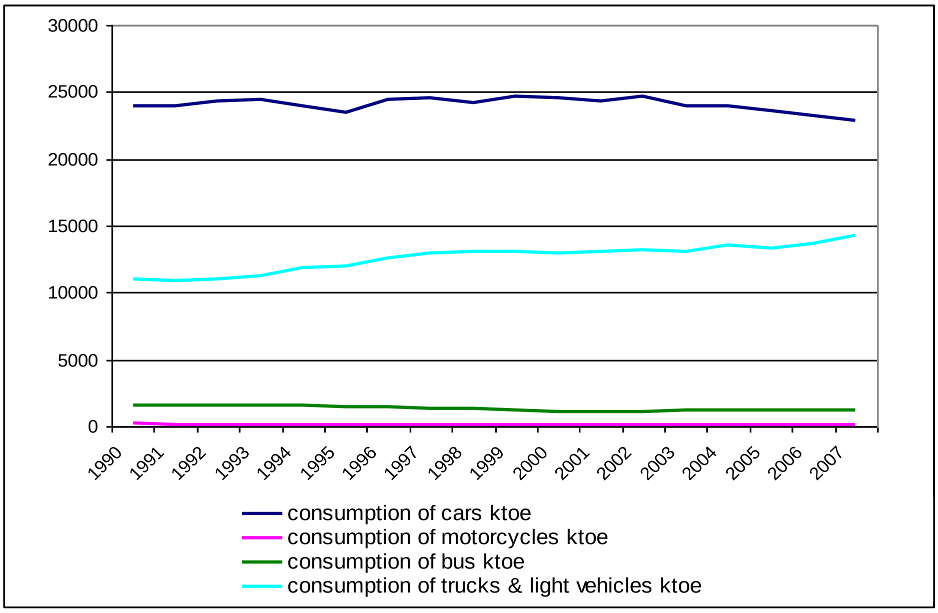


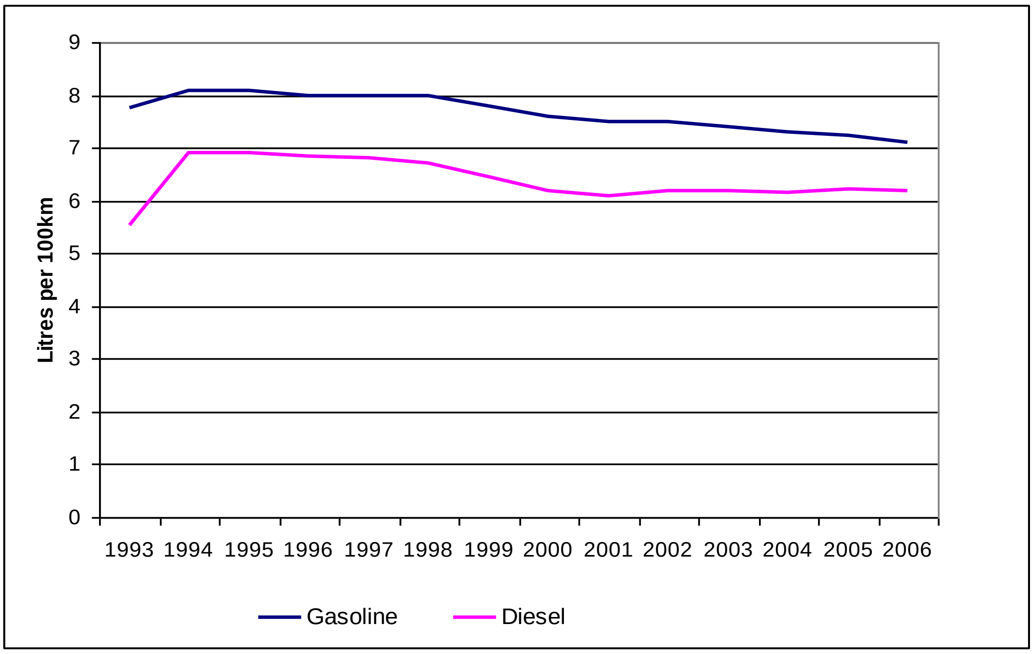
Figure 20 provides a break down of consumption by mode of road transport and shows that the largest increase in consumption is from trucks and light vehicles.

Figure 20: Consumption by mode of road transport



The rise in energy consumption in the road transport sector is mainly due to an increase in the average distance travelled per journey. This trend in road transport has come about despite steady improvements in the fuel efficiency of new vehicles shown in Figure 21.

Figure 21: Average New Car Fuel consumption



3.6 Assessment of energy efficiency/savings through ODEX: total and by sector

This section features a series of aggregate 'ODEX' indicators of energy efficiency that are used to provide an overall perspective of energy efficiency trends by sector for transport, industry and households.

These indicators are called "bottom-up energy efficiency indicators" since they are made up of a weighted average of a series of sub-sector energy efficiency indicators. The advantage of the bottom-up indicators is that they can better evaluate energy efficiency trends at an aggregate level than the usual energy intensity indicators. This is because bottom-up indicators can help remove energy changes due to structural effects and/or other factors not related to energy efficiency.

The overall, all sectors ODEX illustrated in Figure 22 shows two periods of improving energy efficiency (in the early to mid-nineties and the early part of this century) separated by a period of stagnation in the late nineties. Except for the transport sector his broad trend is replicated to large extent in each of the sectors (see Figures 24 to 26).

Figure 22: Overall ODEX

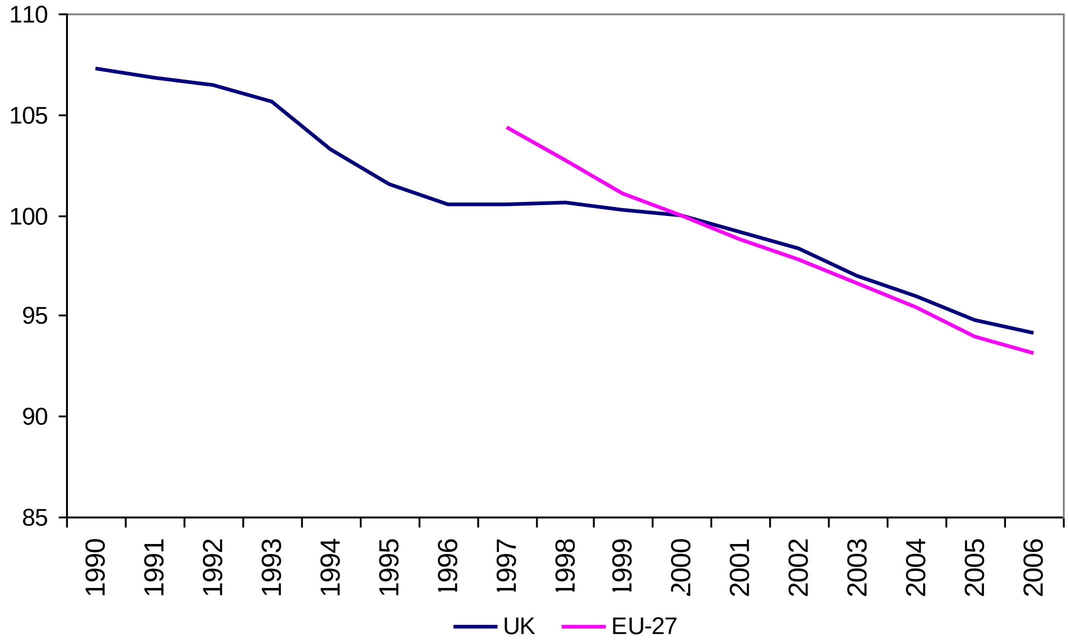


Figure 23 illustrates the transport ODEX. After a significant improvement in UK transport energy efficiency in the early to mid 90's the rate of improvement has since reversed until the late 1990's, when it was back on track again until recent years. The recent improvements can be attributed to a variety of factors including a desire on the part of consumers for more fuel efficient (and hence cheaper cars) against a background of higher fuel prices, the voluntary agreement between ACEA (the European Automobile Manufacturers Association) and the EC to improve the fuel efficiency of cars and the introduction by the UK Government of graduated Vehicle Excise Duty based on carbon emissions.

