making business sense

British Gas Home Energy Report 2011

An assessment of the drivers of domestic natural gas consumption

February 2011

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About Cebr

The Centre for Economics and Business Research Limited ('Cebr') was established in 1992. It is a specialist economics consultancy with expertise advising private and public sector clients in the energy, transport and communications sectors on a range of issues including environmental, consumer, regulatory and competition policy matters. Cebr also has expertise in national and regional macroeconomic forecasting and undertaking economic impact assessments.

Disclaimer

Whilst every effort has been made to ensure the accuracy of the material in this document, neither Cebr nor the report's authors will be liable for any loss or damages incurred through the use of the report.

Authorship and acknowledgements

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London, February 2011

Foreword by British Gas

At the moment £1 in every £4 spent heating our homes is wasted due to poor insulation.

We know that households are finding their budgets stretched and, at a time of rising global commodity prices, this level of waste has to be tackled.

Households across the UK understand that installing basic energy efficiency measures such as insulation will cut their energy use but many are unaware of the level of savings they will make as a result.

That is why we commissioned the British Gas Home Energy Report. We wanted to understand the impact of energy efficiency on national gas consumption and, crucially, how it is impacting bills.

British Gas is uniquely positioned to understand energy use in Britain. We are the largest supplier of energy in the UK with 16 million customer accounts across the country. We service and repair 4 million boilers each year. And we are the largest supplier of energy efficiency products in the country.

We asked the Centre for Economics and Business Research to analyse 40 million British Gas customer meter reads over a four year period. This report, the largest ever independent investigation into domestic gas use, is the result of that analysis and its findings are stark.

British Gas homes have seen a 22 per cent decline in gas consumption on average, as more homes adopt energy efficiency measures, but within these numbers, there are still too many homes which have taken no action at all.

Those British Gas customers who did adopt simple energy efficiency measures, such as insulation, saved an average of £322 each year and saw a 44 per cent fall in their gas use between 2006 and 2010. These are real people saving real money right now. The falls in gas use follow three decades of rises and show the impact energy efficiency is having on British homes.

You may wonder why an energy company would actively seek to encourage people to use less energy. We firmly believe it is the right thing to do, and, as Britain's energy company, we want and need to be at the forefront of the UK's transition to low carbon homes and businesses.

I hope you will find this report informative and enlightening. Its key message is good news for British homes. Rising global energy prices don't have to translate into rising energy bills. Energy efficiency is making a big difference.

Phil Bentley

Managing Director, British Gas

Executive summary

Natural gas plays a vital role in modern Britain. It represents around two-fifths of final energy consumed and dominates the UK domestic sector.

Over much of the past forty years domestic gas consumption grew dramatically and currently stands at six times 1970 UK levels. Much of this total consumption includes gas used in electricity generation destined for the home.

Gas demand for direct household use for space heating, hot water and cooking also tripled over the same period. This rapid growth in domestic consumption was driven by population increases, larger numbers of households and higher standards of living.

Yet various energy efficiency measures meanwhile made significant - and increasingly effective – offsetting contributions to consumption.

Indeed the current trend over the past five years has been a sharp decline in gas use, which has fallen by 17 per cent across Great Britain. This decrease has been driven by:

- **Direct drivers** such as structural effects – which are influenced by the take up of energy efficiency measures, like energy efficient boilers, insulation and double glazing.

- **Indirect drivers** such as household income effects – which are influenced by changes in economic activity and consumer confidence – and lifestyle factors such as increased environmental awareness and climate change concerns galvanised by UK Government and energy supplier campaigns and supported by increased media coverage.

British Gas commissioned the Centre for Economics and Business Research ('Cebr') to assess the factors that have reduced domestic natural gas consumption over the last five years. The focus of this study is to determine the key drivers of natural gas consumption by utilising a British Gas analysis of domestic energy consumption based on 40 million meter readings from four million customers between 2006 and 2009.

This huge study sample represents two-fifths of all British Gas domestic gas accounts – or nearly a fifth of the entire national market.

Based on its own analysis British Gas has identified a substantial decline in domestic natural gas consumption over the last five years, with consumption declining by 22 per cent over the period 2006 to 2010 (compared to 17 per cent for Great Britain), equivalent to a saving of 5.47 million tonnes of CO_2.

This Cebr study examines recent domestic natural gas consumption declines in the context of the consumption modelling British Gas has undertaken while utilising econometric modelling techniques to understand the key drivers of underlying gas consumption. In addition, Cebr has constructed scenarios to better understand the drivers of domestic

natural gas consumption over the next five years in order to identify the potential domestic gas bill savings to households at national and regional levels.

The Great Britain domestic natural gas econometric model we have constructed is:

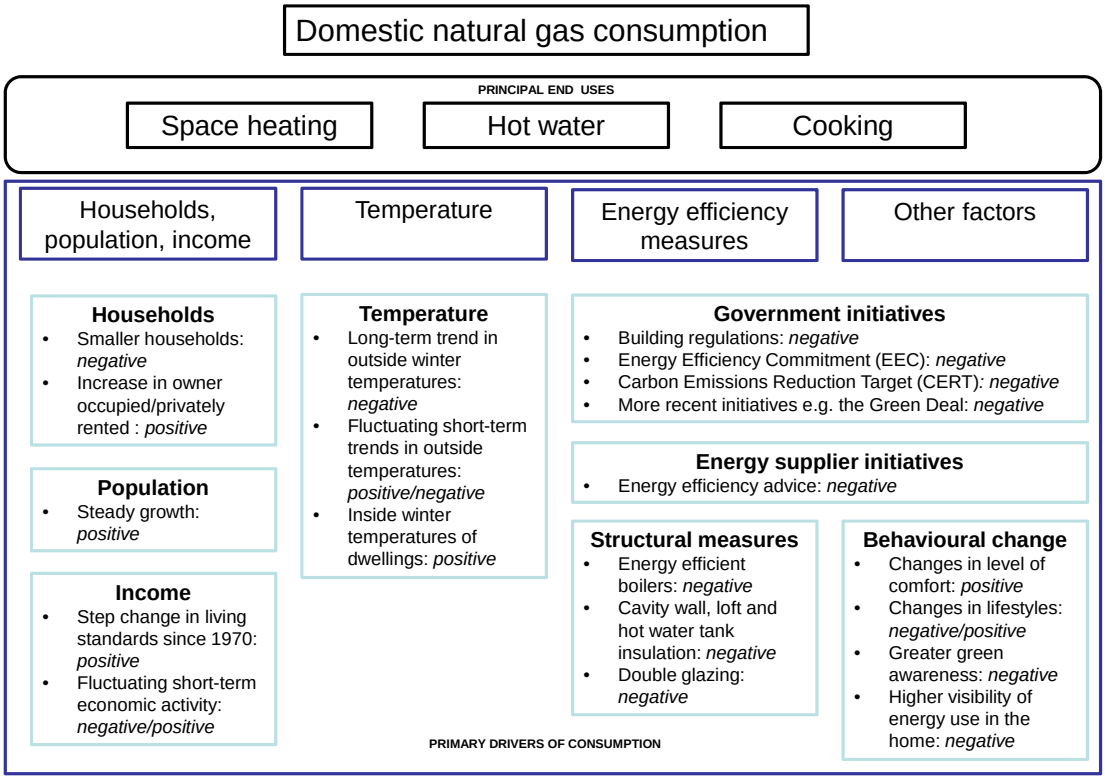
- Intuitive, transparent and easy to understand
- Produces an accurate simulation of domestic natural gas consumption which can be utilised for scenario analysis
- Developed independently by Cebr.

This report concludes that the predominant reason for reduced consumption is the improved adoption of energy efficiency measures such as installing A-rated boilers, cavity wall and loft insulation, as well as energy efficiency advice which leads to low or no cost measures, such as turning the thermostat down, and utilising pipe and floor insulation.

Key drivers

Overall, there are a number of distinct drivers of domestic gas consumption. Figure 1 illustrates the primary drivers over the last 40 years, highlighting whether the driver has had a positive and/or negative impact on consumption.

Figure 1: Principal end uses and primary drivers of UK domestic gas consumption



Source: Cebr

Key findings 2006 to 2010

Figure 2: Energy efficiency measures household natural gas consumption impacts amongst British Gas customers, annual percentage fall, 2006 to 2009

Source: British Gas, Cebr analysis

Table 1: Changes in domestic natural gas consumption amongst British Gas customers, annual percentage change, 2006 to 2010

	2006	2007	2008	2009	2010
Direct effects	***-3.3%***	***-3.3%***	***-3.3%***	***-3.3%***	***-3.3%***
Energy efficient boilers	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%
Loft and cavity wall insulation	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%
Energy efficiency advice[1]	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%
Indirect effects	***-1.6%***	***2.8%***	***-3.0%***	***-4.1%***	***-2.0%***
Economic	1.3%	5.7%	-0.1%	-1.2%	0.9%
Other factors	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%
TOTAL	**-4.9%**	**-0.5%**	**-6.3%**	**-7.4%**	**-5.3%**

Source: British Gas, Cebr analysis

- Actual domestic natural gas consumption of British Gas customers over the period 2006 to 2010 is on a clear downward trend with consumption falling at a compound rate of 4.9 per cent per year, with the following effects driving these changes.

[1] Refers to advice which predominantly leads to low or no cost measures, such as turning the thermostat down, and utilising pipe and floor insulation.

- **Direct drivers**

    - **Energy efficiency measures** – declines in domestic natural gas consumption are *directly* driven by structural energy efficiency measures implemented by households, with the main drivers being energy efficient boilers (representing around 36 per cent the total decline attributed to direct drivers), insulation (also representing around 36 per cent of the total decline) and energy efficiency measures, such as turning the thermostat down, and utilising pipe and floor insulation (representing around 27 per cent).

    - **Price effects** – throughout the period 2006 to 2010, domestic natural gas consumption is not directly influenced by changes in retail gas prices.

Indirect drivers

- **Income effects** – declines and increases in underlying consumption are *indirectly* driven by economic growth, households' incomes and consumer confidence. Changes in economic activity affect households' income and confidence, and ultimately their purchasing behaviour towards a range of goods and services, including energy and gas consumption usage.

- **Other factors** – declines in underlying consumption are *indirectly* driven by other factors including lifestyle changes and households' increasing awareness of green and climate change issues, in response to various Government led initiatives, for example the Energy Efficiency Commitment, the Carbon Energy Reduction Target programme, the Boiler Scrappage Scheme and more recently the Green Deal and mandated rollout of smart meters across Great Britain from 2012 onwards. Households switching payment method, particularly from credit to prepayment has also being identified as another factor

- For all but one year (2007), when income effects dominate, energy efficiency measures are the primary drivers of the decline in consumption.

- While energy efficiency measures taken by British Gas' customers account for the largest proportion of recent declines, economic and other factors also play a significant role in determining households' domestic gas usage.

- The total savings on domestic gas bills for British Gas customers implementing energy efficiency measures over the period 2006 to 2010 is equivalent to an annual saving of around £322. In aggregate, this equates to a total saving of around £1.1 billion, equivalent to an annual saving of around £227 million.

Scenarios 2011 to 2015

To forecast domestic natural gas consumption, we developed the following scenarios:

Table 2: Scenarios for British Gas customer base and British households, 2011 to 2015

Population	Scenario #			
	A No efficiency measures	B Energy efficient boilers only	C Cavity wall and loft insulation only	D All measures
British Gas customers	No further energy efficiency measures implemented between 2011 and 2015	600,000 new A-rated boilers installed annually	750,000 insulation installations annually	Both Scenarios B and C, including other measures
British households		All standard, back and non A-rated combination boilers replaced by A-rated boilers	All households suitable for loft and cavity wall insulation upgraded	

Source: British Gas, Cebr analysis

Table 3: Forecast impact on domestic gas consumption amongst British Gas customers if all measures implemented, annual percentage change

	2010 Actual	2011 Forecast	2012 Forecast	2013 Forecast	2014 Forecast	2015 Forecast
Direct effects	***-3.3%***	***-3.4%***	***-3.7%***	***-3.8%***	***-3.8%***	***-3.8%***
Energy efficient boilers	-1.2%	-1.2%	-1.2%	-1.3%	-1.3%	-1.3%
Loft and cavity wall insulation	-1.2%	-1.2%	-1.3%	-1.3%	-1.3%	-1.3%
Energy efficiency advice	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%
Smart meters	0.0%	-0.1%	-0.3%	-0.3%	-0.3%	-0.3%
Indirect effects	***-2.0%***	***-2.0%***	***0.7%***	***1.4%***	***2.1%***	***2.9%***
Economic	0.9%	0.9%	3.6%	4.4%	5.0%	5.8%
Other factors	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%
TOTAL	**-5.3%**	**-5.4%**	**-3.0%**	**-2.4%**	**-1.7%**	**-0.9%**

Source: British Gas, Cebr analysis

- Forecast natural gas consumption for British Gas customers is expected to continue its downward trajectory over the next five years, with structural energy efficiency measures being the dominant driver of the declines over the whole five year period.

- Other factors will continue to play an important role and reflect on-going initiatives such as the Carbon Energy Reduction Target, the Green Deal and mandated rollout of smart meters across Great Britain, which make an increasing contribution to reducing gas consumption over the forecast period.

- However, as the economy recovers, household incomes are expected to improve and, as confidence returns, this is likely to have an influence on domestic natural gas consumption.

- Crucially, our scenario analysis indicates the average total potential savings available on domestic gas bills for British Gas customers implementing all energy efficiency measures over the period 2011 to 2015 is equivalent to an annual saving of around £349. In aggregate, this equates to a total saving of around £1.4 billion, equivalent to an annual saving of around £276 million.

- Overall the aggregate savings to British households if all energy efficiency measures are implemented could be £6.2 billion, representing an annual saving for the nation of around £1.2 billion per year. Of the £6.2 billion, British Gas customers could save £3.6 billion, equivalent to around £714 million per year.

Implications and recommendations

Adoption of energy efficiency measures has had and will continue to have the greatest impact on domestic natural gas consumption and equates to significant savings for households and customers. It is therefore highly important that government and energy retail suppliers actively promote the uptake of energy efficiency measures.

In terms of the types of energy efficiency measures available, their almost equivalent impact on domestic natural gas consumption means value for money becomes a key consideration. This suggests households should first focus on insulation before turning to the other methods on offer. However, in order for the UK to achieve its onerous and demanding CO_2 targets by 2020 and beyond, it will ultimately be necessary to encourage the adoption of all the efficiency measures available.

Finally, a local approach towards promoting and encouraging the adoption of household energy efficiencies in high consumption regions of Great Britain would be the most effective way of rolling out such measures in order to maximise impact in reducing gas consumption.

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Contents

1 Introduction

In this chapter, we outline why British Gas commissioned Cebr to assess the factors that have had an impact on domestic natural gas consumption over the last five years. We then set out the structure of the report.

1.1 Context

British Gas commissioned Cebr to assess factors that have had an impact on domestic natural gas consumption over the last five years. The focus of this study is to determine the key drivers of natural gas consumption utilising a British Gas analysis of domestic energy consumption based on 40 million meter readings from four million customers over the period 2006 to 2009.

Based on its own analysis British Gas has identified a substantial decline in domestic natural gas consumption over the last five years. This report concludes that the predominant reason for reduced consumption is the improved adoption of energy efficiency measures such as installing A-rated boilers, cavity wall and loft insulation, and energy efficiency advice leading to low or no cost measures, such as, turning the thermostat down, and utilising pipe and floor insulation.

In order for the UK to achieve its onerous and demanding CO_2 targets by 2020 and beyond, it will ultimately be necessary to encourage the adoption of all the efficiency measures available. The UK Government's overarching policy is to enable households to reduce their energy consumption by improving energy efficiency. Initiatives such as the Carbon Energy Reduction Target, the Green Deal and mandated rollout of smart meters across Great Britain from 2012 onwards will revolutionise energy efficiency of British properties.

The active promotion of energy efficiency measures such as A-rated boilers, cavity wall, and virgin and top-up loft insulation as well energy efficiency advice will enable the consumer to deliver such efficiencies. The take-up of such measures will play an integral role in Britain's transition to a low carbon economy.

1.2 Structure of report

This report represents the Final Report of Cebr's assessment of the factors that impact on Britain's domestic natural gas consumption. Based on scenario analysis, our assessment quantifies for the period 2011 to 2015, the energy efficiency and household savings on a national and regional basis.

Our modelling and analysis incorporates comments from British Gas.

The Final Report is structured as follows:

- Section 2 outlines the significant role natural gas plays in Britain's economy in terms of total final energy consumed, and, in particular, its dominance as a form of energy

in the UK's domestic energy sector. We then consider the key drivers of Britain's significant gas consumption growth over the last 40 years and the likely causes of more recent declines.

- Section 3 outlines the underlying data, assumptions, and methodology utilised by British Gas to model consumption of its domestic gas customer base. We then present Cebr's key findings from its econometric modelling of the key drivers of domestic gas consumption over the period 2006 to 2009.

- Section 4 forecasts future consumption patterns for British Gas' customer base based on the econometric model we constructed in the previous chapter and test a number of scenarios which examine the potential efficiency savings for British Gas' customer base and for Great Britain as a whole.

2 Drivers of Great Britain's domestic gas consumption

In this chapter we first outline the significant role natural gas plays in Britain's economy in terms of total final energy consumed, and, in particular, its dominance as a form of energy in the UK's domestic energy sector. We then consider the key drivers of Britain's significant gas consumption growth over the last 40 years and the likely causes of more recent declines.

2.1 Great Britain's domestic gas consumption

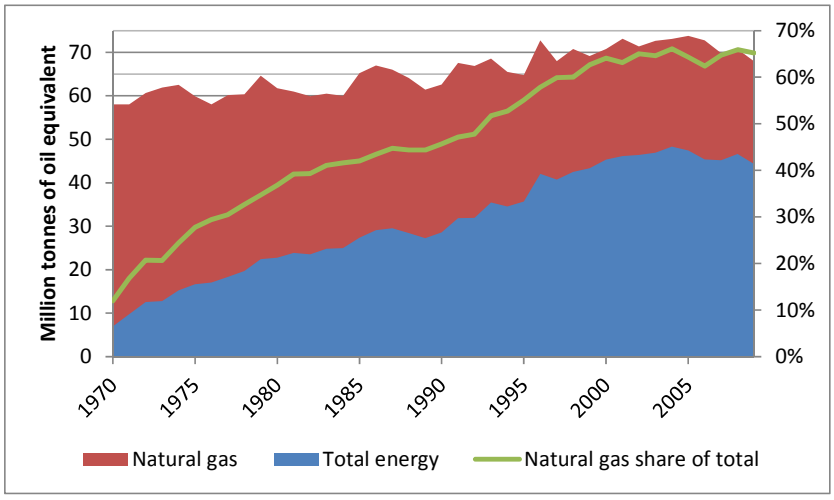
Natural gas plays a significant role in modern Britain. In 2009, natural gas represented around two-fifths (40.7 per cent) of all final energy consumed[2] in the UK, up from 5.4 per cent in 1970.

Natural gas is the dominant form of energy in the UK's domestic sector. In 2009, total primary domestic gas consumption was 44.3 million tonnes of oil equivalent, representing almost two-thirds (65.2 per cent) of the UK's total domestic energy consumption.

In the domestic sector, natural gas is used to heat homes, produce hot water and cook meals. Indirectly, it is also used to produce electricity consumed in homes to power a variety of appliances, from fridges, freezers, washing machines / driers and dishwashers to TVs, DVD players and home computers.

Overall, UK gas consumption for domestic energy use is over six times higher than 1970 levels[3], equivalent to a compound annual growth rate of 4.9 per cent. Figure 2.1 illustrates how gas consumption has changed over the last forty years on an unadjusted basis.

Figure 2.1: Total primary domestic gas consumption, 1970 to 2009



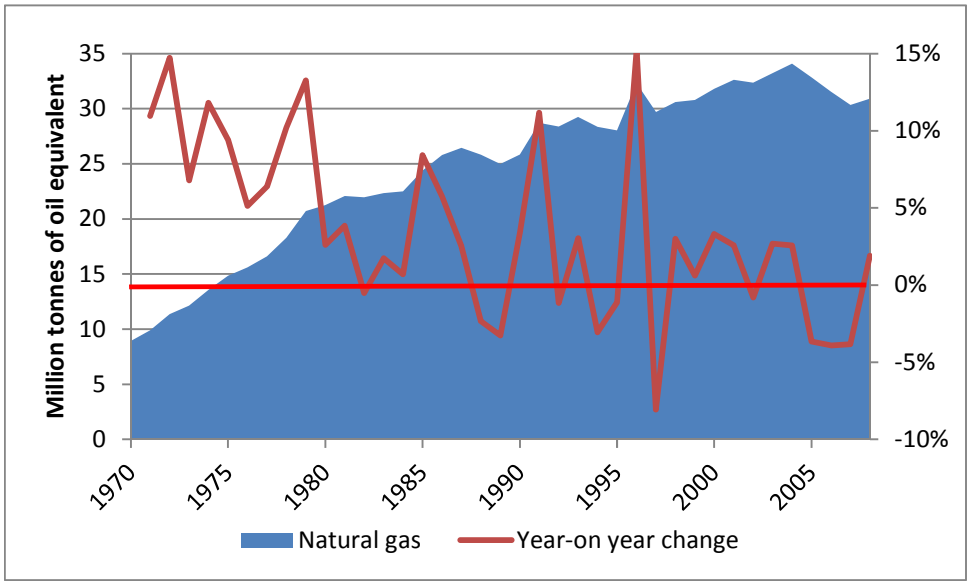
Source: Department of Energy and Climate Change (DECC)[4], Cebr analysis

[2] On a primary energy equivalent basis which represents the amount of fossil fuels and other natural resources required to produce the final energy consumed.

[3] On a primary energy equivalent basis.

The rapid increase in natural gas consumption is due to a number of factors. To understand the drivers of gas only demand by households, the increase in natural gas consumption due to its use in generating electricity needs to be stripped out by looking at domestic gas consumption for final end users. Figure 2.2 illustrates such consumption for the period 1970 to 2009.

Figure 2.2: Domestic natural gas consumption, 1970 to 2009



Source: DECC, Cebr analysis

Final gas consumption in the UK peaked in 2004 at 34.1 million tonnes of oil equivalent, representing a tripling on 1970 levels and around a third (31.9 per cent) higher since 1990.

However, in the noughties, growth slowed, with consumption increasing by 7.2 per cent between 2000 and 2004, equivalent to a compound annual growth rate of 1.7 per cent, and since the peak, final gas consumption has been on a clear downward trend having fallen by 15.5 per cent between 2004 and 2009 to 28.8 million tonnes of oil equivalent, representing a compound annual decline of around 3.3 per cent.

There are many distinct drivers of UK gas consumption. The purpose of the remainder of this chapter is to explore the following drivers of consumption:

- Households, population and income
- Temperature
- Energy efficiency measures
- Other factors e.g. government initiatives, increasing environmental awareness and climate change concerns

[4] Energy consumption in the UK, Domestic data tables, 2010 update

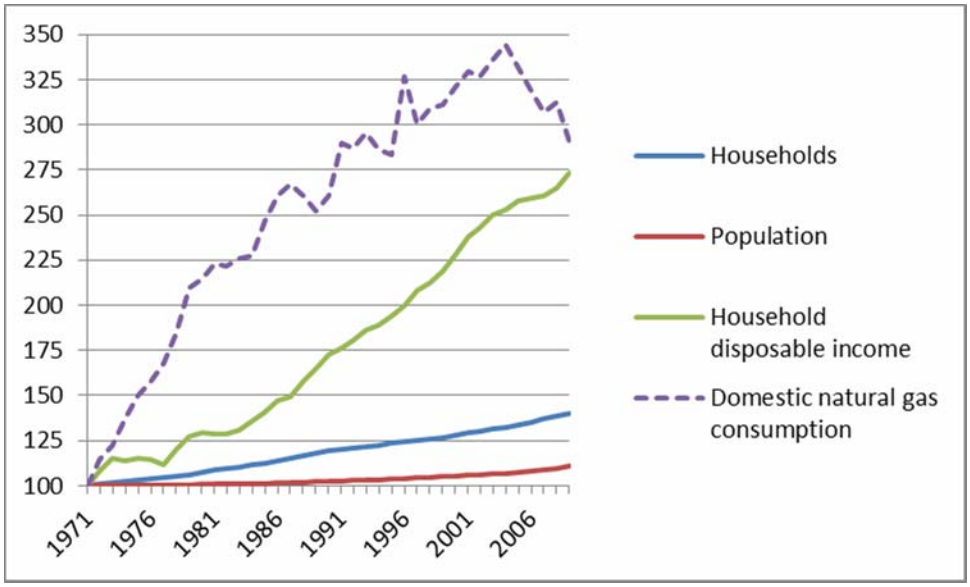
2.2 Households, population and income

2.2.1 Overall drivers

As illustrated in the previous section, Great Britain's domestic natural gas consumption by final users has increased at a compound annual rate of 3.0 per cent since 1970.

As illustrated in figure 2.3, such growth has been driven by factors such as increases in the population size, number of households and standards of living. Since 1971, the number of domestic households has increased by 39.9 per cent to 26.6 million in 2009; the population has increased by 10.6 per cent to 61.9 million and household disposable income increased by 173.5 per cent to £867.7 billion[5].

Figure 2.3: Overall drivers of domestic energy consumption (1971=100)



Source: DECC, Cebr analysis

Population and households

Whilst population growth has progressed steadily over the last 40 years, immigration played a significant role in driving up the rate of growth through the noughties. Growth in the number of households has notably outstripped population growth, with compound annual growth of 0.9 per cent[6] driven by social trends such as smaller household sizes, a reduction in the marriage rate and an increase in the divorce rate. Since 1979 the proportion of people who are married has steadily declined, from 50 per cent in mid-1979 to 40 per cent in mid-2009 while the proportion of divorced people has risen from 2 per cent in mid-1979 to 8 per cent in mid-2009. Hence, the average household size in England has declined from 2.84 in 1971 to 2.33 in 2008.

[5] 2005 prices

[6] For the period 1971 to 2009

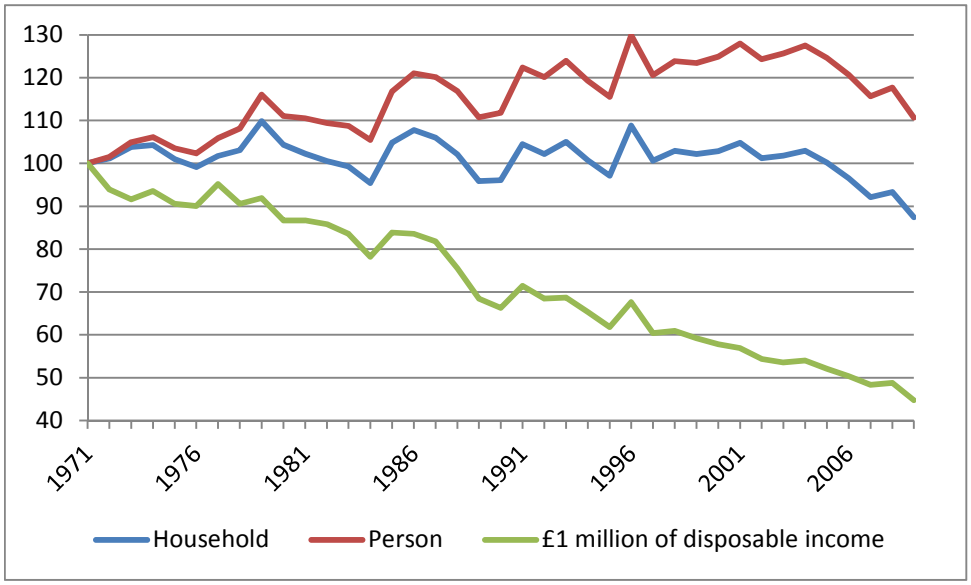
Household income

Finally, economic growth has driven up living standards. Real (i.e. adjusting for inflation) disposable incomes have increased at a compound annual rate of 2.7 per cent since 1971, allowing the volume of goods and services consumed to rise by 2.6 per cent on average each year; in 2006 prices real household consumption expenditure rose from £307 billion in 1971 to £815 billion in 2009.

2.2.2 Energy intensity

Looking at three different measures of energy intensity (i.e. energy consumption per household, person and £1 million of disposable income) illustrates how domestic energy consumption has changed over the last 40 years.

Figure 2.4: Energy intensity 1971 to 2009 (1971=100)



Source: DECC, Cebr analysis

Overall, between 1971 and 2009:

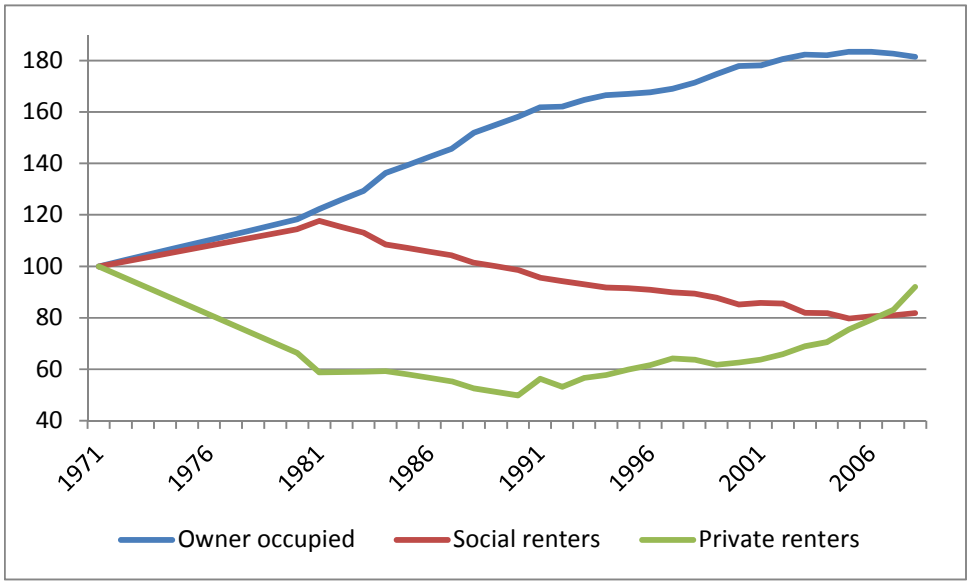
- By household, consumption has fallen by 12.6 per cent
- By population, consumption has increased by 10.6 per cent
- By household income, consumption has fallen by 55.3 per cent

Looking forward, many of the trends driving the growth in gas consumption can be expected to continue. The Office for National Statistics' latest population projections imply that the UK's population will reach 71.6 million in 2033, or annual growth at 0.6 per cent.

In addition, the trends supporting the shift towards a large number of households are expected to continue. The Department for Communities and Local Government projects that average household size in England will continue its downward descent to reach 2.16 by

2033. Hence, the number of UK households will reach 32.8 million in 2033; some 6.8 million more households than in 2008, or average annual growth in the number of households of 0.9 per cent. The shift towards owner occupied and privately rented properties illustrated in figure 2.5, which tend to use more energy, is expected to continue with the rapid growth of privately rented properties.

Figure 2.5: Household tenure, 1971 to 2008 (1971=100)

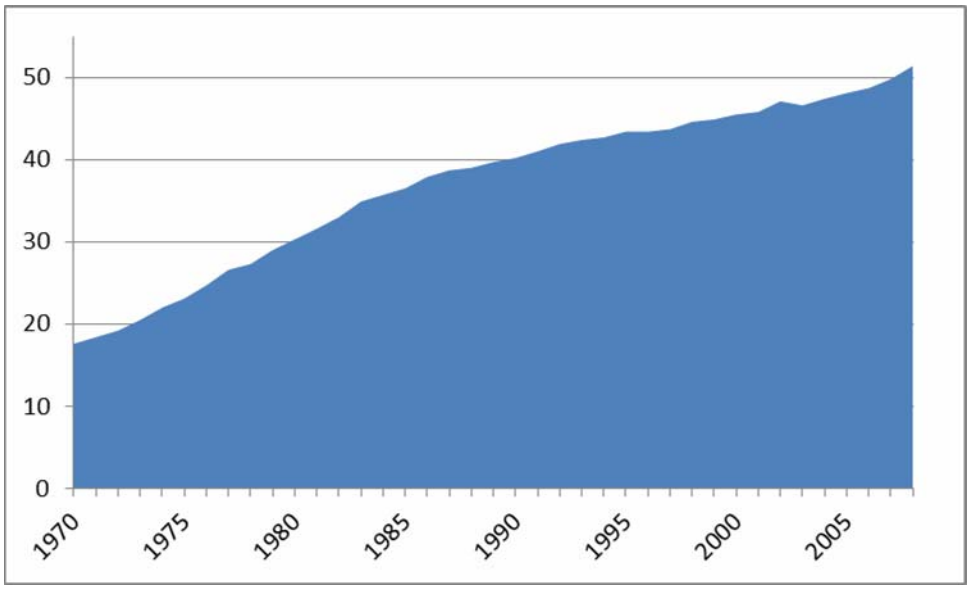


Source: DECC, Cebr analysis

Offsetting the shift towards smaller households and owner occupied/privately rented properties is the higher energy efficiency standards of the UK housing stock driven by building regulations[7] (as illustrated in figure 2.6), changing age profile (as illustrated in figure 2.7) and improving insulation of existing dwellings (see section 2.4).