Figure 23: Transport ODEX

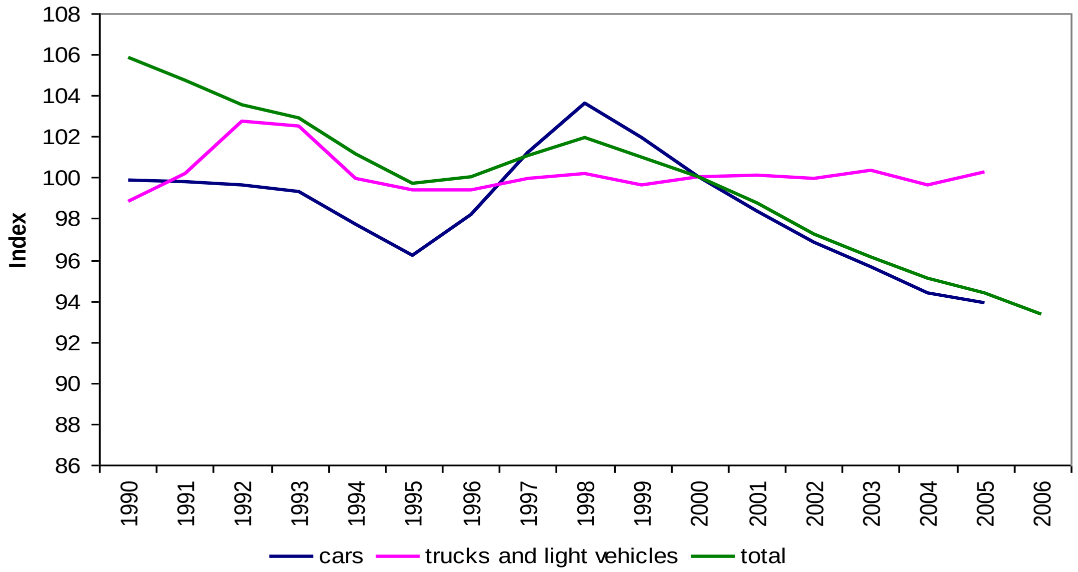
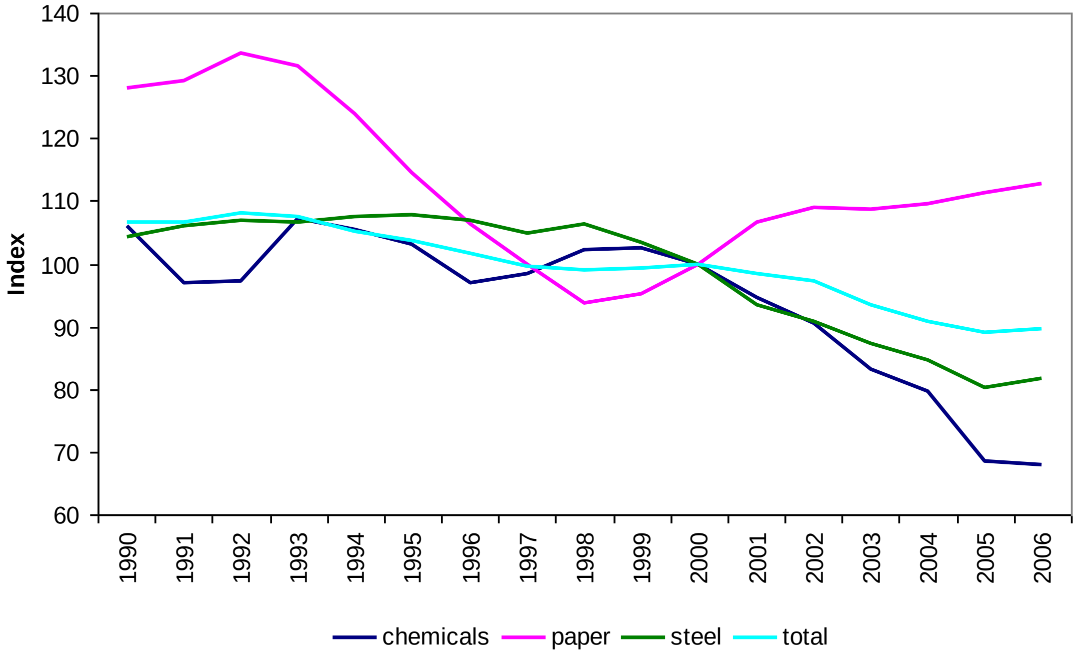


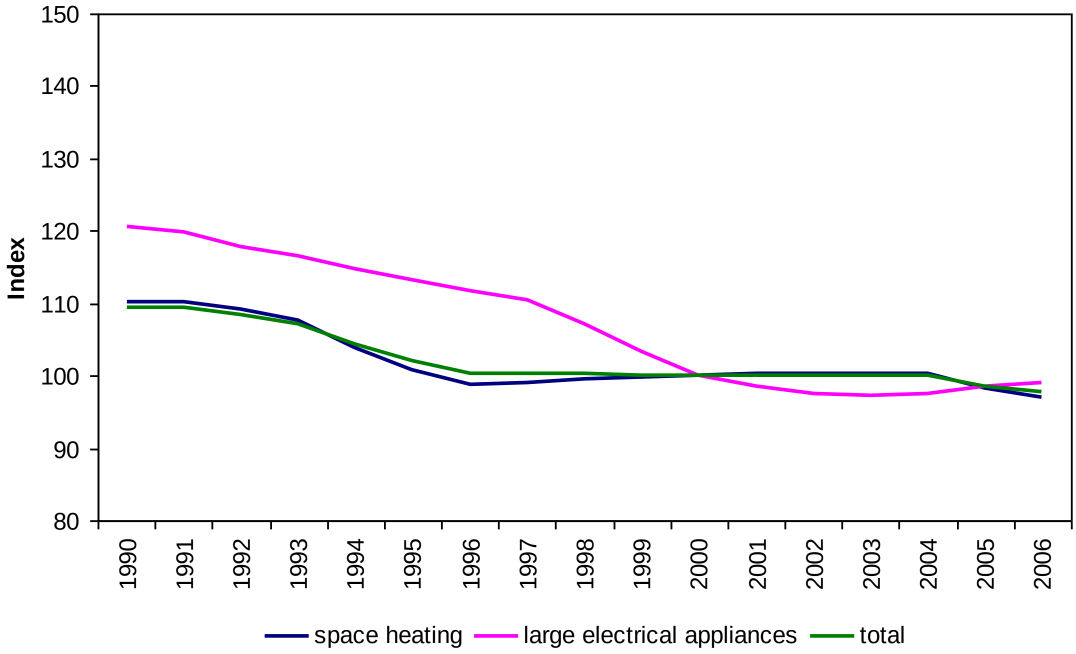
Figure 24 illustrates the industry ODEX. Energy efficiency in industry had improved by around 17% between 1990 and 2007. Energy efficiency in the manufacturing sector was fairly flat during the 1990's and has improved steadily during the 2000's. The recent up-turn is largely due to significant improvements in the chemicals, machinery, non-ferrous and steel sub-sectors, which can be directly attributed to the introduction of the Climate Change Levy and the associated CCAs.

Figure 24: Industry ODEX



The households ODEX is illustrated in Figure 25. The ODEX shows a steady improvement in space heating and a larger improvement in the energy efficiency of appliances. However these improvements have not been fully reflected in the consumption data because of the preference for higher household temperatures, the proliferation of 'luxury' appliances such as dishwashers, plasma televisions, large fridge/ freezers and the relatively recent phenomenon of households owning several of the same type of appliance (e.g. multiple televisions and one fridge for food and another for drinks) have negated many of the gains. In addition, the moves towards smaller household units (i.e. more people living on their own) has also acted against energy savings.

Figure 25: Household ODEX



3.7 CO_2-emissions trends: total and by sector; role of fuels substitutions and of energy efficiency

The UK is committed to reducing greenhouse gas emissions to fulfil its Kyoto obligations and meet its domestic CO_2 targets. CO_2 emissions are reported annually by source sector according to the requirements of the United Nations Framework Convention on Climate Change (UNFCCC).

Figure 26 shows the trend in emissions from each sector over the period 1999-2007. The UK's total CO_2 emissions had widely fluctuated from late 1990's till early 2000's before plateauing in recent years. The decline in CO_2 emissions from the Industry sector has been cancelled out by rises in emissions from the transport and households sectors. This is a trend replicated in many other developed countries where heavy industry is declining, there is improved emissions performance from the power sector but also a strong desire from consumers to travel more, maintain their homes at a higher temperature and purchase more white goods and consumer electronics.