[7] The overall aim of building regulations is to reduce home energy use and CO_2 emissions. In some areas, there are policies which require improvements that cut energy and emissions beyond the statutory minimum. Also, each time a dwelling is either purchased or rented by a new occupant, it is a legal requirement to provide that occupant with an Energy Performance Certificate. This illustrates the energy efficiency of the dwelling's heating/hot water system as well as fixed ventilation and lighting installations. The intention is for high levels of energy efficiency to a key feature of the attractiveness of the property to buyers and tenants.

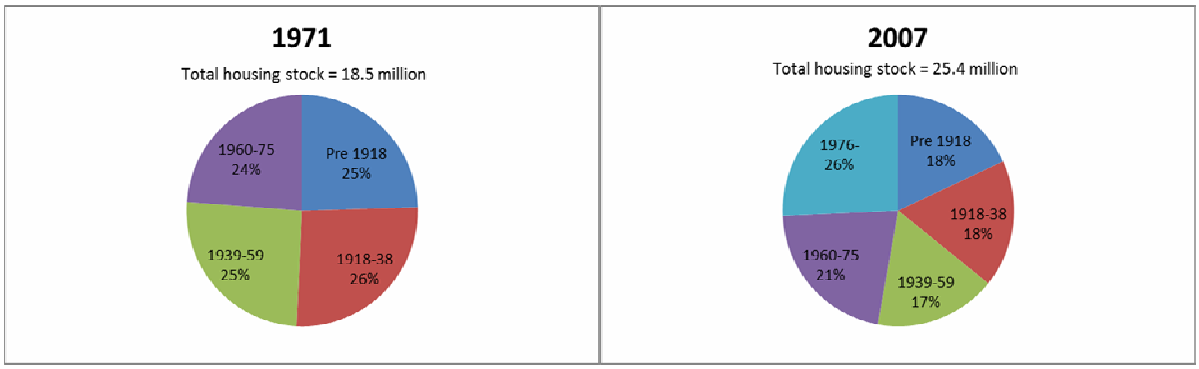
Figure 2.6: Standard Assessment Procedure (SAP)[8] rating, percentage of dwellings, 1970 to 2008



Source: DECC, Cebr analysis

In 2007, newer housing stock (i.e. built after 1976) represented just over a quarter (25.7 per cent) of the total housing. However, in absolute terms, there are still a significant number of properties (4.6 million) which were built prior to 1918, representing just under a fifth (18.0 per cent) of the total housing stock.

Figure 2.7: Date of construction of existing housing stock in Great Britain, 1971 and 2007



Source: DECC, Cebr analysis

Finally, while real household consumption expenditure slumped through the 2008-9 recession, falling by 4.9 per cent from peak to trough, growth returned in 2010. Going forward, consumption growth is expected to be constrained by the effects of the fiscal

[8] SAP is the Government's methodology for assessing and comparing the energy and environmental performance of dwellings. SAP assesses how much energy a dwelling will consume and how much carbon dioxide will be emitted in delivering a certain level of comfort and service provision, based on standardised occupancy conditions, enabling like-for-like comparisons of dwelling performance.

austerity in the short term, but Cebr expect consumption expenditure to reach £891 billion in 2015 and £984 billion in 2020, some 19 per cent higher than in 2010.

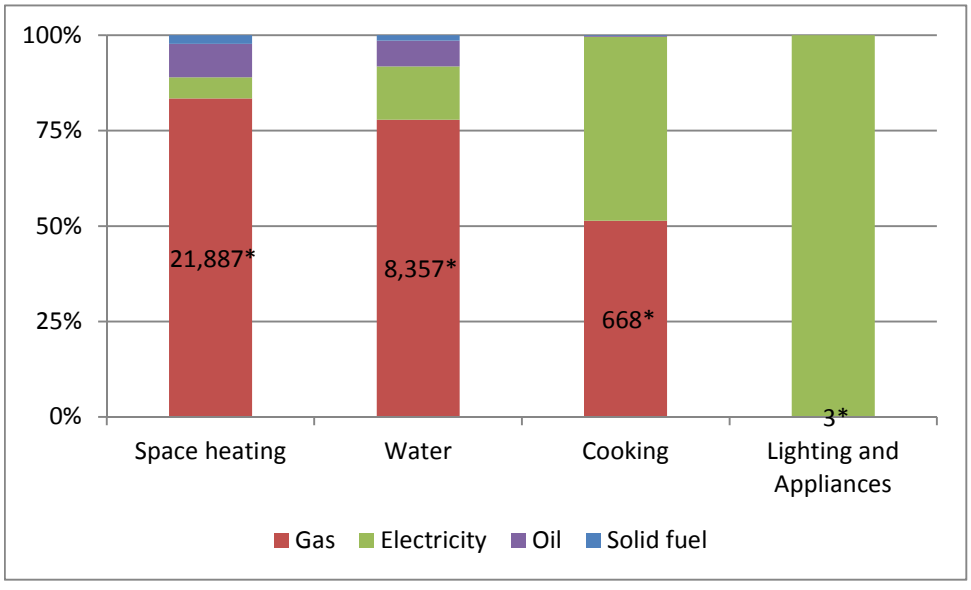
Hence, most of these factors will put upward pressure on domestic gas consumption in the coming years. However, it is notable that although many factors are placing upward pressures on domestic natural gas consumption, there has been a noticeable decline in consumption since the mid noughties.

Energy efficiency measures (discussed in section 2.4) have held down the rate of increase in UK domestic gas consumption and are likely to play a key role in containing growth in gas consumption going forward. This becomes especially vital for the UK economy as dynamic growth in emerging markets puts upward pressure on a range of commodity prices, including natural gas.

2.3 Temperature

Today, natural gas is predominantly used in the domestic sector for space heating, hot water and cooking[9]. It is also the dominant fuel for these end uses, accounting for over four-fifths (83.4 per cent) of total domestic energy consumption for space heating, 77.8 per cent for hot water and 51.4 per cent for cooking.

Figure 2.8: Domestic energy consumption by end use, 2008



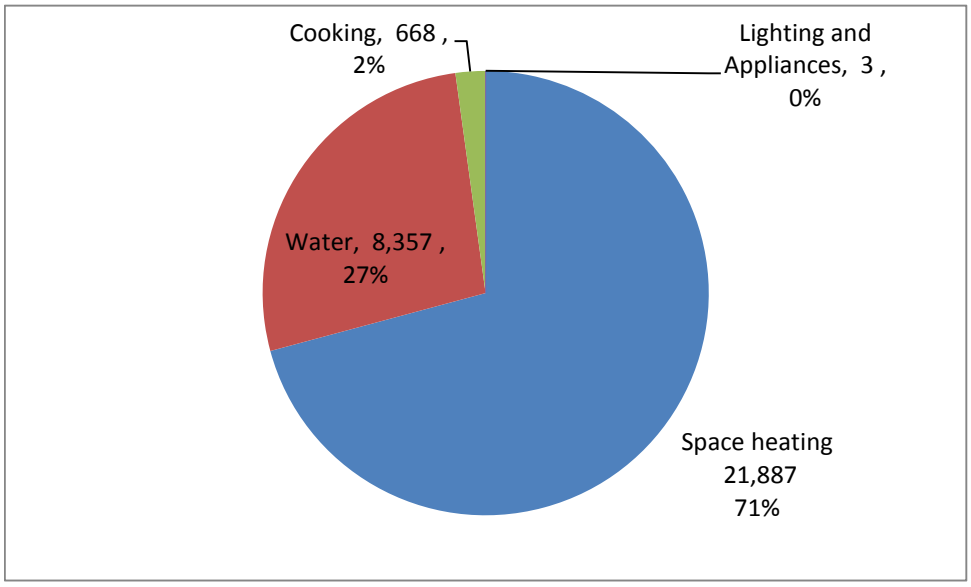
Source: DECC, Cebr analysis

Note: * Domestic gas consumption, Thousand tonnes of oil equivalent

[9] It is also used to a very limited extent for lighting appliances, with domestic gas consumption of around 3,000 tonnes of oil equivalent in 2008 (which is less than 1 per cent of total domestic gas consumption).

Of total domestic gas consumption, space heating and hot water account for the majority of gas consumed by domestic households.

Figure 2.9: Domestic gas consumption by end use, thousand tonnes of oil equivalent, 2008



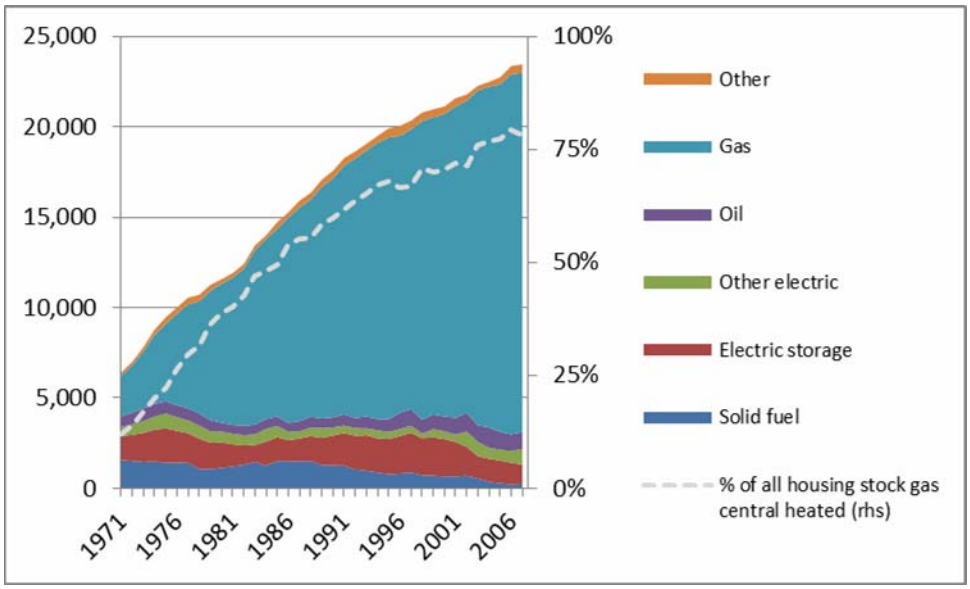
Source: DECC, Cebr analysis

As such, natural gas consumption in the domestic sector is dependent on (outside) winter temperatures, with domestic consumption exhibiting strong seasonal patterns. Within day consumption also varies according to the time of day, with domestic consumption peaking in the morning and evenings, when space heating and hot water boiler timers operate.

Whilst space heating is largely dependent on outside temperatures, other factors, such as increases in internal temperatures, the growth in central heating and the increasing number of households, have positively impacted consumption growth.

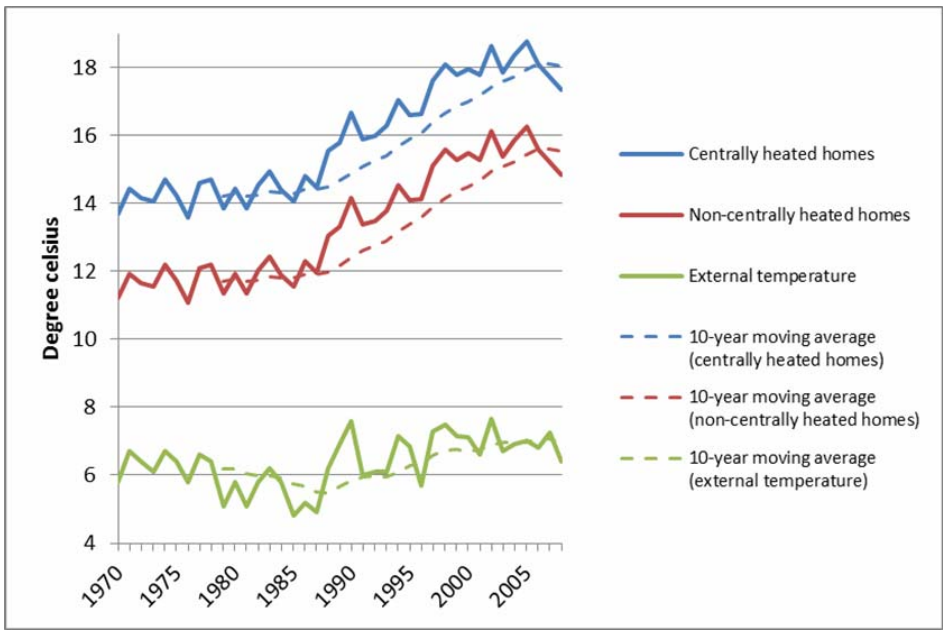
Nearly four-fifths (78.3 per cent) of all homes (equivalent to 19.9 million homes) were gas centrally heated in 2007 compared to just 12.1 per cent (equivalent to 2.3 million homes) in 1971. As a result average internal household temperatures have risen significantly from 13.7 degrees Celsius in 1970 to 17.3 degrees Celsius in 2008.

Figure 2.10: Centrally heated homes, thousands, 1971 to 2007



Source: DECC, Cebr analysis

Figure 2.11: Internal and external temperatures, 1970 to 2008



Source: DECC, Cebr analysis

Note: Average external temperature during January to March and October to December.

2.4 Energy efficiency measures

There are various energy efficiency measures which directly reduce natural gas domestic consumption, including:

- Energy efficient natural gas boilers
- Loft, cavity wall and hot water tank insulation
- Double glazing.

2.4.1 Energy efficient natural gas boilers

Boilers can be energy efficiency rated according to the average annual efficiency achieved under typical domestic conditions, taking into account assumptions regarding climate, housing conditions, occupancy patterns, controls and other factors.

Introduced in 1999, the Seasonal Efficiency of Domestic Boilers in the UK (SEDBUK) estimates the seasonal efficiency of boilers in the UK, and is used in SAP assessments. It is an annual average, calculated from full-load efficiency and part-load efficiency tests results and other data.

Although SEDBUK is expressed as a percentage, up until October 2010, an A to G scale of percentage bands was in use, with A being the most efficient and G the least[10].

With the current lifespan of a boiler around 12 years[11], replacing the existing inefficient stock of boilers would take a considerable time.

Various government initiatives and regulations have resulted in growth in energy efficient boilers.

From 2005 any new gas boiler installed at a property had to be high energy efficiency condensing boiler[12] and since October 2010 any new boiler must be A-rated.

The Government's Boiler Scrappage Scheme, introduced in January 2010, was open to households with working G-rated boilers[13] who could apply for a voucher entitling them to £400 off the price of an A-rated boiler[14]. The scheme closed at the end of March 2010, with 133,976 vouchers being issued and 117,373 grants being paid, equivalent to just under £47 million.

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[10] This banding has been withdrawn to avoid confusion with the proposed European energy label using similar ratings based on different principles.

[11] Energy Savings Trust

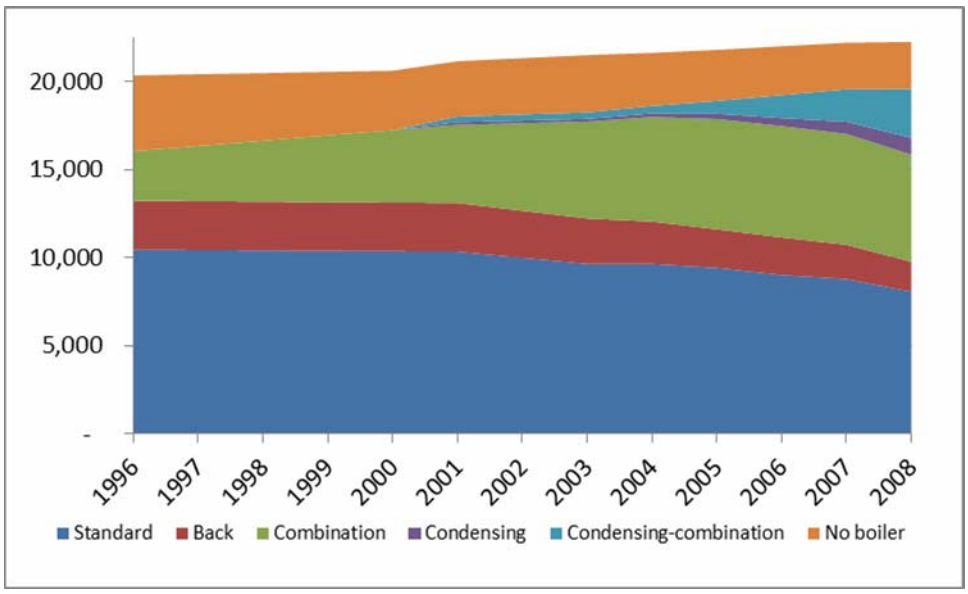
[12] A condensing boiler captures much more useable heat from its fuel than a non-condensing one.