Figure 26: CO_2-emissions trends: total and by sector

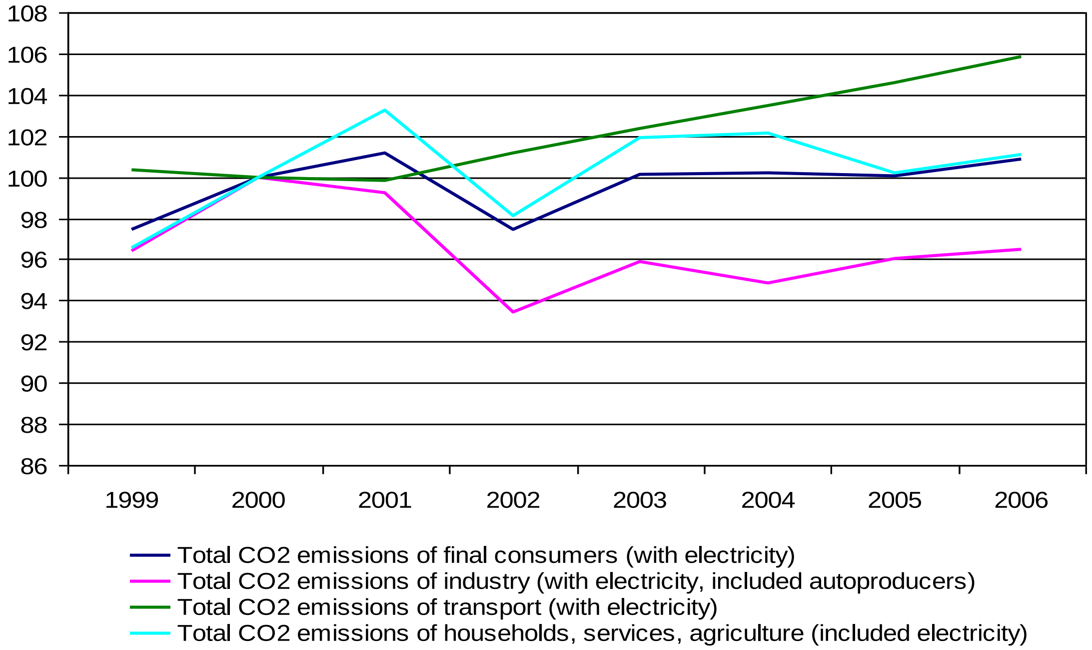
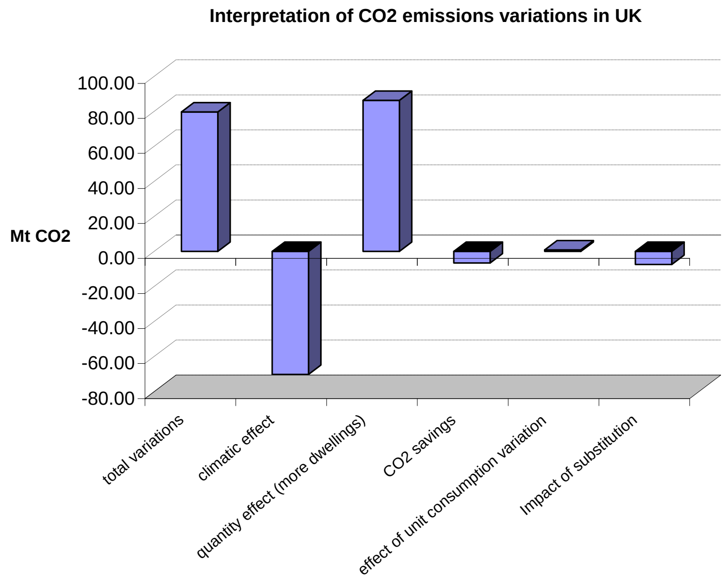


Figure 27 illustrates the CO_2 emissions trends in households, separating out impacts from energy efficiency and energy substitution. There is a small fuel substitution effect as the UK's shift towards gas happened much earlier in 1980's.

Figure 27: Interpretation of CO_2 Emissions



It appears that the climatic effect and quantity effect cancel each other out and that there is little impact from CO_2 savings. In addition the impact of substitution is minimal. However, from the earlier data eg Figure 6 there appears to be little impact of climatic corrections on final energy intensity hence this climatic effect seems very large. In addition the overall ODEX (Figure 22) indicates that the UK has seen steady improvement in energy efficiency and hence the CO_2 savings seem too small.

4 Energy efficiency measures

4.1 Recent Energy Efficiency Measures

Household Sector

Carbon Emissions Reduction Target and suppliers obligation [Innovative]
CERT began on 1 April 2008 and is the main policy for household energy efficiency. It operates as an obligation on the six major energy suppliers to meet carbon targets by encouraging households to take-up energy efficiency measures. The suppliers are free to decide how to meet their targets, but in the main they promote subsidised offers on loft and cavity wall insulation and high-efficiency lights and appliances.

Building Regulations
The Building Regulations (specifically Part L) set the minimum energy efficiency standards that any newly constructed home must achieve. The Government regularly tightens these standards so that a house built today will be at least 40 percent more energy efficient than one built before 2002. Significantly, the Government has made a commitment to make all new buildings zero carbon by 2016.

Metering and Billing
The Government is aiming to have smart meters rolled-out to all domestic customers by the end of 2020. Smart meters enable meter readings to be taken remotely and together with a display device give householders real time information on their energy use. The new information smart meters provide will help consumers to see what energy they are using and how to save money on their bills.

Energy Performance Certificates
Energy Performance Certificates indicate how to improve energy efficiency, providing information on the energy efficiency of homes sold or rented. By requiring all homes put on the market to have an energy rating Energy Performance Certificates will give all buyers and renters of homes transparent, accurate information on the energy running costs of their homes, and practical advice on how to improve it, helping them cut their fuel bills and their carbon emissions.

Product policy and labelling
Significant amounts of money and energy are wasted by leaving appliances in stand-by mode when not in use, as well as energy wasted through appliances not being as energy efficient as they could be. The UK is aiming to reduce this wastage through a number of strategies. These include international negotiations to set tougher minimum standards for energy-using products, better labelling and information to consumers, and voluntary agreements with industry.

Act on CO_2 [Innovative]
The UK has made significant progress in recent years in empowering consumers to make choices – having rolled out mandatory A-G labels on appliances, homes and new vehicles, the Energy Saving Trust's 'Energy Saving Recommended' labelling for appliances, the ACT ON CO_2 advice line led by the Energy Saving Trust, offering free expert advice, the Trust's free home energy checks, and an online carbon calculator.

Community Energy Saving Programme (CESP)
CESP is a new obligation on energy suppliers and electricity generators to deliver an estimated £350 million of energy efficiency measures to the most vulnerable domestic consumers. Companies obligated by the CESP will have to achieve their share of the overall target by promoting carbon-reduction measures to domestic energy users.

Transport Sector

Speed limits
Speed limits are an important part of achieving appropriate speeds on the road and are adopted for safety, environmental and accessibility reasons. The setting of speed limits has been primarily concerned with road safety issues, however in recent years it is evident that the speed at which the car is travelling has an impact on fuel efficiency and emissions emitted. The Government is considering further measures to reduce speed limits to reduce fuel consumption however these measures are not popular with motorists.

Graduated Vehicle Excise Duty
Graduated Vehicle Excise Duty (GRAD VED) was introduced as an incentive to purchase vehicles with low emission levels: Between April 2009 and April 2010, there will be major reforms in the Vehicle Excise Duty regime . From 2009, the new tax bands for Vehicle Excise Duty will be introduced. From 2010, more polluting cars will pay higher taxes and the least polluting cars will pay no tax.

Smarter Choices
Smarter Choices is a programme to promote changes towards more sustainable patterns of travel behavior using a range of measures. These include workplace, school and personalised travel planning, travel awareness campaigns and marketing. These measures have the potential to reduce congestion and carbon emissions

Renewable Transport Fuel Obligation [Innovative]
The Renewable Transport Fuel Obligation (RTFO) Programme places an obligation on fuel suppliers to ensure that a certain percentage of their aggregate sales is made up of biofuels. The Government intends to set variable targets for the level of carbon and sustainability performance expected from all transport fuel suppliers claiming certificates for biofuels in the early years of the RTFO.

Industrial Sector

Climate Change Agreements
Climate Change Agreements allow a part exemption from the Climate Change Levy (for businesses within certain sectors. The Government provides an 80% discount from the levy for those sectors that agree challenging targets for improving their energy efficiency or reducing carbon emissions. Climate change agreements have now been signed with almost all of the eligible sectors. There are Climate Change Agreements with over 50 industrial sectors and these will run until March 2013.

The Enhanced Capital Allowance Scheme
The scheme provides businesses with enhanced tax relief for investments in equipment that meets published energy-saving criteria. The scheme is a very straightforward way

for a business to improve its cash flow through accelerated tax relief. The scheme enables businesses to claim 100% first-year capital allowance on investments in energy-saving equipment, against the taxable profits of the period of investment.

Tertiary Sector

Carbon Reduction Commitment [Innovative]
(More information is provided in Section 4.3)
The Carbon Reduction Commitment (CRC) is a mandatory cap and trade scheme in UK designed to encourage improvements in energy efficiency and drive changes in behaviour and infrastructure. CRC focuses on significant energy users not covered by the EU-ETS in the private and public sector and is expected to achieve emissions reductions of at least 4MtCO_2 per year by 2020.

Cross-cutting measures

Environmental Transformation Fund
The Environmental Transformation Fund is a financial commitment by the UK to help the UK and developing countries address the challenge of climate change. It is split into a UK and an international fund. The UK part supports the development and deployment of low carbon energy technology, including technology for the efficient use of energy. The international part supports development and poverty reduction through environmental protection, and helps developing countries respond to climate change.

CHP
Combined Heat and Power (CHP) is a fuel-efficient energy technology that, unlike conventional forms of power generation, puts to use the by-product heat that is normally wasted to the environment. CHP can increase the overall efficiency of fuel use to more than 75%, compared with around 50% from conventional electricity generation. Furthermore, because it often supplies electricity locally, CHP can also avoid transmission and distribution losses. The UK Government launched CHP Focus on the 2nd September 2008, this is an initiative to support the development of CHP in the UK. It consists of a website containing comprehensive information on all aspects of CHP, whether users are new to CHP or looking for specific information. There is also free helpline support, where experts can provide guidance to those who require it.

4.2 Patterns and Dynamics of Energy Efficiency Measures

This section uses spider diagrams to illustrate and compare the spread of policies in each sector in the UK. Where possible, efforts have been made to identify and explain any apparent trends.

Spider diagrams are a graphical representation of the distribution of energy efficiency policies across the MURE policy categories. They provide an overview of the type of measures a country has implemented and allow simple, broad comparisons to be made between the types of measures implemented in different countries or regions. Spider diagrams are constructed by assigning each policy within a sector (e.g. residential or transport) to one of the following 7 categories:

- **Coop:** Co-operative Measures
- **Cros:** Cross-cutting with sector-specific characteristics
- **Fina:** Financial
- **Fisc:** Fiscal/Tariffs
- **Info:** Information/Education
- **Le/I:** Legislative/Informative
- **Le/N:** Legislative/Normative

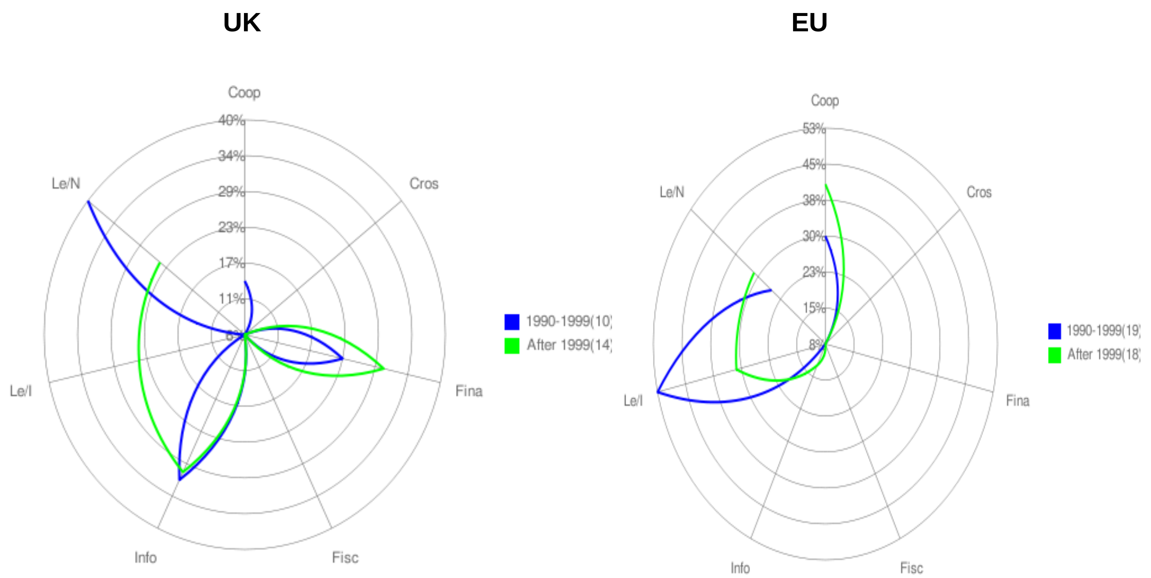
In each sector, the percentage of the total number of measures that fall into each category is then plotted on a heptagonal chart with 7 axes (each axis represents one of the policy categories). The area enclosed by the plotted points is then shaded, which gives a clear indication of the type of measures employed in the sector.

In each sector the UK has been compared against the rest of Europe by categorising and summing both the measures being implemented in the rest of the EU-15 + Norway and Croatia (for simplicity referred to as the EU hereafter) and the measures being implemented centrally by the EC. For simplicity, the EU plus EC measures will be referred to as the EU-15 measures during the remainder of this section.

Household Sector

The UK/EU domestic energy efficiency measures show that the majority of measures were legislative and educational-informational during 1990-1999, after 1999 there has been a shift towards more financial measures and less legislation. The UK also has a broad spread of measures – it has measures in 5 of the 7 categories, which would seem to indicate a balanced approach to domestic sector policy making in the UK. In the EU there have been more legislative measures.

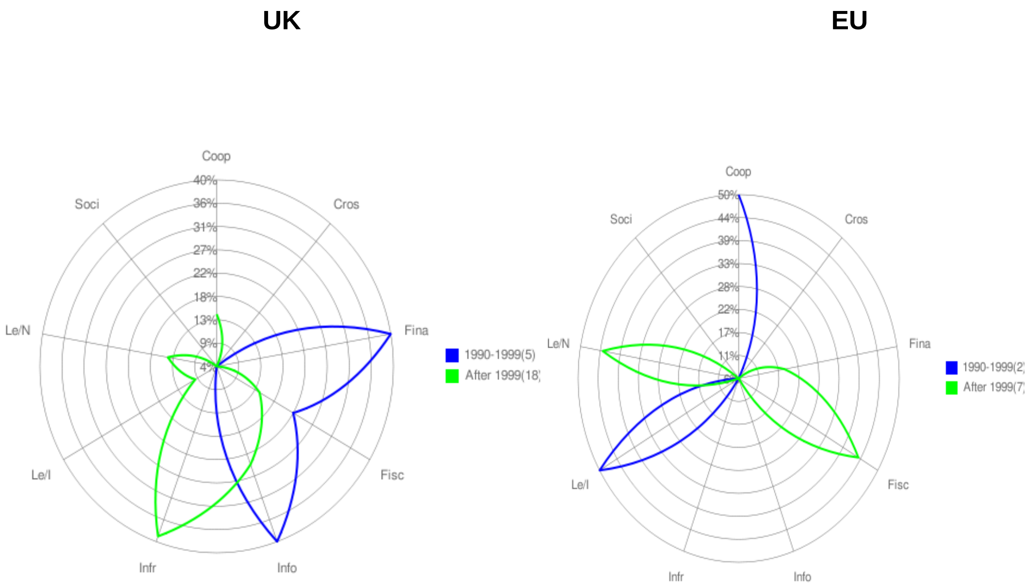
Figure 28: Energy efficiency measure patterns for the household sector: development of measure by type over time



Transport Sector

Figure 29 illustrates the UK/EU transport energy efficiency measures. The UK has the majority of transport policies spread across the categories with Infrastructure, Fiscal, Financial and Information-education, with very limited legislation. Whereas in the EU, the majority of policies fall into the legislative and fiscal categories.

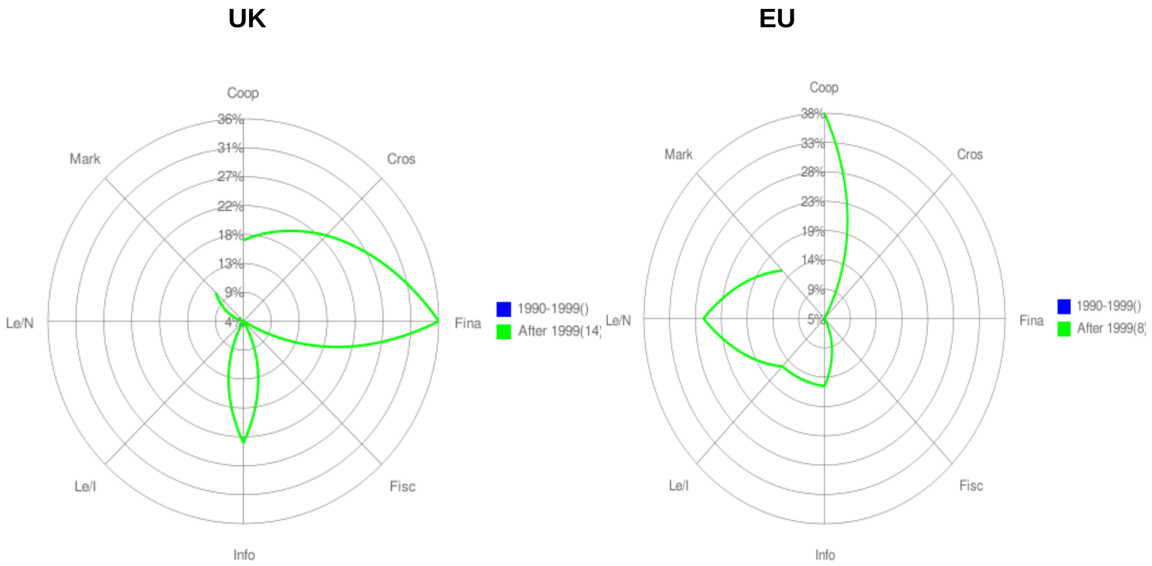
Figure 29: Energy efficiency measure patterns for the transport sector: development of measure by type over time weighted by quantitative impact



Industrial Sector

Figure 30 illustrates the UK/EU industry measures, which shows a spread across most of the categories in the UK, with the exception of Fiscal-Tariffs and Legislative policies. In the EU the measures are mainly cooperative and legislation. However, care should be taken not to overstate the percentage results since there are only relatively few UK industry energy efficiency measures – the least of any sector.

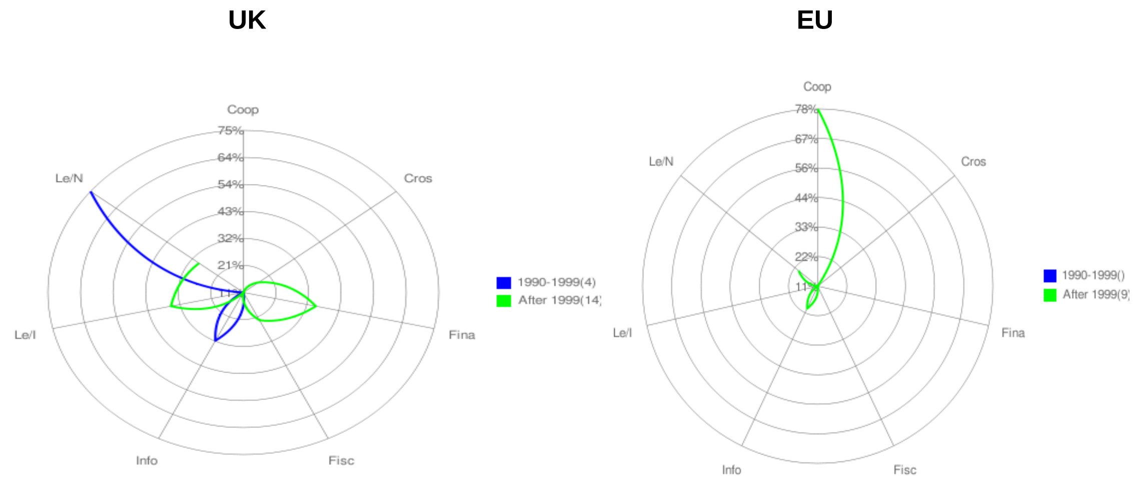
Figure 30: Energy efficiency measure patterns industry sector: development of measure by type over time



Tertiary Sector

Figure 31 illustrates the UK/EU tertiary energy efficiency measures. Following the pattern of the other sectors, the UK measures are distributed evenly across the categories with only the cooperative category without a measure. This is in contrast to the EU where most measures are in the cooperative category.