[13] According to the Energy Savings Trust, around 4.5 million boilers are G-rated.

[14] The vouchers could also be used for renewable heating systems such as biomass boilers or heat pumps.

Figure 2.12 illustrates the changing make-up of the type of boilers installed in England, with a noticeable growth in A-rated boilers (i.e. condensing and condensing-combination[15] boilers) particularly from 2005 onwards.

Figure 2.12: Boiler types (England only), thousands of dwellings, 1996 to 2008



Source: DECC, Cebr analysis

Overall, the number of standard boilers has declined by just under a quarter (22.7 per cent) between 1996 and 2008, with a more marked decline in the number of back boilers, which was down by almost two-fifths (39.1 per cent).

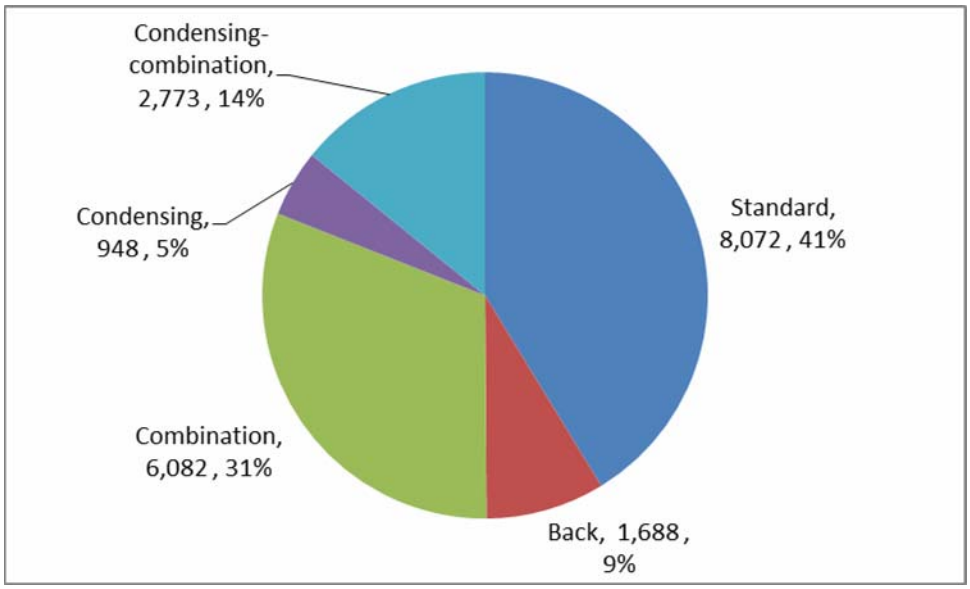
Combination boilers exhibited a rapid increase from 2.8 million in 1996 peaking at 6.3 million in 2006. However, since then the shift to A-rated condensing-combination boilers has resulted in the number of 'traditional' combination boilers falling by 3.6 per cent to 6.1 million in 2008.

The number of A-rated boilers has increased dramatically since 2001, with an annual rate of growth of 25.4 per and 31.1 per cent for condensing and condensing-combination boilers respectively between 2001 and 2008. This annual rate of growth has increased since 2005, reflecting Government energy efficiency regulations, energy retail supplier initiatives and customer pull in recognition of the cost savings available from reducing their energy use, and greater awareness of the environmental impact of carbon emissions.

Despite the rapid growth in the number of installed A-rated boilers, the number of inefficient boilers (i.e. condensing and condensing-combination boilers) with a rating worse than A is significant. Overall, in 2008, just over four-fifths (81.0 per cent) of all boilers installed could be classed as 'inefficient'.

[15] A condensing-combination boiler is a specific type of condensing boiler which generates water on demand for space heating and hot water, reducing the need for a hot water tank.

Figure 2.13: Breakdown of boiler types, thousands of dwellings, 2008



Source: DECC, Cebr analysis

2.4.2 Loft, cavity and hot water tank insulation

Insulation is an energy efficiency measures that prevents heat loss from dwellings, hot water tanks and pipes and therefore reduces the amount of energy required to heat the home and hot water. The three main types of insulation are loft, cavity wall and hot water tank insulation. Other insulating measures include draught stripping and radiator panels.

Overall, in terms of three main types of insulation, in 2007:

- 95.0 per cent of households that are suitable[16] had **loft insulation**, up from 51 per cent in 1976. However, not all homes have lofts that can be insulated. For example, flats and homes with loft conversions. In 2007, 77.9 per cent of households were suitable for loft insulation.

- 48.1[17] per cent of households with cavity walls[18] had some form of **cavity insulation**, up from 3.8 per cent in 1976. However, not all homes are built with cavity walls making them unsuitable for insulation. For example, Victorian homes tend to have solid walls.

- 94.4 per cent household with hot water tanks[19] had **hot water tank insulation**. Not all homes have hot water tanks. The popularity of combination boilers since the

[16] Equivalent to 19.8 million households

[17] 2008 figure

[18] Equivalent to 18.0 million households

[19] Equivalent to 19.3 million households

1980s has seen the percentage of all households with a hot water tank decline from a peak of 91.2 per cent 1988 to 75.9 per cent in 2007.

The relatively high take-up of these energy efficiency measures reflects building regulations and government initiatives collectively aimed at reducing household energy consumption.

The Energy Efficiency Commitment (EEC) was a set of obligations set out by the British energy sector regulator, the Office of Gas and Electricity Markets, requiring certain gas and electricity suppliers to meet an energy saving target in domestic properties.

The first phase – referred to as EEC1 – ran from 2002 to 2005, with the second phase, EEC2 running from 2005 to 2008. Table 2.1 illustrates the number of insulation measures installed at dwellings over the period 2002 to 2008.

Table 2.1: Number of EEC insulating measures installed and their energy savings, EEC1 (2002 to 2005) and ECC2 (2005 to 2008)

	EEC1			EEC2		
Measure	Number of measures installed	Energy savings (GWh)	% of total energy saved	Number of measures installed	Energy savings (GWh)	% of total energy saved
Cavity wall insulation	791,524	25,069	51.7%	1,760,829	76,654	55.2%
Loft insulation (virgin)	226,245	9,697	20.0%	490,770	31,005	22.3%
Loft insulation (top-up)	528,496	4,139	8.5%	1,297,257	19,086	13.7%
DIY loft insulation (m^2)	15,979,367	8,101	16.7%	31,982,937	9,073	6.5%
Solid wall insulation	23,730	973	2.0%	41,319	2,209	1.6%
Hot water tank jackets	195,832	434	0.9%	231,854	507	0.4%
Draught stripping	22,743	39	0.1%	30,299	70	0.1%
Radiator panels (m^2)	38,878	13	0.0%	62,160	8	0.0%
Other insulation (m^2)	2,625	21	0.0%	1,460,359	230	0.2%
TOTAL	-	48,486	100.0%		138,842	100.0%

Source: DECC, Cebr analysis

Of the 48,486 GWh of the energy savings achieved during EEC1 from insulating measures, just over half (51.7 per cent) can be attributed to cavity wall insulation and 45.2 per cent by loft insulation measures (i.e. virgin, top-up and DIY). EEC2 achieved estimated energy savings of 138,842 GWh from insulation measures, almost tripling the amount of energy saved, with again over a half (55.2 per cent) attributed to cavity wall insulation and 42.5 per cent by loft insulation measures.

The Carbon Emissions Reduction Target (CERT) replaced EEC2 as the Government's domestic energy efficiency obligation on energy suppliers from 1 April 2008 until December 2012[20]. The CERT programme set an obligation on energy suppliers with 50,000 or more domestic consumers to reduce carbon dioxide emissions by promoting energy efficiency and micro renewables to domestic energy users. Since CERT was implemented, insulation is the main measure that has been delivered, accounting for 62 per cent of total CO_2 savings delivered by all of the measures implemented since the start of CERT. According to the

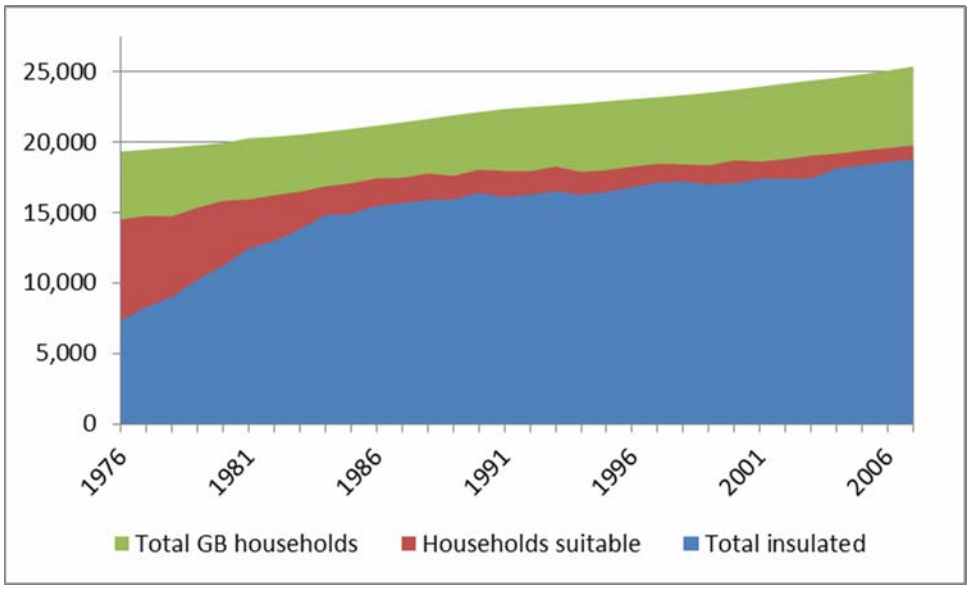
[20] CERT was restructured in June 2010, with the obligation on energy companies extended from March 2011 to December 2012.

latest Ofgem E-Serve CERT Update published in December 2010, 3.21 million insulation measures have been installed (broken down into 1.43 million cavity wall insulation measures; 1.75 million loft insulation measures and 0.03 million solid wall insulation measures).

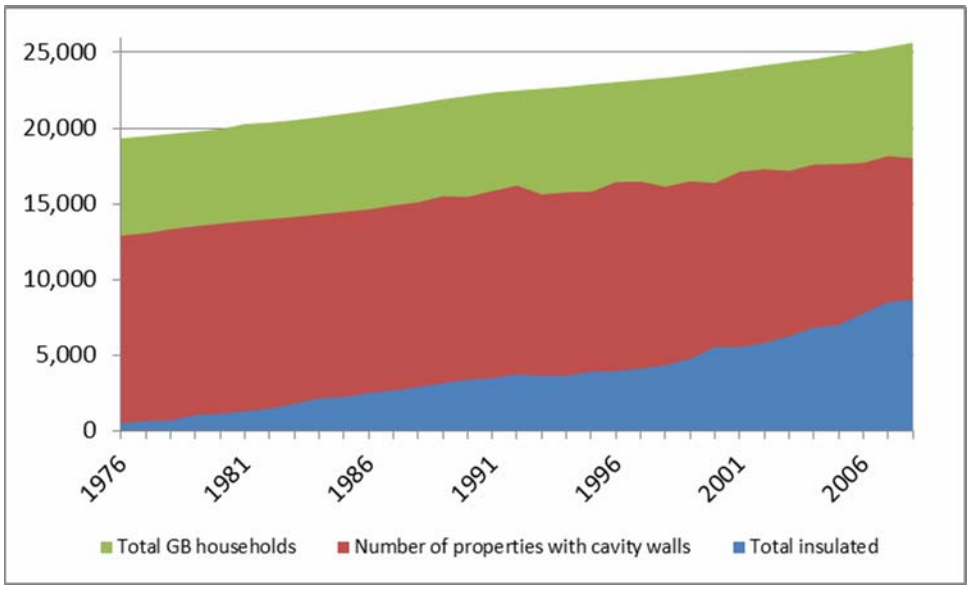
Figure 2.14 illustrates GB households with insulation broken down into loft, cavity wall and hot water tank insulation. Each graph highlights that not all households are suitable for some or all of the measures. This is due to the dwelling having no loft e.g. flats, loft conversions; having no cavity walls e.g. Victorian dwellings, certain flats; and / or no hot water tank, due to the property utilising a combination boiler for its hot water needs.

Figure 2.14: GB households with insulation by type, thousands

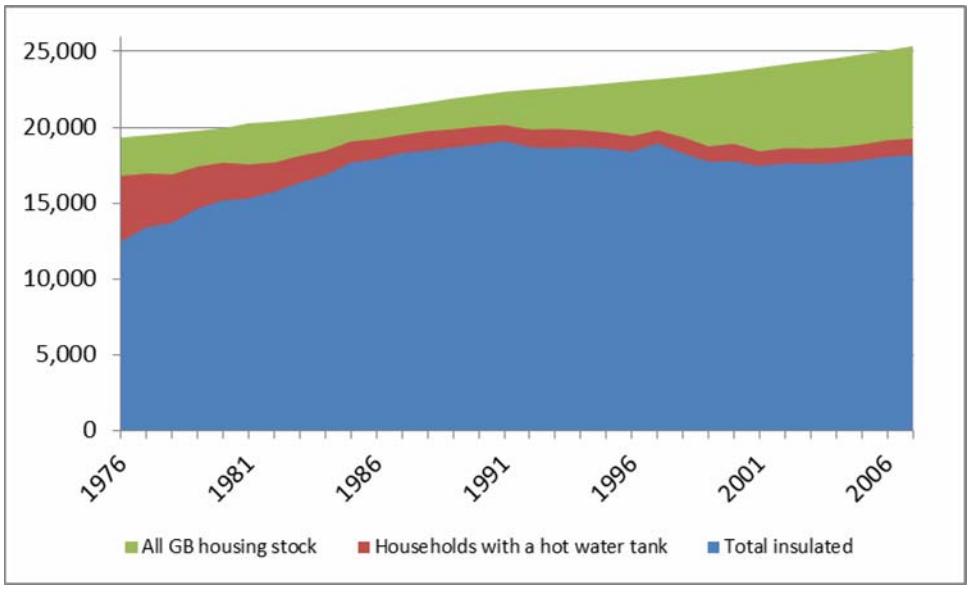
Loft insulation, 1976 to 2007



Cavity wall insulation, 1976 to 2008



Hot water tank insulation, 1976 to 2007

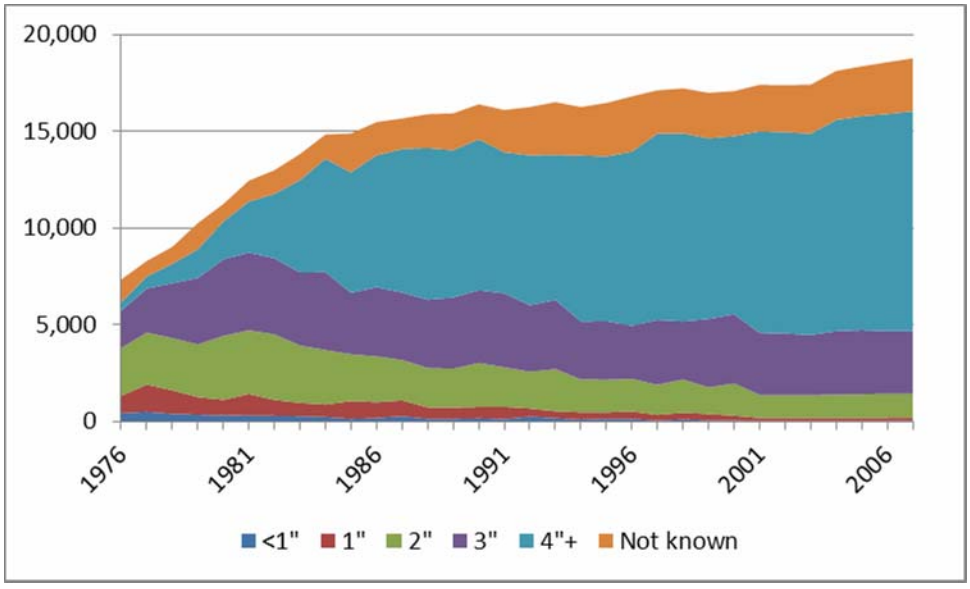


Source: DECC, Cebr analysis

Looking at the depth on the insulation for loft and hot water insulation, illustrates that whilst the vast majority of insulation is now installed at the higher depths, current initiatives[21] indicate there is still substantial scope for households with insufficient levels of insulation to top this up in order to reap the substantial energy efficiency benefits available via this relatively low cost measure.