Figure 31: Energy efficiency measure patterns tertiary sector: development of measure by type over time



4.3 Innovative Energy Efficiency Measures

The Carbon Reduction Commitment (CRC) is a mandatory cap and trade scheme. CRC focuses on large organisations in the private and public sector and is expected to achieve emissions reductions of at least 4MtCO_2 per year by 2020. The scheme will be key in achieving the overall UK targets of reducing greenhouse gases by at least 26% by 2020 and by at least 80% by 2050 compared to the 1990 baseline.

CRC is an innovative energy saving scheme for the UK that it will encourage improvements in energy efficiency, reduce carbon emissions and offer to organsiations long-term financial benefits from reduced energy costs. The scheme has been designed to generate a shift in awareness especially at senior level, drive changes in behavior and infrastructure and promote corporate social responsibility.

The sectors being targeted include among others retail organisations, banks, universities, hotels, local authorities and government departments.

Organisations are eligible for CRC if they (and their subsidiaries) have at least one half-hourly electricity meter (HHM) settled on the half-hourly market. They also qualify if their total half-hourly electricity consumption exceeded 6,000 megawatt-hours (MWh) during 2008. To avoid overlap with existing measures, it would not target emissions covered by Climate Change Agreements nor direct emissions covered by the EU ETS. In addition, organisations with over 25% of their energy use emissions in CCAs would be completely exempt. CRC will be a "light touch" scheme by allowing self certification of energy use and emissions, backed by an independent risk based audit regime.

CRC will be broadly revenue neutral to the UK Government. The auction revenue will be recycled to participants by means of a simple, direct, annual payment proportional to average annual emissions since the start of the scheme, with a bonus/penalty depending on the organisation's position in a CRC league table. The table will act as a metric for financial incentives as well as reputational incentives as it will be available for public scrutiny.

For more information go to

http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/

4.4 Energy efficiency measure evaluations

This section presents tables detailing each energy efficiency measure and the semi-quantitative estimate of its electricity saving impact, grouped by sector. This rating, either low, medium, or high, is derived from calculating the measure energy saving as a percentage of the overall energy consumption of the sector, using the following boundaries:

- LOW Saving: <0.1%
- MEDIUM Saving: Between 0.1% & 0.5%
- HIGH Saving: ≥ 0.5%

4.4.1 Semi-quantitative Impact Estimates of Energy Efficiency Measures

Household Sector

The UK has a number of policies aimed at improving energy efficiency in the household sector. The impact is the highest for the legislative/normative measures, and the financial measures such as the EEC, EST and CERT are expected to generate significant savings.

Table 3: Household Sector - Semi-quantitative impact estimates of energy efficiency measures

Code	Title	Status	Type	Semiquantitative Impact
UK3	Reduction in VAT rate for energy saving materials	Ongoing	Fiscal/Tariffs	Low
UK4	Home Energy Conservation Act 1995 and Energy Conservation Act 1996	Ongoing	Co-operative Measures	Low
UK5	UK fuel poverty schemes	Ongoing	Financial	Low
UK7	The Energy Saving Trust (various initiatives)	Ongoing	Financial, Information/Education	High
UK11	Transco Affordable Warmth Campaign	Ongoing	Information/Education	Low
UK13	Market Transformation Programme (inc. implementation of minimum standards and labelling for appliances)	Ongoing	Legislative/Normative	High
UK14	Building Regulations (pre 2006)	Completed	Legislative/Normative	High
UK17	Energy Efficiency Commitment	Completed	Financial	High
UK19	Building Regulations (2006)	Ongoing	Legislative/Normative	High
UK20	Carbon Emissions Reduction Target & Suppliers obligation (Former EEC 3)	Ongoing	Financial	High
UK21	Energy Performance Certificates	Ongoing	Legislative/Informative	High
UK22	Code for Sustainable Homes	Ongoing	Legislative/Informative	Medium
UK23	Metering and Billing	Proposed (advanced)	Information/Education	Medium
UK24	Act on CO_2 Campaign	Ongoing	Information/Education, Unknown	Medium
UK26	Stamp Duty	Ongoing	Financial	Unknown
UK27	Household Sector: Microgeneration	Ongoing	Financial	Unknown

Transport Sector

The energy efficiency policies with the largest impact in the Transport Sector tend to be the fiscal or legislative.

Table 4: Transport Sector - Semi-quantitative impact estimates of energy efficiency measures

Code	Title	Status	Type	Semiquantitative Impact
UK1	Ten Year Plan for Transport	Ongoing	Infrastructure	Medium
UK2	Energy Saving Trust - Initiatives	Ongoing	Financial, Information/Education/Training	Low
UK8	Graduated Vehicle Excise Duty	Ongoing	Fiscal	Medium
UK9	Company Car Taxation	Ongoing	Fiscal	Medium
UK10	Fuel Duty Levels	Ongoing	Fiscal	High
UK13	Freight Facilities Grant	Ongoing	Infrastructure	Low
UK16	Renewable Transport Fuel Obligation	Proposed (advanced)	Legislative/Normative	High
UK17	Smarter Choices	Ongoing	Information/Education/Training	Medium
UK19	Low Carbon Vehicle Partnership	Ongoing	Co-operative Measures	Low
UK20	Transport Innovation Fund	Proposed (advanced)	Infrastructure	Low
UK22	Grant Support Towards Light Rail Schemes	Ongoing	Infrastructure	Low
UK24	Rail Technical Strategy	Ongoing	Infrastructure	Medium
UK25	Eco-driving and the Act on CO_2 Campaign	Ongoing	Information/Education/Training	Medium
UK26	Speed Limits	Ongoing	Legislative/Normative	Low
UK27	New Vehicle Labels	Ongoing	Legislative/Informative	Low
UK28	Speed Limit for Goods Vehicles and Buses	Ongoing	Legislative/Normative	Low

Industry Sector

A mixture of co-operative, financial and market based measures are expected to have the largest impact in the industry sector.

Table 5: Industry Sector - Semi-quantitative impact estimates of energy efficiency measures

Code	Title	Status	Type	Semiquantitative Impact
UK5	The Enhanced Capital Allowance Scheme	Ongoing	Financial	Medium
UK6	Climate Change Agreements	Ongoing	Co-operative Measures	High
UK7	Integrated Pollution Prevention and Control (IPPC)	Ongoing	Legislative/Normative	Medium
UK8	The Carbon Trust - (Various initiatives)	Ongoing	Financial, Information/Education/Training	High

UK11	Emissions Trading Scheme - UK (and EU)	Ongoing	New Market-based Instruments	High
UK16	Climate Change Levy	Ongoing	Cross-cutting with sector-specific characteristics	Medium
UK17	Combined Heat and Power (CHP)	Ongoing	Information/Education/Training	Low

Tertiary Sector

In the Tertiary sector the policies with the highest impact are the legislative and fiscal measures.

Table 6: Tertiary Sector - Semi-quantitative impact estimates of energy efficiency measures

Code	Title	Status	Type	Semiquantitative Impact
UK1	Building Regulations (2006)	Ongoing	Legislative/Normative	High
UK2	Carbon Trust - Various Initiatives	Ongoing	Financial	High
UK4	Building Regulations (Pre-2006)	Completed	Legislative/Normative	High
UK5	Climate Change Levy	Ongoing	Cross-cutting with sector-specific characteristics, Financial	High
UK7	The Energy Saving Trust - (Various Initiatives)	Ongoing	Information/Education/Training	Medium
UK11	The Enhanced Capital Allowance Scheme	Ongoing	Fiscal/Tariffs	High
UK12	Carbon Reduction Commitment	Ongoing	Legislative/Informative	High
UK14	Metering and Billing	Proposed (advanced)	Legislative/Normative	Medium
UK15	Energy Performance Certificates	Ongoing	Legislative/Informative	High
UK16	Climate Change Agreements	Ongoing	Fiscal/Tariffs	High

Cross Cutting

Table 7: Cross Cutting - Semi-quantitative impact estimates of energy efficiency measures

Code	Title	Status	Type	Semiquantitative Impact
UK4	Environmental Transformation Fund	Ongoing	Financial Measures	Unknown
UK3	Climate Change Act	Ongoing	General Energy Efficiency / Climate Change / Renewable Programmes	High
UK1	“Are You Doing Your Bit?” Campaign	Completed	Non-classified Measure Types	Low
UK2	Climate Change Communication Initiative	Ongoing	General Energy Efficiency / Climate Change / Renewable Programmes	Medium

4.4.2 Lessons from Quantitative Energy Efficiency Measure Evaluations

Evaluation of the Carbon Emissions Reduction Target (CERT)

CERT is one of the Governments key mechanisms for improving the energy efficiency of the housing stock.