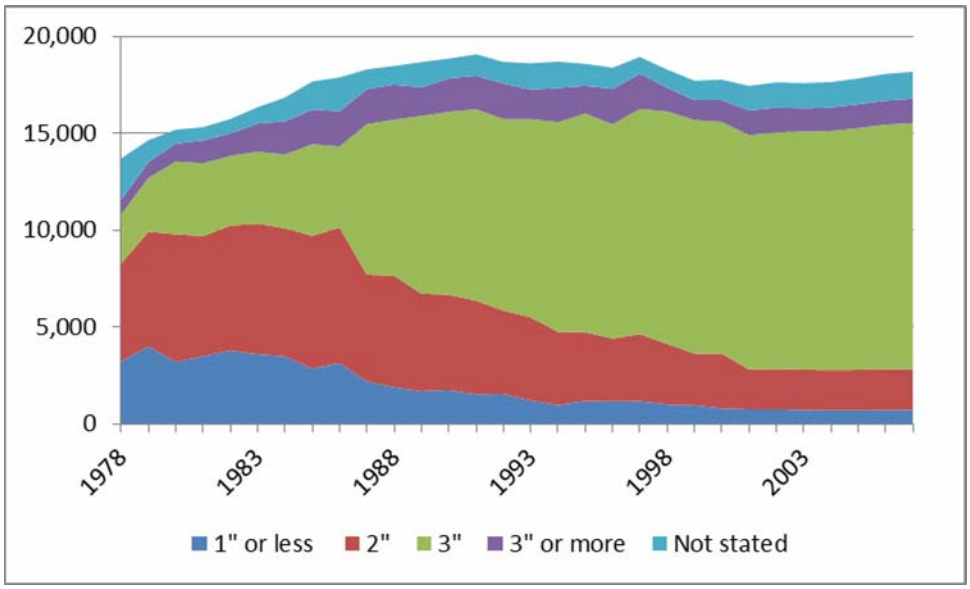
Figure 2.15: Depth of loft and hot water insulation in Great Britain, thousands

Loft insulation, 1976 to 2007



[21] For example, the Energy Saving Trust recommends that households have 270mm (10.6 inches) depth of mineral wool insulation. It estimates there are around 12.9 million lofts that do not have the recommended depth of insulation.

Hot water tank insulation, 1978 to 2007



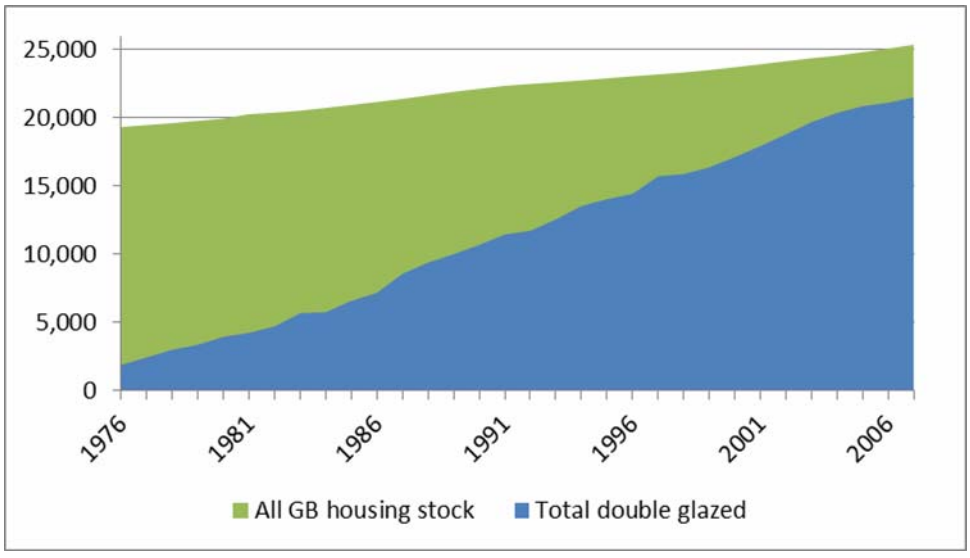
Source: DECC, Cebr analysis

2.4.3 Double glazing

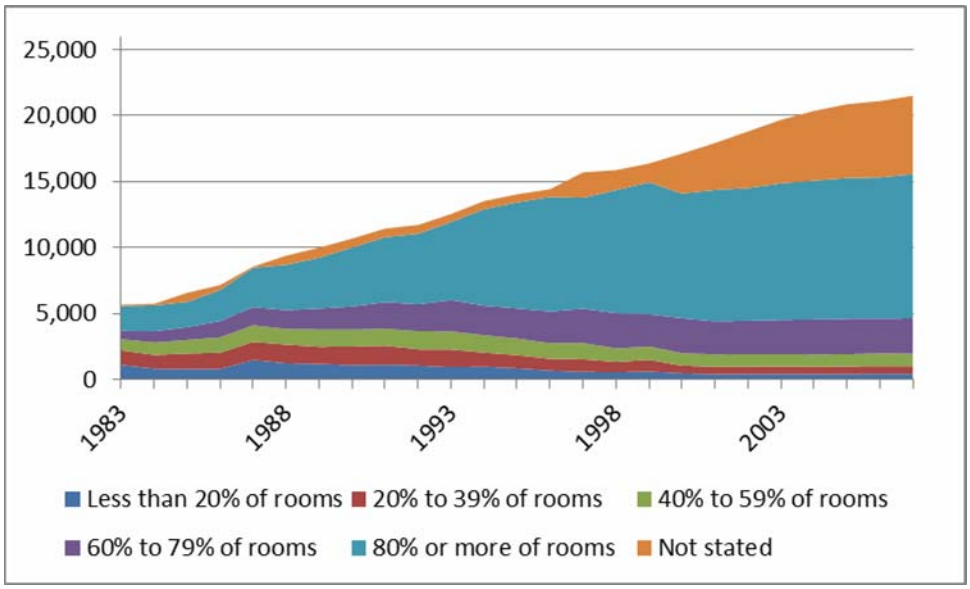
In terms of double glazing, 84.8 per cent of households had double glazing in 2007, up from 9.7 per cent in 1976.

Figure 2.16: Ownership of double glazing in Great Britain, thousands, 1976 to 2007

Total double glazed



Proportion of dwelling doubled glazed



Source: DECC, Cebr analysis

Looking at the total number of rooms double glazed, there is still scope for certain households to extend this measure to the whole property in order to reap the substantial energy efficiency benefits.

2.5 Other drivers

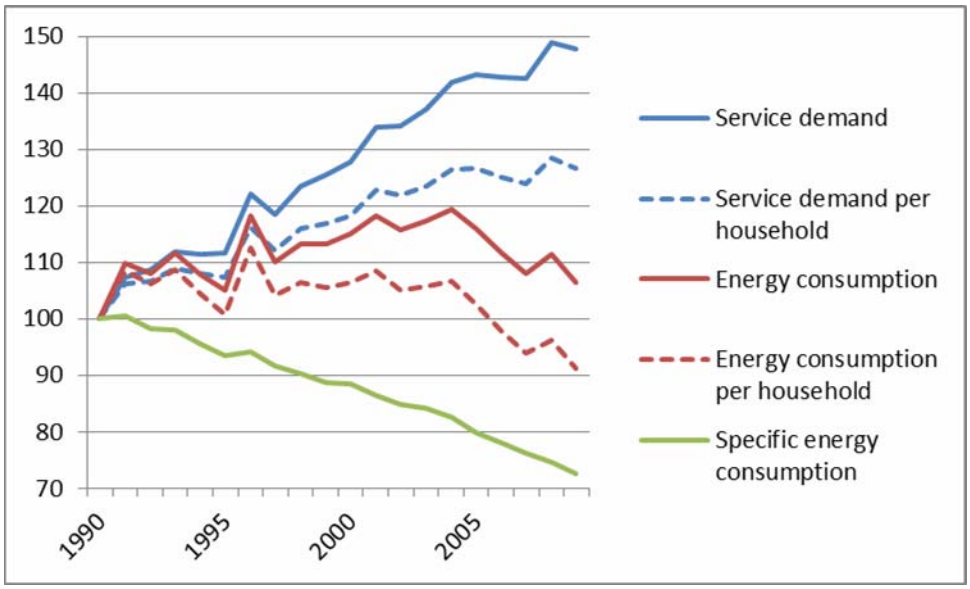
Changes in natural gas domestic consumption can also be partly explained by other drivers, notably:

- Changes in level of comfort and lifestyle requirements of households
- Changes in lifestyles
- Increasing environmental awareness and climate change concerns

2.5.1 Changes in levels of comfort and lifestyle requirements

Energy service demand reflects changes in the level of comfort and lifestyle requirements of households. Specific energy consumption reflects the energy required to maintain a particular level of energy service in households, and takes into account changes in demand for individual energy services (for example, level of household comfort and hot water use).

Figure 2.17: Specific energy consumption for households, 1990 to 2009 (1990=100)



Source: DECC

Over the whole period, on a household basis, increasing service demand reflects households' increasing comfort and lifestyle requirements, although this has recently tailed off from its peak in 2008.

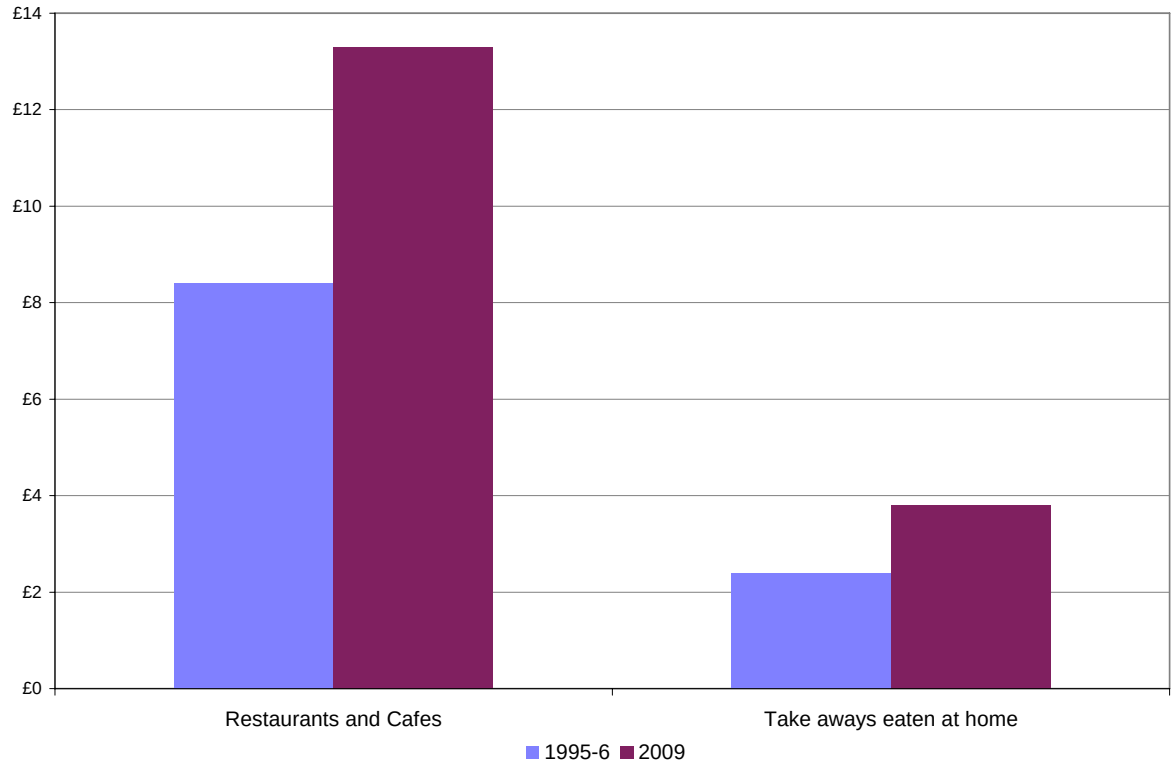
Both service demand and energy consumption are dominated by space heating, which fluates, as illustrated earlier, according to temperature.

On the other hand, specific energy consumption, which is dominated by cumulative insulation levels and boiler efficiencies, has fallen dramatically by over a quarter over the whole period, relecting the various energy efficiency measures households are adopting.

2.5.2 Changes in lifestyles

More convenience foods are now consumed and people eat out more regularly than in the past. In 2009, the average household spent £17.10 per week on restaurant and takeaway food, equivalent to £445 million per week across the United Kingdom. This has increased substantially over time, a factor that will have put downward pressure on the demand for domestic gas consumption. Data from the Office for National Statistics illustrate the trend: in 1995-6 the average UK household spent £2.40 per week on takeaway meals eaten at home and £8.40 per week at restaurants and cafes. This rose to £3.80 per week and £13.30 per week respectively by 2009; both up by around 58 per cent. This is illustrated in figure 2.18 below.

Figure 2.18: Changes in lifestyle: average amount spend on eating by average UK households, £ per week

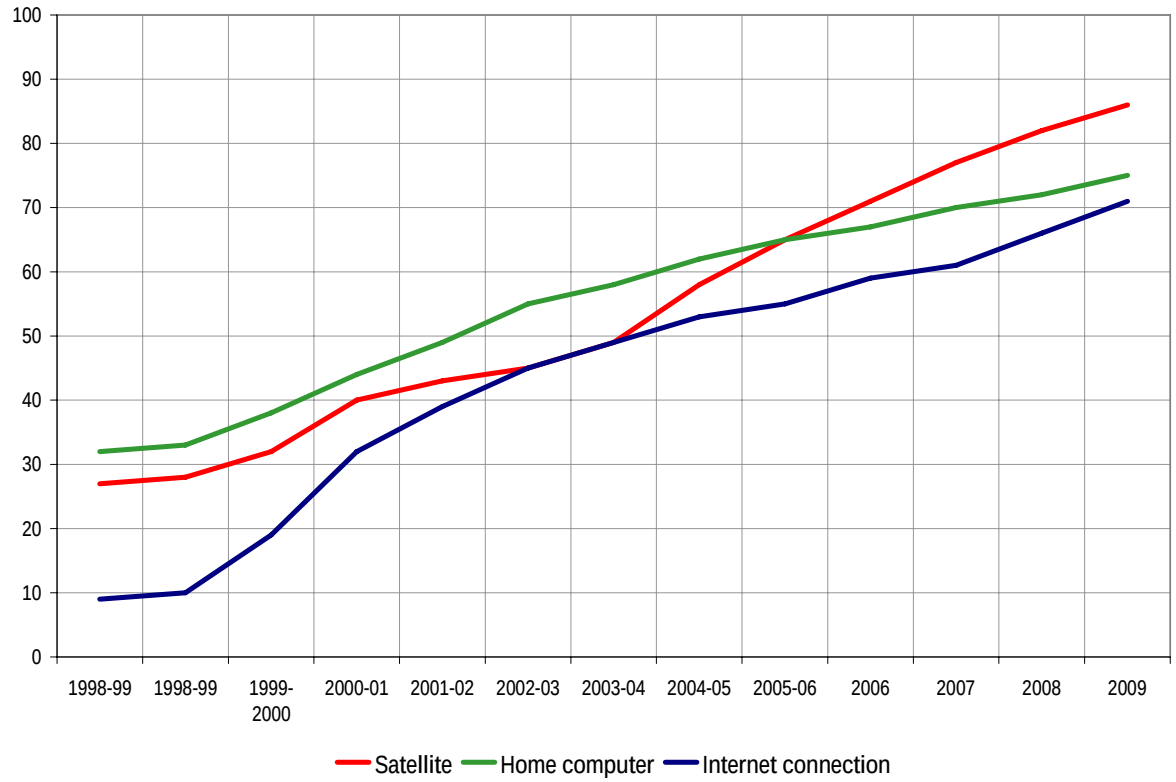


Source: ONS

While the trend towards eating out and takeaway will bear down on demand for domestic gas consumption, other trends may be working in the opposite direction. Over the last twenty years, the personal computer, widespread use of the internet and increased ownership of satellite television have all emerged. Personal computer ownership has risen dramatically from 13 per cent in 1985 to 75 per cent in 2009. Notably, the share of households with access to internet at home reached 71 per cent in 2009, up from 9 per cent in 1998-9. In 2010, 30.1 million adults in the UK (60 per cent) accessed the Internet every day or almost every day; nearly double the estimate in 2006 of 16.5 million.[22] The share of UK households with a digital, cable or satellite television receiver has risen from 19 per cent in 1996-7 to 86 per cent in 2009. Figure 2.19 below illustrates these changes. These trends together point to an increased tendency for home entertainment and hence need for household heating and gas consumption.