Evaluating CERT the (combined) 2006 English House Condition Survey (EHCS) dataset was taken as the base position. A scenario model simulated the installation of the key CERT measures onto this base and examined the effect upon the fuel poor. The energy cost savings as a result of the installations were used to determine how many households have been removed from fuel poverty.

This analysis has examined the effect of the energy efficiency improvements (as likely to be installed under CERT) on this ratio. If an energy efficiency improvement (or set of improvements) reduces the fuel poverty ratio of a household from above 0.1 to below 0.1 then the household can be said to have been removed from fuel poverty.

Only the effect of the most significant CERT measures has been analysed. These are:

- Cavity wall insulation
- Virgin loft insulation
- Top-up loft insulation
- Hot water cylinder insulation
- Fuel switching
- Solid wall insulation

On average, around 163,000 households (136,000 vulnerable) have been removed from fuel poverty following the CERT improvements. As fuel poverty is defined a household that requires to spend more than 10% of its income on all fuel use in order to meet an adequate heating regime. Results also show that there are an additional 104,000 households (86,000 vulnerable) originally spending 9-10% on their fuel, which following the CERT improvements now spend < 9% on fuel. There are also an additional 145,000 households (123,000 vulnerable) originally spending between 8-9% on fuel now spending < 8% on fuel.

Evaluation of Energy Efficiency Commitment (EEC) (replaced by Carbon Emissions Reduction Target April 2008) [financial instrument]

A number of evaluation projects[12] have taken place between 2004 and 2008 considering different aspects of the measures covered under the EEC (the evaluations consider data up until 2006). The key conclusions from these reviews were:

The average saving per property is 2710 kWh/a, providing carbon savings of 144 kg/a and a customer saving of £38/a.

The extent to which energy savings achieved in houses which have received insulation upgrades are compromised by increases in comfort levels was investigated. The study also sought to establish whether there were differences in the comfort levels maintained by priority households (those in receipt of a qualifying benefit) and the occupants of non-priority homes. The final goal of the study was to compare the observed energy savings with the predictions of the BREDEM model.

The conclusions were:

- Energy savings as a result of insulation measures**.** Energy characteristic plots for each dwelling were generated, before and after the installation of insulation. In these, total fuel consumption over each week is plotted against the mean internal-external temperature difference for that week. This process, which eliminates the effect of changes in external or internal temperature over the course of the trial, eventually demonstrated that the specific energy consumption of the whole sample had fallen by 18.8 ± 1.5% as the result of the insulation measures.
- The effect of insulation on internal temperatures**.** An examination of internal temperatures before and after insulation has indicated that, on average, these increased by 0.57°C after properties were insulated. Interestingly, the temperature take was lower (0.46°C) among the priority group than among the non-priority households (0.78°C), although this result is not statistically significant,
- Heating patterns. Analysis of data from the temperature logger mounted on the heating system has lead to the development of an algorithm which allows the times of heating operation to be determined. This has revealed that, on average, householders operate their heating systems for 8.8 hours a day, a result which compares well with the current BREDEM assumption of 9 hours. The non-priority group operated their heating for one hour more than the priority group, but this result is not statistically significant. It was further been found that people operated their heating for an average of 9.1 hours per day at weekends, compared to 8.7 hours on weekdays, a result which is significant at the 5% level. Non-priority households have been shown to start their heating systems later in the morning, but to be more likely to operate them throughout the day,

[1] Monitoring Energy Savings achieved from Insulation Measures installed in Gas Heated Homes in SoP3 and EEC Schemes Report by the Energy Saving Trust to Defra (2004)

[2] Measurement of energy savings and comfort levels in houses receiving insulation upgrades. Prepared by:Energy Monitoring Company For Energy Saving Trust. June 2006

Cavity wall and loft insulation are amongst the most effective ways of improving the thermal performance of the fabric of houses and provide real energy savings. However, when they are installed, the actual energy savings derived from measurements of before and after consumptions are commonly found to be less than expected from the predictions of models such as BREDEM. This discrepancy, termed a 'reduction factor' is caused in part by changed internal temperatures, a 'comfort factor', with the remainder due to other causes such as insulation performance, occupancy and ventilation.

It is possible to quantify either a reduction factor or a comfort factor from five of the 13 reports reviewed[3]. These figures suggest that the best estimates for the reduction factor and the comfort factor expressed as a percentage of the theoretical expected energy savings are:

Reduction factor: 50%

of which Comfort factor: 15%

These figures are rounded estimates and should not be considered precise values; there will be considerable variation between different houses in practice. The derived reduction factor is considered to be typical of houses that have had their thermal performance improved by cavity wall and loft insulation.

The overall 'comfort factor' includes all the factors that affect the achievement of the theoretical energy savings calculations using BREDEM. This includes 'true comfort' taken by the customer in the form of higher temperatures together with other factors such as lower than expected energy consumption prior to measure installation, underperformance of insulation measures and any errors in the energy savings calculations. The sample numbers exclude households for which the readings supplied were rejected as incomplete or implausible, but including those later excluded from the analysis as outliers. Although there are some detailed differences in the definition of the two terms, the classifications "disadvantaged" and "priority" and may both be described as "priority", which is the more recent term.

Further analysis of the data[4] to determine whether the reduction factor varies with the type of measure installed was carried out. The sample dwellings received a range of combinations of cavity wall insulation, loft insulation upgrades to 200mm (from various starting thicknesses), draught stripping and hot water tank insulation. To remove the complexity associated with the effect of multiple measures, cases which had received more than one measure only were first excluded from the sample. It was concluded that there was no statistically significant difference in reduction factor between different types of insulation and therefore the same reduction factor of 50% should apply to all types of insulation.

3 Review of Differences between Measured and Theoretical Energy Savings for Insulation Measures. Centre for Research on Indoor Climate and Health Glasgow Caledonian University (for the Energy Savings Trust) December 2006

4 Disaggregation of the Energy Savings Achieved from Insulation in EESoP3 and the Energy Efficiency Commitment.' Energy Saving Trust (November 2008)

Ownership of loft insulation has saturated at 90—95% of potential however, there remains opportunity for greater depth of insulation (more than 100mm) currently at approximately 60% of potential.

By 2006, 39.3% of cavity walled houses had cavity wall insulation[5]. This is the result of changes in the Building Regulations for new build and extensions and access to grants. There is still significant potential for this measure.

Evaluation of Climate Change Agreements (Industry)

Climate Change Agreements (CCA) were agreed between certain energy intensive users and UK Government in March 2001. Being party to a CCA, and meeting targets, allows companies to claim up to an 80% reduction in the Climate Change Levy, which was placed on non-domestic energy supplies from 1 April 2001.

The responsibility for negotiating energy efficiency and carbon savings targets, and operating the Climate Change Agreements rests with the UK Government's Department of Energy and Climate Change (DECC). HM Revenue and Customs collect the levy for Government and deal with exemptions and exclusions[1]. The industrial sector associations play a pivotal role in managing the agreements for their members and others falling within the scope of the agreements. DECC engaged AEA (then also known as ETSU and subsequently Future Energy Solutions) to provide independent technical advice and facilitate the negotiations with the eligible sectors.

Full details on the agreements are given in a series of papers and guidance notes on the Defra website[2]. Each CCA has a performance target for the years 2002, 2004, 2006, 2008 and 2010. The Defra website also has an analysis of the original targets, the results of the first, second and third target period assessment and this fourth target period assessment. The analysis of the original targets provided an estimate of the carbon savings expected from the CCAs beyond "Business As Usual" (BAU). Since the publication of that analysis there have been widespread structural changes in UK industry, changes to products because of market forces and entrants and exits in many sectors. Therefore, while the sectors remain, the character has often changed substantially.

The results presented represent the population of the CCAs as at the end of each sector's respective fourth target period, as reported to DECC on 9 February 2009. This is inevitably not the same population as that at the start of the agreements or at any other target period. This unfortunately makes comparisons between target periods difficult. Some sector agreements may cover considerably less energy than at the start of the agreements, but some of this energy reduction may be due to exits where the facility has been closed, and may not be as a result of the CCA. Conversely some sector agreements may now cover more energy than at the start of the agreements as a result of new entrants.

This target period is the second where there is overlap with the EU Emissions Trading Scheme (EU ETS). The EU ETS came into effect from January 2005. Approximately 500 installations covered by EU ETS are also covered by CCAs of which about 330

5 Domestic Energy Factfile 2008. BRE (for EST)

opted out of EU ETS for the first phase (2005-2007). For those remaining in EU ETS, there is the potential for double counting of emissions and so procedures to adjust for this were agreed, described in paper CCA-D06 available on the Defra website. In order to demonstrate their performance against their CCA targets, some sectors have reported results before and after the EU ETS double counting adjustments. The summary results, except for trading of allowances, are quoted before double counting adjustments for those sectors that gave the additional breakdown.