[22] ONS Internet Access 2010

Figure 2.19: Share of households owning durable goods, percentage of all UK households



Source: ONS Family Spending

2.5.3 Increasing environmental awareness and climate change concerns

It also appears likely that other behavioural changes by households have also started to have impacts on domestic natural gas consumption.

A 2009 survey of public attitudes and behaviours towards the environment, published by the Department for Environment, Food and Rural Affairs, provides a representative picture of what individuals in England think on a range of environmental issues, including attitudes towards the environment and energy use in the home.

The survey confirmed that most individuals have some knowledge of climate change, with the majority of respondents saying they knew either 'a lot' or 'a fair amount' about climate change (61 per cent), global warming (65 per cent) and carbon dioxide emissions (52 per cent).

The survey also confirmed an increase in the proportion of individuals willing to do things to help the environment:

- 47 per cent of respondents said they would a bit more to help the environment, compared with 43 per cent in 2007

- 27 per cent said they were environmentally-friendly in most or everything they did, compared with 19 per cent in 2007
- 47 per cent said they did quite a few things that are environmentally-friendly, compared with 41 per cent in 2007.

In terms of energy (and water) use in the home, 77 per cent of respondents disagreed with the statement 'I don't really give much thought to saving energy in the home' compared with 62 per cent in 2007.

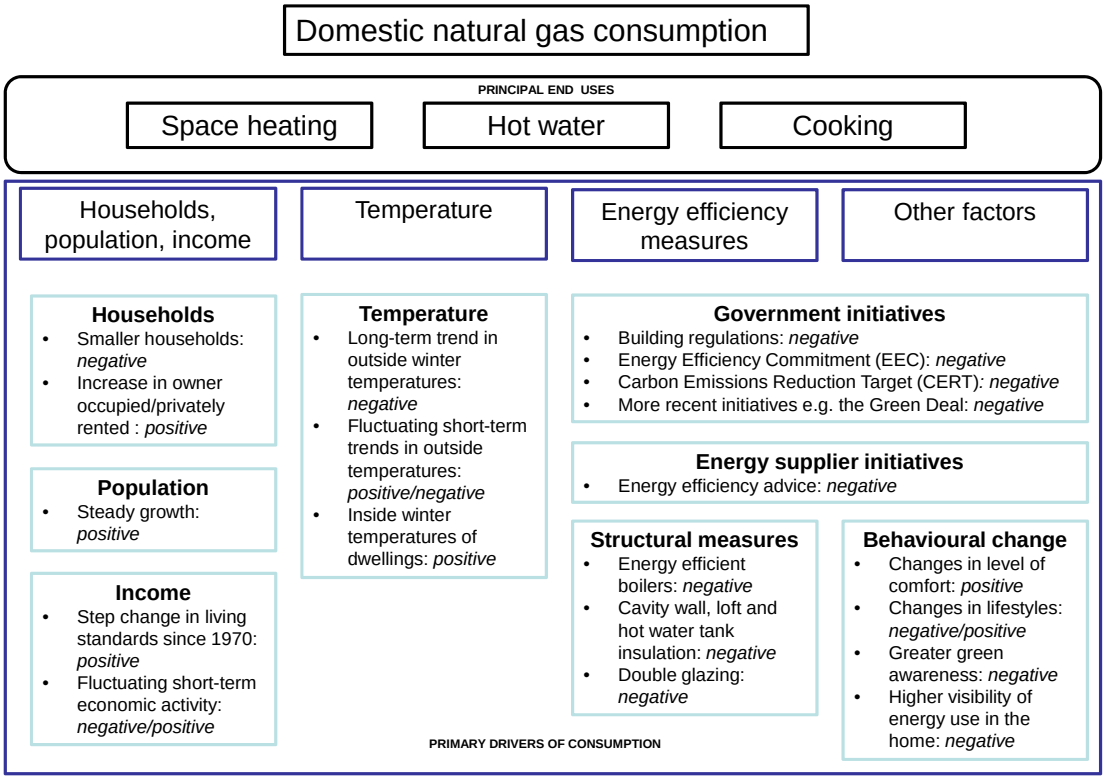
In terms of energy savings behaviour in the home:

- 76 per cent said they were cutting down use of gas and electricity at home, compared to 58 per cent in 2007
- 66 per cent said they were turning down thermostats.

2.6 Conclusions

Overall, there are a number of distinct drivers of UK gas consumption. Figure 2.20 illustrates the primary drivers over the last 40 years, highlighting whether the driver has had a positive and/or negative impact on consumption.

Figure 2.20: Principal end uses and primary drivers of UK domestic final gas consumption

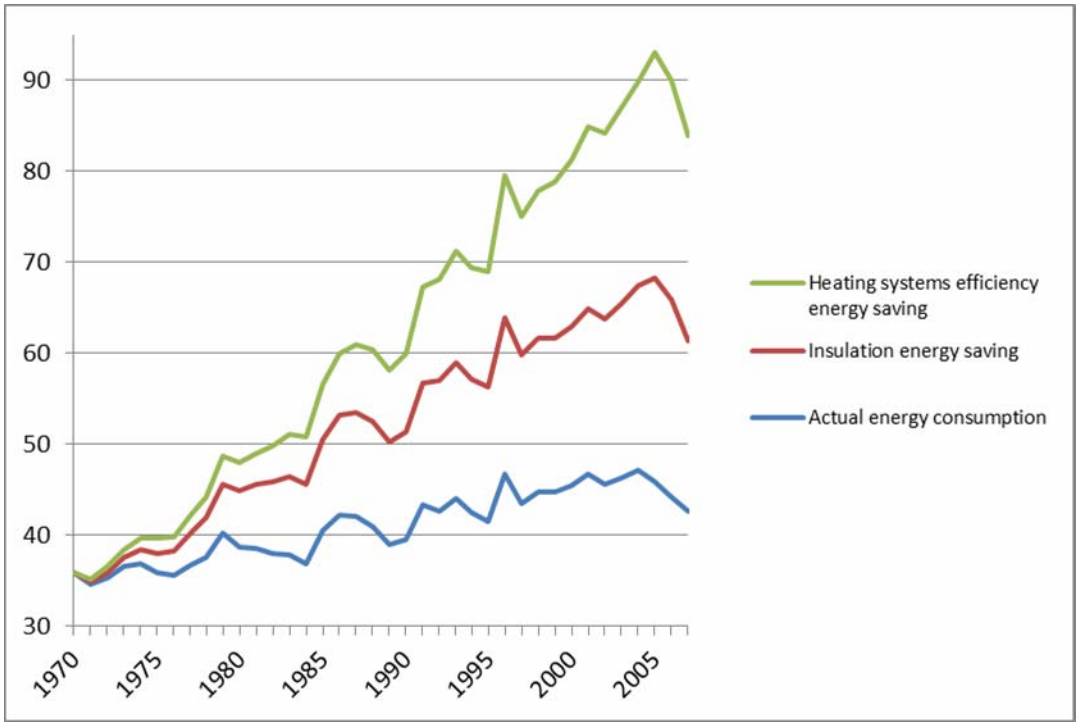


Source: Cebr

Clearly, linkages exist between many of these drivers. For example, a step change in living standards over the last 40 years has influenced many lifestyle and social trends, and attitudes towards level of comfort with households.

Whilst domestic gas consumption has increased dramatically since 1970, driven by significant changes in living standards, population growth and households, there has been a dramatic decline in actual energy consumption since the mid noughties, as illustrated in Figure 2.21.

Figure 2.21: Great Britain energy savings, million tonnes of oil equivalent, 1970 to 2007



Source: DECC

Energy efficiency measures have made a significant and lasting contribution to reducing consumption. Figure 2.21 illustrates what these savings are based on how much additional energy would be required if heating systems efficiencies and insulation levels remained at the 1970 levels.

The next chapter will assess the extent to which energy efficiency measures have reduced domestic natural gas consumption over the last five years.

3 British Gas' Gas Consumption Model

In this chapter we outline the underlying data, assumptions, and methodology utilised by British Gas to model consumption of its domestic gas customer base. We then present Cebr's key findings from its econometric modelling of the key drivers of domestic gas consumption over the period 2006 to 2009.

3.1 Overview

British Gas has undertaken modelling of domestic gas consumption for its customers utilising 40 million meter reads from over four million of its customers over the period 2006 and 2009. This sample represents over two-fifths of its total domestic gas customer accounts[23] and around 18 per cent of all domestic gas accounts in Great Britain[24]. Such a sample therefore represents a significant proportion of the Britain's domestic gas customer accounts.

British Gas commissioned Cebr to first validate the consumption and energy efficiency modelling it had undertaken and then determine the key drivers of changes in domestic natural gas consumption by its customers over this period.

Having closely reviewed the input data, assumptions made and the modelling approach employed by British Gas' analytical team to derive its actual historic gas consumption trends over the period 2006 and 2009, once minor adjustments are made to its sample to make it representative of the British Gas customer base, Cebr believes this accurately reflects natural gas consumption patterns of its customers.

Cebr also reviewed the data, assumptions and methodology used to derive energy efficiency savings for households implementing various structural changes to their dwellings, such as installing new A-rated energy efficient boilers and insulting their cavity walls and lofts. Cebr also believes the modelling British Gas has undertaken on this issue accurately reflects energy efficiency savings over this period.

Table 3.1 presents the overall headline figures from this exercise, once Cebr's adjustments are taken into account.

Table 3.1: Changes in domestic natural gas consumption amongst British Gas customers, annual percentage change, 2006 to 2010

	2006	2007	2008	2009	2010
TOTAL	-4.9%	-0.5%	-6.3%	-7.4%	-5.3%

Source: British Gas, Cebr analysis

[23] For year ended 31 December 2009, British Gas' domestic gas customer accounts totalled 9.4 million.

[24] In 2007, total domestic gas accounts stood at 22.4 million.

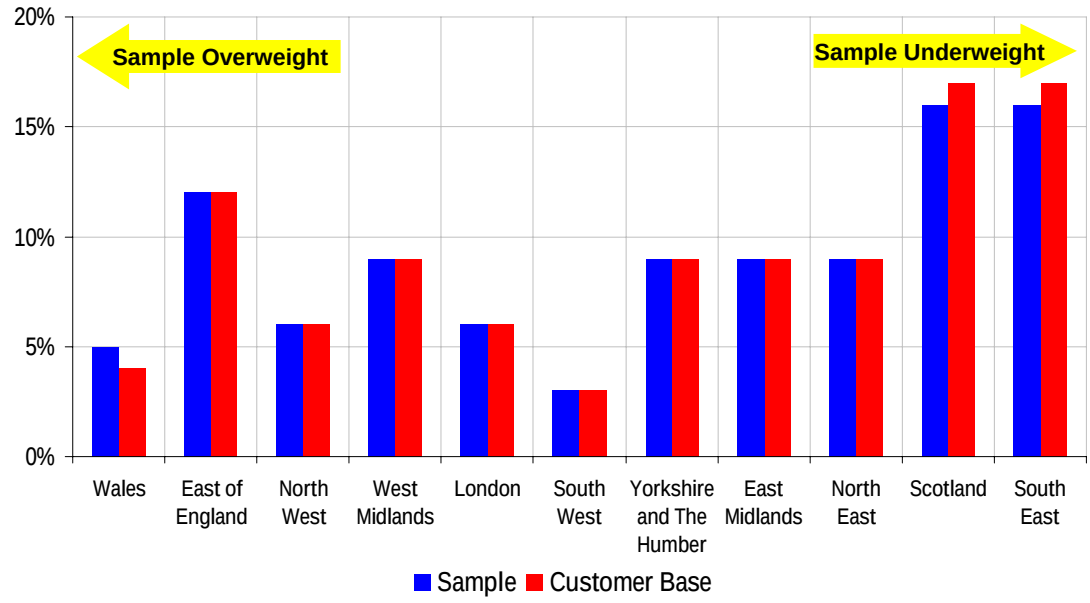
Confirming the national trends identified in the previous chapter, actual domestic gas consumption of British Gas' customers over the period 2006 to 2010 is on a clear downward trend with consumption falling at a compound annual rate of 4.9 per cent per year. The declines in household natural gas consumption can be explained by energy efficiency measures installed by its customers, as well as underlying economic trends and other factors which influence household behaviour. For all but one year (2007), when income effects dominate (see section 3.5.1), energy efficiency measures are the primary drivers of the decline in consumption.

Our findings show that while energy efficiency measures taken by households account for the largest proportion of the changes in gas consumption, they cannot wholly explain the recent falls in domestic gas consumption. Economic factors play an important role in determining households' energy usage. In this chapter, we analyse the importance of economic trends captured by changes in Gross Domestic Product (GDP), household incomes and gas prices. Additionally, household attitudes towards the direct savings that can be made from energy efficiency and more broadly to climate change issues may also influence behaviour – we examine the issue of green awareness in section 3.5.3.

3.2 Cebr's assessment of the sample

In order to analyse domestic gas consumption patterns between 2006 and 2009, actual meter read data from a sample of over four million British Gas domestic gas customers was utilised. Our findings show that the regional differences between the sample data and British Gas' overall customer base do not vary significantly. Figure 3.1 illustrates the regional share of customers in the sample data and British Gas' overall customer base.

Figure 3.1: Regional share between sample data and British Gas' customer base, percentage share



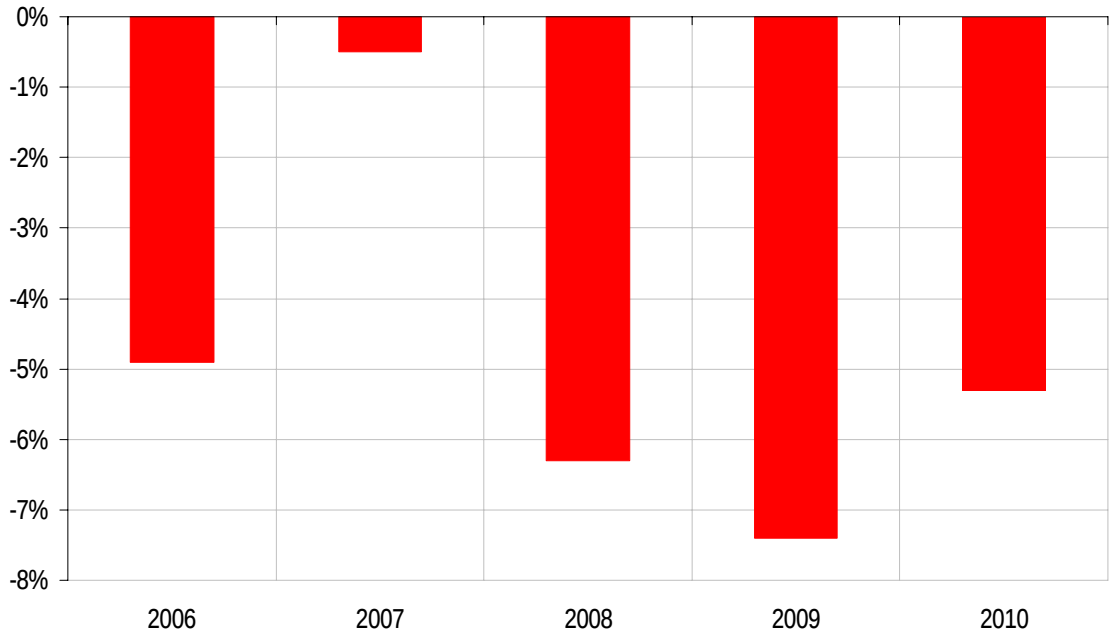
Source: British Gas, Cebr analysis

The sample data marginally over-represents Wales and under-represents Scotland and the South East. To account for these differences, Cebr adjusted British Gas' consumption data to reflect regional differences between the sample base and its overall customer base.

3.3 Key findings 2006 to 2010

Domestic natural gas consumption amongst British Gas' customers has shown a downward trend between 2006 and 2009 as a result of households' energy efficiency measures, underlying changes in the UK economy and other behavioural factors. The figure below illustrates actual annual changes in gas consumption based on meter read data over the period from 2006 to 2009, with actual overall gas consumption data for 2010.

Figure 3.2: Domestic natural gas consumption amongst British Gas customers, annual percentage change



Source: British Gas, Cebr analysis

Overall, domestic gas consumption has fallen on a compound annual rate basis by 4.9 per cent between 2006 and 2010. Cebr has investigated the drivers below when assessing gas consumption over this period:

- **Direct drivers** such as efficiency measures implemented by British Gas' gas customers and changes in retail gas prices; and
- **Indirect drivers** such as household income effects, which are influenced by changes in economic activity and consumer confidence, and other factors, including lifestyle factors, greater green awareness and climate change concerns driven by Government

led initiatives, such as the Green Deal and Energy Efficient Commitment and energy retail supplier promotions.