Key Results

The key results of the fourth target period assessment[6] show:

- 20.3 million tonnes of CO_2 per year emissions were saved in total compared to sector baselines
- 36 out of 52 sectors reporting met their targets outright
- In a further 12 sectors all the facilities had their Climate Change Levy discounts renewed
- 99 per cent of facilities (8,973) have had Climate Change Levy discounts renewed
- Generally, there was continued improvement across the sectors.

6 Source: CLIMATE CHANGE AGREEMENTS – RESULTS OF THE FOURTH TARGET PERIOD ASSESSMENT. July 2009 (AEA). Information on previous assessment periods is available at http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/ccas/ccas.aspx

5 National Developments under the EU Energy Efficiency Directive and the 20% Energy Efficiency Target of the EU

5.1 Energy End-Use Efficiency and Energy Services Directive

The Energy Services Directive came into force on 17 May 2006, with the objective to enhance end-use energy efficiency across the EU. Member States had until 17 May 2008 to implement the Directive's requirements. DECC has overall responsibility for this and is co-ordinating the implementation for the UK.

The Directive imposes various obligations on Member States, including a requirement that:

- Specified energy companies promote energy efficiency to their customers.
- Final customers receive energy metering as far as this is technically possible, financially reasonable and proportionate to potential energy savings and other billing requirements
- An indicative 9 percent energy savings target is met by 2016 – with public sector playing an exemplary role in helping achieve this.

The UK already had a number of measures in place to promote energy efficiency, however some compliance gaps were identified and the options are being considered; the following are actions being undertaken:

- Signed voluntary agreements with the relevant parts of the energy supply sector under which requires energy suppliers to promote energy services and energy efficiency, the DfT is implementing similar voluntary agreements for the transport fuel sector
- Signed voluntary agreements with all parts of the public sector to buy energy efficient products
- Implemented new requirements to provide comparisons of consumption information on residential gas and electricity bills.

As a part of implementing the Directive, an Energy Services Development Network (ESDN) has been set up, to bring together organisations with a common interest in improving energy efficiency, and act as a forum to exchange ideas and test new initiatives.

The Directive also requires the Government to have an effective system in place for verifying energy savings from the UK's energy efficiency programmes. Government is now piloting a new initiative to bring together and analyse existing data on buildings and energy use from energy suppliers, Government, installers and other sources

5.2 Future strategy for energy efficiency in the UK

The Government has a comprehensive strategy outlined in its 2007 National Energy Efficiency Action Plan (NEEAP) which aims to ensure that energy efficiency improvements play their part in meeting the UKs carbon reduction targets and the 20% Energy efficiency target of the EU.

Low Carbon Transition Plan

The Government has published the UK Low Carbon Transition Plan in July 2009, which is a route map to a low carbon country. This White Paper plots out how the UK will meet the cut in emissions of 34% on 1990 levels by 2020. It is the first ever comprehensive low carbon transition plan to 2020. This Plan includes the following provisions.

The Government has put in place the world's first ever legally binding target to cut emissions 80% by 2050 and a set of five-year "carbon budgets" to 2022 to keep the UK on track.

For the first time, all major UK Government departments have been allocated their own carbon budget and must produce their own plan.

Getting 40% of our electricity from low carbon sources by 2020 with policies to:

- Produce around 30% of our electricity from renewables by 2020 by substantially increasing the requirement for electricity suppliers to sell renewable electricity.
- Fund up to four demonstrations of capturing and storing emissions from coal power stations.
- Facilitate the building of new nuclear power stations.

Clarifying that Ofgem, in its job to protect consumers, both current and future, should help tackle climate change and ensure security of supply.

Making homes greener by:

- Channelling about £3.2 billion to help households become more energy efficient by increasing the current programme by 20% between 2008 and 2011 and then extending it to the end of 2012.
- Rolling out smart meters in every home by the end of 2020.
- Piloting "pay as you save" ways to help people make their whole house greener – the savings made on energy bills will be used to repay the upfront costs.
- Introducing clean energy cash-back schemes so that people and businesses will be paid if they use low carbon sources to generate heat or electricity.
- Opening a competition for 15 towns, cities and villages to be at the forefront of pioneering green innovation.

Helping the most vulnerable by:

- Creating mandated social price support at the earliest opportunity with increased resources compared to the current voluntary system. The Government is minded to focus new resources particularly on older pensioners on the lowest incomes.

• Piloting a community-based approach to delivering green homes in low income areas, helping around 90,000 homes.
• Increasing the level of Warm Front grants so most eligible applicants can receive their energy saving measures without having to contribute payment themselves.

Helping make the UK a centre of green industry by supporting the development and use of clean technologies, including up to £120 million investment in offshore wind and an additional £60 million to cement the UK's position as a global leader in marine energy.

Transforming transport by cutting average carbon dioxide emissions from new cars across the EU by 40% on 2007 levels, supporting the largest demonstration project in the world for new electric cars, and sourcing 10% of UK transport energy from sustainable renewable sources by 2020.

In order to achieve the improvement in energy efficiency of 20% and meet the UK's legally-binding target to cut UK greenhouse gas emissions by 80 percent by 2050, the Departments of Energy and Climate Change (DECC) and Communities and Local Government (CLG) have jointly published a consultation on a new Heat and Energy Saving Strategy (HES), alongside consultations on amendments to Community Energy Saving program (CERT) and a new Community Energy Saving Programme (CESP).

- Heat and Energy Saving Strategy (HESS) consultation, setting out the Government's longer-term ambitions for how we use energy in our homes and businesses;
- the design of the Community Energy Savings Programme (CESP), which aims to deliver significant packages of energy efficiency measures to households in low-income communities;
- a 20% increase to the Carbon Emission Reduction Target (CERT) on major energy suppliers, driving significant investment in GB household energy and carbon saving by March 2011.

The HES strategy sets out the Government's vision to 2020 and beyond, and seeks views on a range of policies to decarbonise the way homes and businesses are heated.

The overarching ambition is for all homes to have received by 2030 a 'whole house' package, including all cost-effective energy saving measures, plus renewable heat and electricity measures as appropriate. The HESS proposals build on the UK's Government commitment to make all new homes and non-domestic buildings zero carbon by 2016 and 2019 respectively, and its aim for smart meters to be rolled-out to all domestic customers by the end of 2020.

CESP and CERT are two proposed complementary measures under the Heat and Energy Saving Strategy. They offer up-front support against the capital costs of residential and community energy schemes, rather than on-going subsidies.

CESP seeks to promote the measures which give households the biggest savings in fuel bill and carbon emissions, whilst CERT is designed to deliver CO_2 savings in the most cost-effective way.

Under CESP, energy suppliers and electricity generators will be required to achieve an overall carbon emissions reduction target, by means of promoting carbon-reduction measures to domestic energy users.

CERT was introduced in April 2008 as the successor to the Energy Efficiency Commitment. This measure also places an obligation on energy suppliers and electricity generators to promote energy savings measures in households. Here, the focus is mainly on cost-effectiveness, especially for low-income and vulnerable consumers.

Annex 1

Energy Efficiency Measure Summary by Country

Household Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
UK3	Reduction in VAT rate for energy saving materials	Ongoing	Fiscal/Tariffs	2000		Low
UK4	Home Energy Conservation Act 1995 and Energy Conservation Act 1996	Ongoing	Co-operative Measures	1996		Low
UK5	UK fuel poverty schemes	Ongoing	Financial	2000		Low
UK7	The Energy Saving Trust (various initiatives)	Ongoing	Financial, Information/Education	1992		High
UK11	Transco Affordable Warmth Campaign	Ongoing	Information/Education	2001		Low
UK13	Market Transformation Programme (inc. implementation of minimum standards and labelling for appliances)	Ongoing	Legislative/Normative	1994		High
UK14	Building Regulations (pre 2006)	Completed	Legislative/Normative	1995		High
UK17	Energy Efficiency Commitment	Completed	Financial	2002	2008	High
UK19	Building Regulations (2006)	Ongoing	Legislative/Normative	2006		High
UK20	Carbon Emissions Reduction Target & Suppliers obligation (Former EEC 3)	Ongoing	Financial	2008	2011	High
UK21	Energy Performance Certificates	Ongoing	Legislative/Informative	2007		High
UK22	Code for Sustainable Homes	Ongoing	Legislative/Informative	2007		Medium
UK23	Metering and Billing	Proposed (advanced)	Information/Education	NA		Medium
UK24	Act on CO_2 Campaign	Ongoing	Information/Education, Unknown	2007		Medium
UK26	Stamp Duty	Ongoing	Financial	2008	2012	Unknown
UK27	Household Sector: Microgeneration	Ongoing	Financial	2007		Unknown