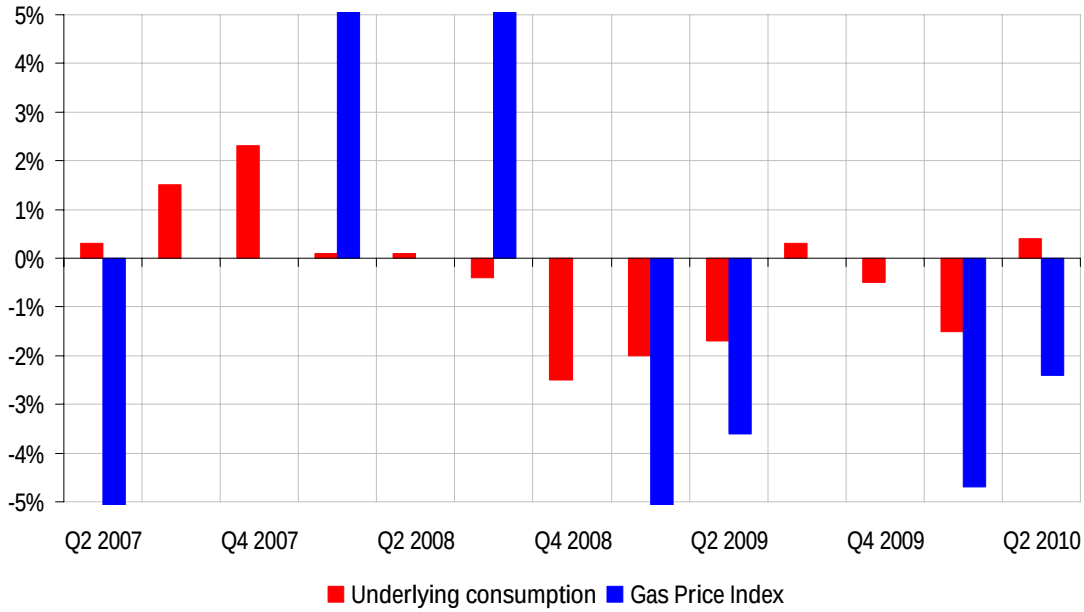
The remainder of this chapter will examine the extent to which each of these factors influenced household gas consumption behaviour over the period 2006 to 2009.

3.4 Direct drivers

3.4.1 Retail gas prices

Over the period considered, Cebr did not find any relationship between domestic natural gas consumption and retail gas prices. As Figure 3.3 illustrates, retail gas prices changes are not significantly correlated with domestic natural gas consumption changes.

Figure 3.3: Underlying domestic natural gas consumption and retail gas price index, quarter-on-quarter change



Source: British Gas

An explanation as to why retail prices are not directly influencing gas consumption behaviour may be a reflection of how consumers' respond to retail energy price changes. Surveys conducted for Ofgem[25] confirm that price, and relative price in particular, is the main reason why consumers choose to switch energy supplier. This suggests that consumers react to increasing price differentials by switching to a lower cost retail supplier rather than remaining with their current one and reducing the amount of energy they consume to offset the price change.

[25] For example, Ipsos-MORI Ofgem Customer Engagement Survey, July 2008

3.4.2 Energy efficiency measures

As part of the British Gas modelling approach, the potential energy efficiency savings to customers from the installation of various energy efficiency measures have been calculated. Table 3.2 illustrates the output from this modelling and shows the average effect of various energy efficiency measures taken by households on overall domestic consumption.

Table 3.2: Energy efficiency savings impacts on British Gas' domestic natural gas consumption, annual percentage fall, 2006 to 2009

Energy efficiency measure	Sample size (customers)	Household Impact	Average percentage fall in domestic gas consumption
Energy efficient boilers	42,000	18.0%	1.2%
Insulation	109,000	15.0%	1.2%
- Cavity Wall	*47,000*	*18.3%*	*0.4%*
- Loft	*62,000*	*13.8%*	*0.7%*
Energy efficiency advice	21,000	9.5%	0.9%
TOTAL	-	-	**3.3%**

Source: British Gas, Cebr analysis

Over the period from 2006 to 2009, British Gas' domestic natural gas consumption fell annually by 3.3 per cent as a direct result of energy efficiency measures implemented by British Gas households.

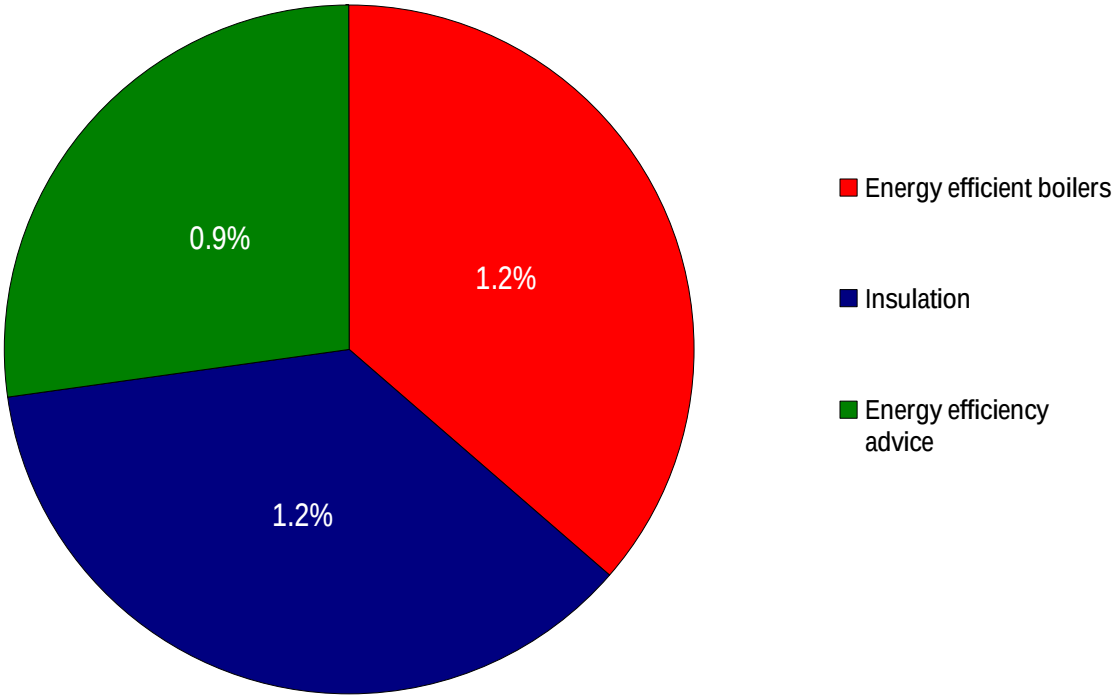
On a household basis, insulating measures overall have a slightly smaller impact on household consumption than installing A-rated energy efficient boilers. However, when looking at the two components of insulation separately, the largest impacts on natural gas consumption are for those households insulating their cavity walls (18.3 per cent) closely followed by those installing an A-rated energy efficient boiler (18.0 per cent) and those insulating their lofts (13.8 per cent overall).

Aggregating the household impacts across the whole of the British Gas customer base paints a slightly different picture, due to its overall composition and make-up. Overall, the key drivers of the recent declines of domestic natural gas consumption are:

- **Energy efficient boilers**, representing around 36.4 per cent of the total decline attributed to all energy efficiency measures
- **Insulation** measures, comprising cavity wall and loft insulation, also representing a 36.4 per cent of the total decline
- **Energy efficiency advice**, representing around 27.3 per cent of the total decline.

Figure 3.4 illustrates the contribution of the various energy efficiency measures to the overall annual decline in domestic natural gas consumption.

Figure 3.4: Contribution of energy efficiency measures to 3.3 per cent annual decline in domestic gas consumption



Source: British Gas, Cebr analysis

Table 3.3 illustrates the drivers of the declines attributed to energy efficiency advice:

Table 3.3: Energy efficiency advice household and overall impact, annual percentage decline

Energy efficiency measure	Estimated number of customers	Household impact	Average percentage fall in domestic gas consumption
Double glazing	400,000	13.5%	0.53%
Thermostat one degree down	100,000	10%	0.10%
Tank jacket	200,000	4%	0.08%
Draught proofing	300,000	2%	0.06%
Pipe insulation	300,000	1%	0.03%
Floor insulation	200,000	5%	0.10%
OVERALL IMPACT	**-**	**-**	**0.90%**

Source: British Gas

On a household basis, the largest impacts on gas consumption is the structural measure of double glazing (13.5 per cent) and a behavioural response to energy efficiency advice i.e. by turning the thermostat down by one degree (10 per cent). The behavioural response may be partly explained by the proactive characteristics of households seeking energy efficiency advice but is also likely to illustrate that access to clear and relevant information about current and potential energy efficiency ratings can have a direct behavioural impact on gas consumption. This has important implications about ensuring all domestic gas customers

are aware of the information that is currently available to them. Based on the evidence of those who have utilised such information, increased awareness allows customers to make informed decisions about how to become more energy efficient.

Overall, as space heating and hot water are the primary drivers of domestic gas consumption, direct structural measures, including double glazing, putting insulation jackets on hot water tanks, pipe and floor insulation, and drafting proof, collectively have made a significant contribution to gas consumption declines attributed to energy efficiency advice.

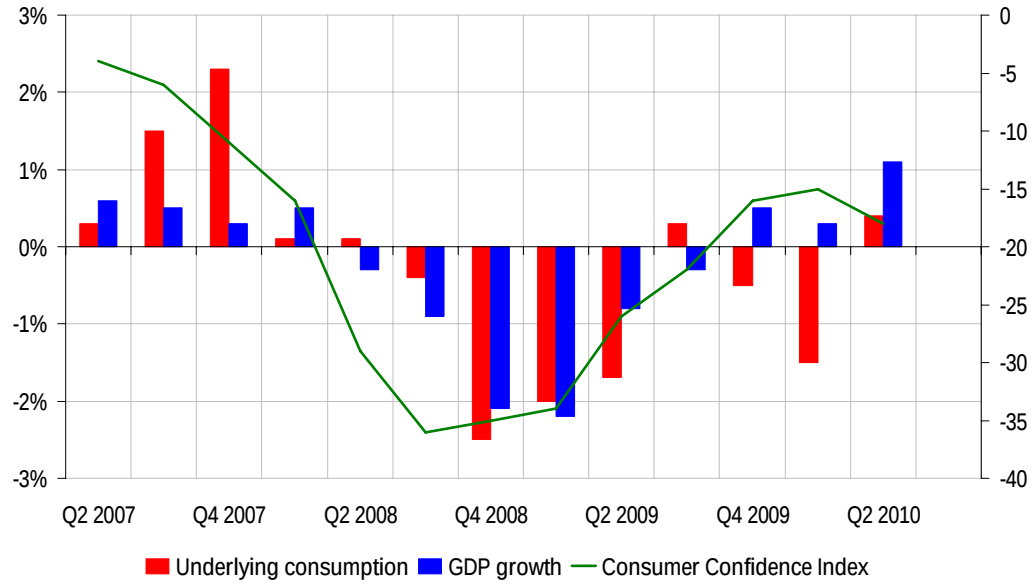
3.5 Indirect drivers

3.5.1 Economic factors

Economic factors play an important role in determining changes in domestic gas consumption. Changes in economic activity affect households' income and confidence, and ultimately their behaviour towards energy and gas consumption usage. Households' growing environmental awareness and concerns, driven by various initiatives implemented by the UK Government and energy suppliers may also play a role in impacting energy consumption negatively.

Figure 3.5 illustrates changes in **underlying gas consumption** *which excludes the direct natural gas consumption falls resulting from various energy efficiency measures.*

Figure 3.5: Underlying consumption (kWh per customer) and UK Gross Domestic Product (LHS), UK Consumer Confidence Index (RHS), Quarter-on-quarter change



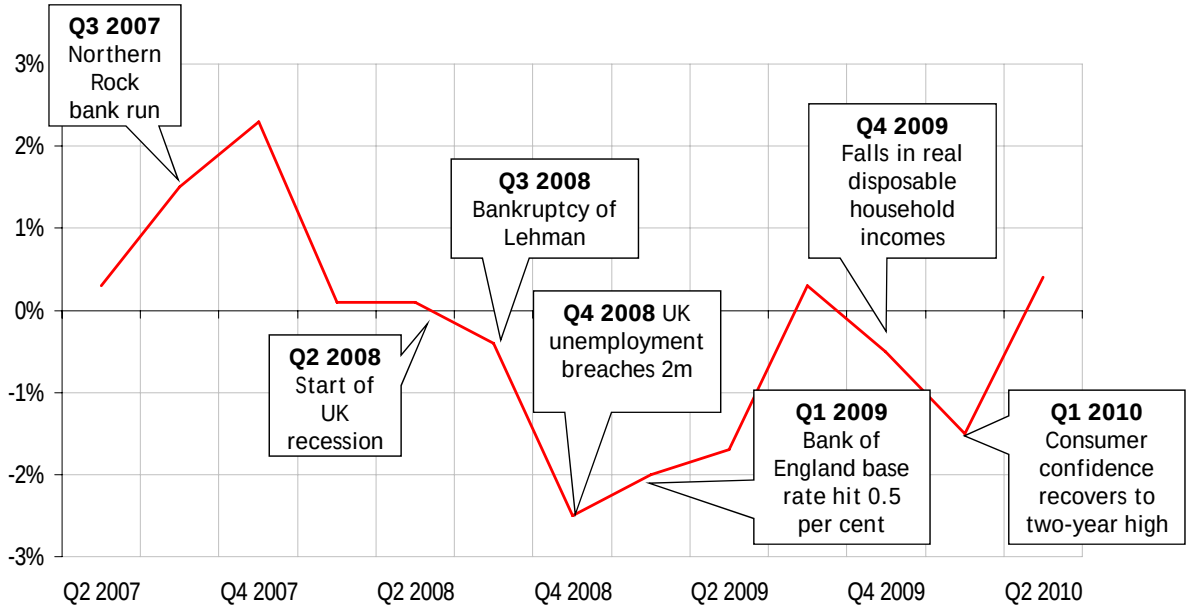
Source: British Gas, Gfk, Cebr analysis

Figure 3.5 illustrates that changes in households' underlying consumption is closely linked with economic growth. During periods of prosperous economic growth, domestic natural

gas consumption increases as expenditure on energy rises. During periods of stagnant or negative economic growth, underlying domestic natural gas consumption tends to decline as households' incomes and confidence deteriorate. During the credit crunch, which started in the second quarter of 2008, underlying gas consumption fell at an average annual rate of 3.9 per cent.

Figure 3.6 below illustrates that domestic gas consumption is significantly sensitive to developments in the UK economy.

Figure 3.6: Underlying changes in domestic gas consumption amongst British Gas customers, quarter-on-quarter change



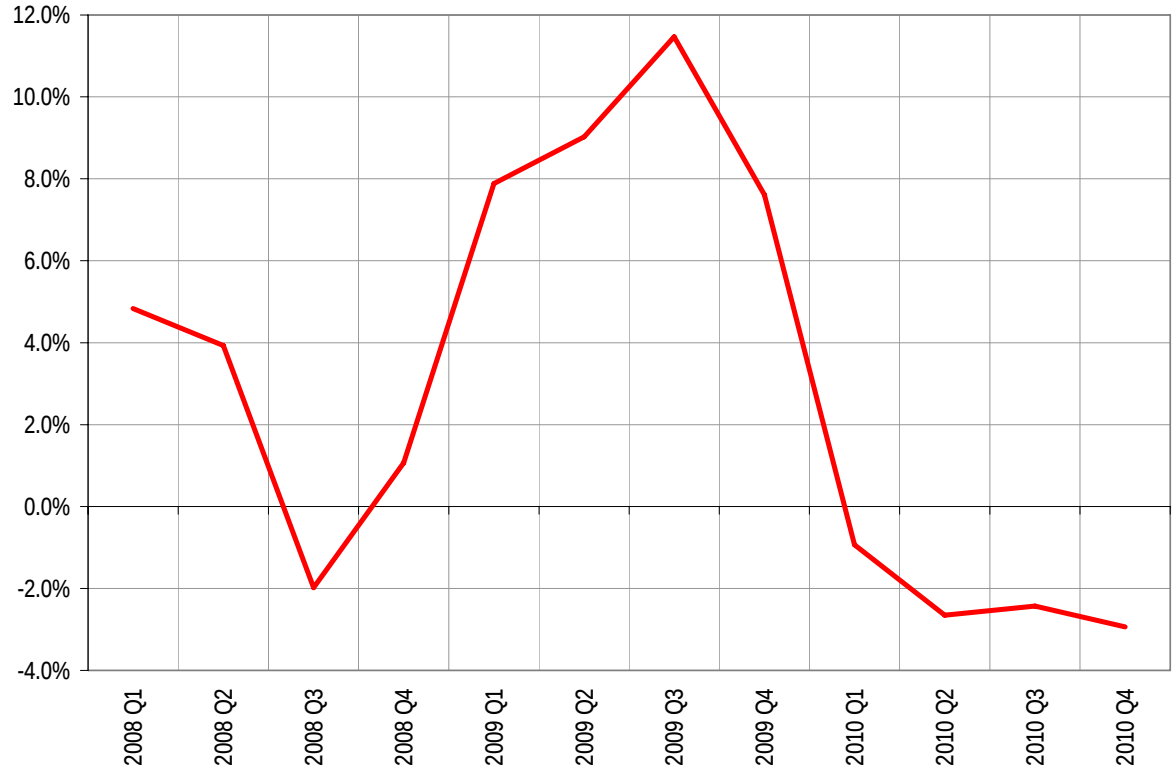
Source: British Gas, Cebr analysis

Figure 3.6 shows that underlying gas consumption falls troughed at the height of the financial crisis in Q4 2008. In response to the financial crisis, the Bank of England began to cut base rates during Q4 2008 – this led to interest rates reaching a record low of 0.5 per cent by the end of Q1 2009. The immediate boost to household disposable incomes from reduced mortgage interest payments acted as a buffer to consumption during this time.