Transport Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
UK1	Ten Year Plan for Transport	Ongoing	Infrastructure	2000	2010	Medium
UK2	Energy Saving Trust – Initiatives	Ongoing	Financial, Information/Education/Training	1996		Low
UK8	Graduated Vehicle Excise Duty	Ongoing	Fiscal	2001		Medium
UK9	Company Car Taxation	Ongoing	Fiscal	2002		Medium
UK10	Fuel Duty Levels	Ongoing	Fiscal	1993		High
UK13	Freight Facilities Grant	Ongoing	Infrastructure	1974		Low
UK16	Renewable Transport Fuel Obligation	Proposed (advanced)	Legislative/Normative	2008	N/A	High
UK17	Smarter Choices	Ongoing	Information/Education/Training	2005		Medium
UK19	Low Carbon Vehicle Partnership	Ongoing	Co-operative Measures	2003		Low
UK20	Transport Innovation Fund	Proposed (advanced)	Infrastructure	2008		Low
UK22	Grant Support Towards Light Rail Schemes	Ongoing	Infrastructure	1989		Low
UK24	Rail Technical Strategy	Ongoing	Infrastructure	2007		Medium
UK25	Eco-driving and the Act on CO_2 Campaign	Ongoing	Information/Education/Training	2007		Medium
UK26	Speed Limits	Ongoing	Legislative/Normative	1934		Low
UK27	New Vehicle Labels	Ongoing	Legislative/Informative	2005		Low
UK28	Speed Limit for Goods Vehicles and Buses	Ongoing	Legislative/Normative	2005		Low

Industry Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
UK5	The Enhanced Capital Allowance Scheme	Ongoing	Financial	2001		Medium
UK6	Climate Change Agreements	Ongoing	Co-operative Measures	2001		High
UK7	Integrated Pollution Prevention and Control (IPPC)	Ongoing	Legislative/Normative	2000	N/A	Medium
UK8	The Carbon Trust - (Various initiatives)	Ongoing	Financial, Information/Education/Training	2001		High
UK11	Emissions Trading Scheme – UK (and EU)	Ongoing	New Market-based Instruments	2002	2012	High
UK16	Climate Change Levy	Ongoing	Cross-cutting with sector-specific characteristics	2001		Medium
UK17	Combined Heat and Power (CHP)	Ongoing	Information/Education/Training	2008		Low

Tertiary Sector

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
UK1	Building Regulations (2006)	Ongoing	Legislative/Normative	2006		High
UK2	Carbon Trust - Various Initiatives	Ongoing	Financial	2001		High
UK4	Building Regulations (Pre-	Completed	Legislative/Normative	1995	2006	High

	2006)					
UK5	Climate Change Levy	Ongoing	Cross-cutting with sector-specific characteristics, Financial	2001		High
UK7	The Energy Saving Trust - (Various Initiatives)	Ongoing	Information/Education/Training	1992		Medium
UK11	The Enhanced Capital Allowance Scheme	Ongoing	Fiscal/Tariffs	2001		High
UK12	Carbon Reduction Commitment	Ongoing	Legislative/Informative	2009	2011	High
UK14	Metering and Billing	Proposed (advanced)	Legislative/Normative			Medium
UK15	Energy Performance Certificates	Ongoing	Legislative/Informative	2007		High
UK16	Climate Change Agreements	Ongoing	Fiscal/Tariffs	2003	2013	High

Cross Cutting

Code	Title	Status	Type	Starting Year	Ending Year	Semiquantitative Impact
UK4	Environmental Transformation Fund	Ongoing	Financial Measures	2008		Unknown
UK3	Climate Change Act	Ongoing	General Energy Efficiency / Climate Change / Renewable Programmes	2008		High
UK1	“Are You Doing Your Bit?” Campaign	Completed	Non-classified Measure Types	1998	2002	Low
UK2	Climate Change Communication Initiative	Ongoing	General Energy Efficiency / Climate Change / Renewable Programmes	2006	2009	Medium

Annex 2

Country Profile

Energy Efficiency Profile: United Kingdom

October 2008

Energy Efficiency Trends

Overview

The UK has seen a gradual improvement in energy efficiency, of approximately 12%, over the period 1990-2005 as illustrated by the overall ODEX index. This is due to improvements in all three of the sectors under consideration; industry, households and transport.

Industry

During the period 1990–2005 UK industrial energy efficiency has improved by around 16%, with steady overall year-on-year progress being made after an initial period of stagnation in the early 1990s. Within energy-intensive sub-sectors, the energy intensity of primary metals (iron/steel and non-ferrous metals) increased towards the end of the 1990s before starting to decline in recent years. Analysis of non energy-intensive sub-sectors suggests recent increases in energy intensity for the manufacture of textiles may have reached a peak, whilst food, equipment manufacture, chemicals and paper continue to fluctuate. Chemicals has exhibited a general downward trend, however since 2001 there has been a slight increase in the manufacture of paper.

Households

Overall household energy efficiency has improved by around 14% over the period 1990-2005. However, most of the improvement was seen in the early part of the 1990s and since this point rising service demand has acted to offset continued improvements in insulation and heating efficiency. Climate corrected fuel consumption per dwelling has also risen by approximately 10% over the period, although there are hopes that consumption will begin to plateau due to a gradual saturation of ownership for some appliances, coupled with continued efficiency improvements. In 2005 there was a slight improvement compared to 2004.

Transport

Transport energy efficiency has improved steadily over the period 1990–2005 by approximately 8%. This is due to a gradual improvement in car efficiencies, which are the dominant consumer of UK transport energy. However, some of these improvements in road and air transport have been counterbalanced by decreases in the efficiency of road freight transport.

Energy Efficiency Policy Measures

Institutions and programmes

The UK's Department for Environment, Food and Rural Affairs (Defra) published the new UK Climate Change Programme in 2006. A key part of the strategy is to put in place the legislative framework to deliver a low carbon economy. In November 2007 the Climate Change Bill was introduced into Parliament, which should create the clear and credible long-term legal framework required.

Defra is also the lead department for energy efficiency and for policy on combined heat and power (CHP). In June 2007 they published the UK Energy Efficiency Action Plan which sets out in detail the policy framework that has been put in place for improving efficiency across all sectors of the economy, in order to meet the UK energy saving target under the EU Energy End-Use Efficiency and Energy Services Directive of 9%. In addition, two government agencies, the Carbon Trust (CT) and Energy Saving Trust (EST) are responsible for improving energy efficiency and stimulating reductions in carbon emissions in the industrial/commercial and household/transport sectors respectively.

Industry

The EU ETS is the key mechanism to reduce emissions in energy intensive organisations, driving energy efficiency as a low-cost means of emission reduction. In 2001 the government introduced the Climate Change Levy, which is a tax on the energy use of the UK business and public sector. As part of the Levy package UK government signed Climate Change Agreements (CCAs) giving industries an 80% discount provided they meet agreed carbon reduction targets. The Government will also implement the Carbon Reduction Commitment (CRC) in 2009; this is a mandatory cap-and-trade scheme for large commercial and public sector organisations. Separately from these schemes, the Carbon Trust provides advice, as well as technical and financial assistance, for businesses wishing to improve energy efficiency.

Households and services

The EST is primarily responsible for promoting energy efficiency in the household sector. A key policy has been the Energy Efficiency Commitment (EEC), which put an obligation on UK energy suppliers to make energy savings amongst their customers. The first phase of EEC ran from 2002-2005, and a second phase ran until 2008. The Carbon Emission Reduction Target (CERT) replaced the EEC in April 2008, and extends the scope of the obligation to include microgeneration and behavioural measures. There are also centrally funded government schemes in England (known as Warmfront) and Wales, Scotland and Northern Ireland specifically aimed at alleviating fuel poverty via improvements in energy efficiency. In July 2007, the UK government published its 'Building a Greener Future: a Policy Statement' which confirmed its intention for all new homes to be zero carbon from 2016, with a progressive tightening of the energy efficiency components in building regulations by 25% in 2010, and by 44% in 2013, up to the zero carbon standard in 2016.

Transport

In April 2008 the Renewable Transport Fuel Obligations (RTFO) Order 2007 came into force, this requires that 2.5% of transport fuel must come from renewable sources in 2008-2009. The Government will consult later in 2008 on slowing down the proposed rate of increase in the RTFO in light of the concerns about biofuels. Other transport based policies include the introduction of variable vehicle excise duty (VED) and variable company car taxation; these are graduated to reflect the CO_2 emissions from cars, with lower rates for fuel efficient vehicles, and increases in rates for the least efficient.
Energy prices and taxes

Energy prices and taxes

The UK introduced the Climate Change Levy, (a tax on the business use of fossil fuel energy) in 2001. Companies that are part of CCAs and which successfully meet the conditions of their agreement are eligible for an 80% discount on the levy. UK businesses are also able to reduce their tax liability through the use of enhanced capital allowances on energy efficient goods and services; this provides businesses with a first year 100% tax allowance on designated energy efficient equipment investment. Value Added Tax on energy is currently at 17.5% with the exception of the domestic sector, which has a reduced rate of 5%.

Selected Energy Efficiency Measures

Sectors	Title of Measure	Since	CO_2 (1) (Mt)
Industry	Climate Change Agreements	2001	1.1
Industry	Carbon Trust programmes	2001	4.0
Industry	Carbon Reduction Commitment	2009	0.3
Industry	UK Emissions Trading Scheme	2002	1.1
All	Revised Building Regulations 2005/06	2006	0.7
Households	Fuel Poverty Schemes – Warm Front	2000	1.5
Households	Carbon Emission Reduction Target (CERT)	2008	3.6
Transport	Renewable Transport Fuels Obligation	2008	9.5
Transport	Voluntary commitments on CO_2 from Cars (2)	1995	8.4

Note: the above estimates are taken from the UK Energy Efficiency Action Plan, published July 2007.

[1] Estimated annual energy savings by end of 2010 unless stated otherwise.

[2] CO_2 savings are from voluntary commitments, graduated VED and changes in company car taxation