A report compiled by Cebr on behalf of ASDA, the Asda Income Tracker, illustrates the declines in average household spending power through to Q3 2008 as soaring commodity prices pushed the cost of living up and the labour market weakened. However, from this point onwards, the declines in spending power were arrested, through a combination of the December 2008 cut in the rate of Value Added Tax (VAT) to 15 per cent and the unprecedented lows in the Bank of England interest rate, bringing down the cost of mortgage repayments. Data from the ONS retail price index showed average mortgage payments down by as much as 46 in October 2009 when compared to October 2008, contributing to the gains in average spending power, with household income growth peaking in Q3 2009. This period corresponds with a slowdown in the rate of decline of gas

consumption and a return to positive quarterly growth in Q3 2009. By the end of 2009, the UK economy had emerged from recession, growing by 0.5 per cent during the fourth quarter.

Figure 3.7: Cebr's Asda Income Tracker – Average UK household discretionary income per week, annual percentage change



Source: ONS, Cebr analysis

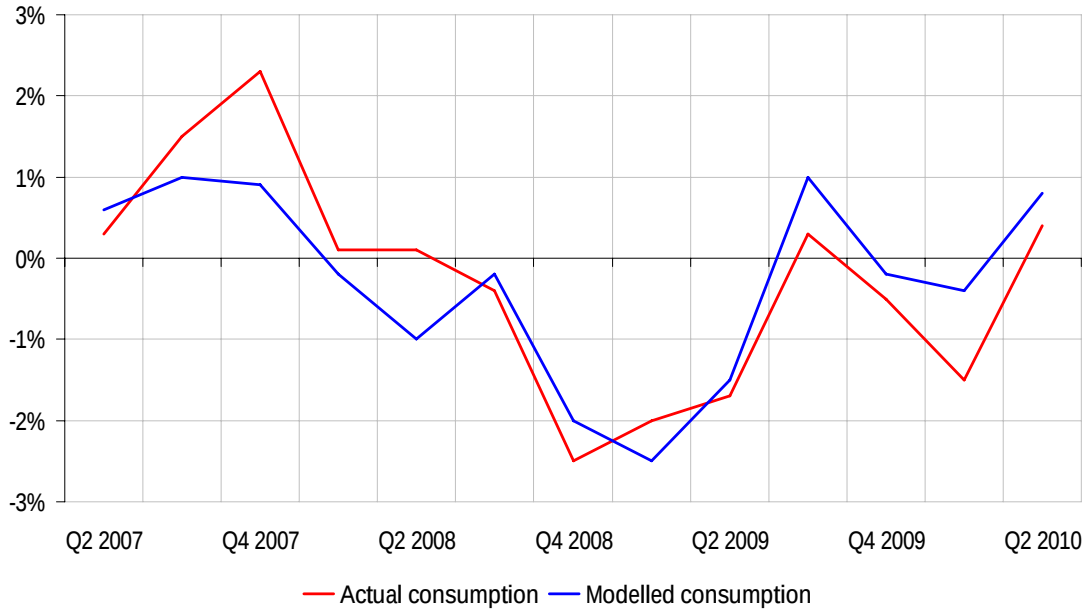
However, by Q4 2009, unemployment had reached 2.5 million and household disposable incomes were being squeezed through slow earnings growth as a result of a weak labour market, and rising debt repayments. At the start of 2010, VAT returned to 17.5 per cent, commodity prices rose on the back of the global economic recovery and earnings growth remained weak, sending discretionary income growth into negative territory in Q1 2010, as illustrated by the Asda Income Tracker. Correspondingly, in Q4 2009 and Q1 2010, gas consumption declined once more. However, overall economic conditions did improve further in 2010; unemployment stabilised and the economy grew by 1.1 per cent in Q2 2010; the strongest quarterly growth since 2006. Hence, gas consumption began to grow again in Q2 2010, albeit below the growth rates recorded before the recession.

3.5.2 Time-series Econometric analysis

Cebr has undertaken econometric modelling and analysis in order to quantify the relationship between domestic natural gas consumption and changes in economic activity. The econometric model Cebr developed is summarised in Appendix A.

Figure 3.8 illustrates Cebr's modelled natural gas consumption against actual underlying gas consumption.

Figure 3.8: Actual and modelled gas consumption, quarter-on-quarter growth



Source: Cebr analysis

3.5.3 Other factors

As outlined in the previous section, Cebr has developed an econometric model which explains changes in underlying gas consumption as a result of **indirect effects**. Our findings show that there have been general quarterly declines in gas consumption over the period from 2006 to 2009, which are independent of changes in the state of the economy, and the financial health of British households. This is portrayed through a negative coefficient of 0.001 in the econometric analysis that Cebr have undertaken.

As such, there are other factors which may influence recent consumption falls.

Lifestyle factors and an increased awareness of the environment by households appear to one set of factors which explain part of recent falls. A shift in British Gas' customer base from high-consuming households to lower-consuming environmentally conscious households could be a significant driver of recent consumption falls.

Households switching payment method, particularly from credit[26] to prepayment[27] has also being identified as another factor, with a household impact of a 20 per cent decline in consumption, or 0.2 per cent when aggregated across British Gas' customer base.

The large drop by households switching payment method is likely to driven by greater visibility of the gas bills by households who are required to pay for gas in advance of use.

Interestingly, British Gas has identified that behavioural changes of customers switching from credit to prepayment and then back to credit at a later stage does not have the opposite effect on household gas consumption. In other words, once households become accustomed to closely monitoring and tracking their gas bills and associated consumption, such behaviour becomes embedded. This has important implications for future energy efficiency measures, such as smart metering.

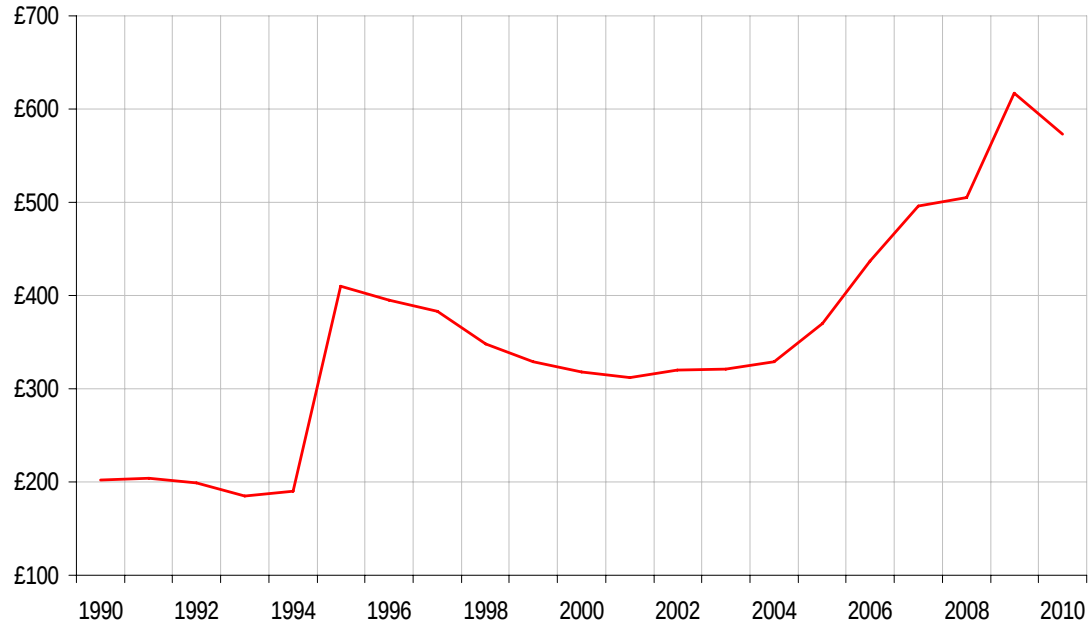
3.6 Average gas bill savings from 2006 to 2010 efficiency measures

Cebr has estimated the average saving for British Gas regional customers that have implemented efficiency measures. Over the period from 2005 to 2010, domestic gas bills have risen by around 54 per cent, growing at an annual rate of 9.1 per cent. As noted in section 3.4.1, there does not appear to be a significant relationship between retail gas prices and domestic consumption. Figure 3.9 illustrates growth in average domestic gas bills in Great Britain between 1990 and 2010.

[26] There are two main credit methods: Direct Debit – where a fixed amount of payment is taken from a bank account each month, quarter or year; and Standard Credit – where customers pay on receipt of the bill, either by cash, cheque, credit card or standing order.

[27] Prepayment meters are meters that require payment for energy to be made in advance of use, by inserting electronic tokens, keys or cards into the meter.

Figure 3.9: Average Great Britain domestic gas bills, pounds per year in real terms



Source: DECC, Cebr analysis

According to DECC, the average domestic gas bill in 2010 was £573. Cebr have estimated average gas bill savings received by British Gas customers from implementing all efficiency measures which include installation of energy efficient boilers, insulation and other efficiency measures.

Table 3.4: Average saving on gas bills to British Gas customers from implementing all efficiency measures, pounds per year

Region	2006	2007	2008	2009	2010	2006-2010 Average
Wales	320	330	321	308	303	316
Scotland	333	343	333	320	315	329
North East	321	330	321	308	303	317
North West	324	334	325	312	306	320
Yorkshire and The Humber	329	339	329	316	311	325
East Midlands	322	332	323	310	304	318
West Midlands	327	336	327	314	309	323
East of England	352	362	352	338	332	347
London	322	332	323	310	305	318
South East	344	355	345	331	325	340
South West	260	268	261	250	246	257
GREAT BRITAIN	**326**	**335**	**326**	**313**	**308**	**322**

Source: Cebr analysis

British Gas customers who implemented all energy efficiency measures have saved an average of £322 per year. The highest savings occur in high-consuming regions of Great

Britain, such as the South East, East of England and Scotland. The lowest savings occur in Wales, the South West and North East. As the figure below illustrates, households in lower gas consuming regions of Great Britain tend to have lower savings.

Table 3.5: Average 2006 to 2010 savings on gas bill to British Gas customers from implementing all efficiency measures, pounds per year and average gas consumption, kWh

Region	Total saving	Average gas consumption
Wales	316	18,844
Scotland	329	19,923
North East	317	19,020
North West	320	19,093
Yorkshire and The Humber	325	19,731
East Midlands	318	19,018
West Midlands	323	18,901
East of England	347	20,419
London	318	18,668
South East	340	19,995
South West	257	15,563
GREAT BRITAIN	322	**19,170**

Source: Cebr analysis

Overall, the northern regions of Great Britain have structurally higher levels of gas consumption, and as such the overall saving on gas bills is significantly higher.

Appendix B provides a breakdown of the average saving on gas bills to British Gas customers from installing new energy efficient boilers, loft insulation and cavity wall insulation.

Table 3.6 illustrates the annual saving for all British Gas customers from implementing all British Gas efficiency measures. In 2010, British Gas has saved their customers around £217 million through energy efficiency measures.

Table 3.6: Total annual customer saving through all British Gas efficiency measures, millions of pounds per year

Region	2006	2007	2008	2009	2010	2006-2010 Total
Wales	9.8	10.1	9.8	9.5	9.3	49
Scotland	38.4	39.5	38.4	36.9	36.2	189
North East	21.0	21.6	21.0	20.2	19.8	103
North West	13.5	13.9	13.5	13.0	12.7	67
Yorkshire and The Humber	19.5	20.1	19.5	18.7	18.4	96
East Midlands	19.8	20.4	19.8	19.0	18.7	98
West Midlands	20.4	21.0	20.4	19.6	19.3	101
East of England	30.1	31.0	30.1	28.9	28.4	148
London	12.5	12.8	12.5	12.0	11.8	62
South East	39.7	40.9	39.7	38.2	37.5	196
South West	5.1	5.2	5.1	4.9	4.8	25
GREAT BRITAIN[28]	229.5	236.4	229.8	220.8	216.9	1,133

Source: Cebr analysis

British Gas has made an aggregate saving for its customers of £1.1 billion over the period from 2006 to 2010. Total annual customer savings have averaged £227 million per year over the same period.

3.7 Conclusions

Cebr has examined the key drivers of changes in domestic natural gas consumption for British Gas' customer base between the period from 2006 and 2010. Overall, there appears to be three effects driving consumption changes:

- **Direct drivers**
    - **Energy efficiency measures** – declines in domestic natural gas consumption are *directly* driven by structural energy efficiency measures implemented by households, with the main drivers being energy efficient boilers (representing around 36 per cent of the total decline attributed to direct drivers), insulation (also representing around 36 per cent of the total decline) and British Gas energy efficiency advice uptake (representing around 27 per cent).
    - **Price effects** – over the period 20016 to 2010, domestic natural gas consumption is not directly influenced by changes in retail gas prices.

[28] Great Britain totals may not sum precisely due to rounding.

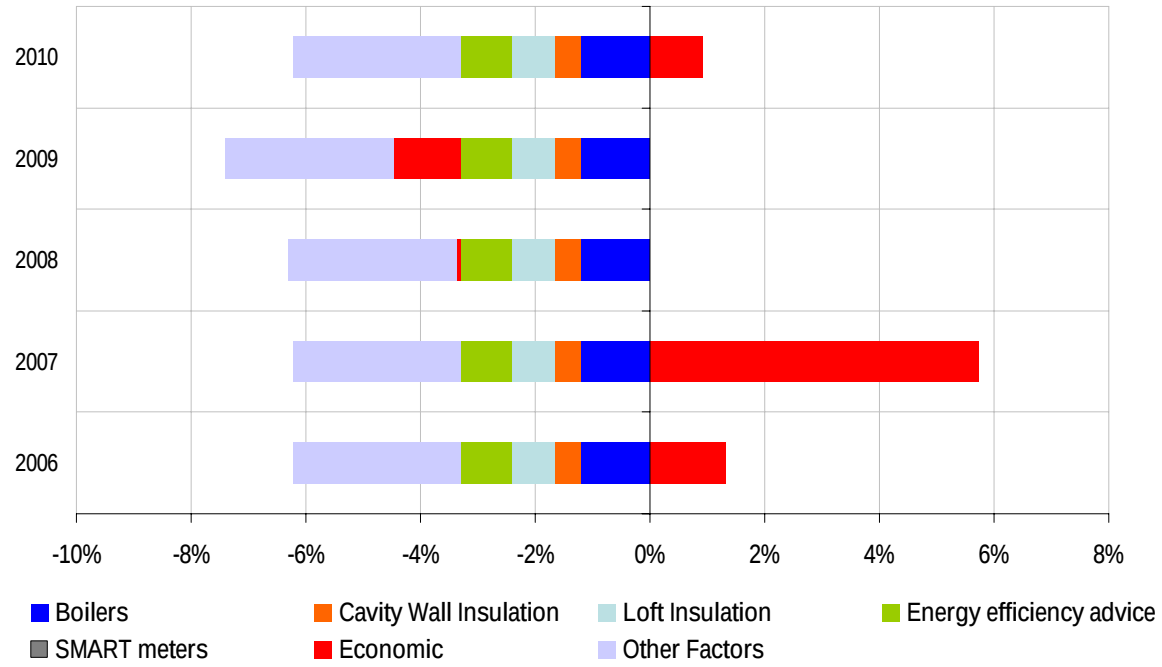
- **Indirect drivers**

    - **Income effects** – declines and increases in consumption are *indirectly* driven by economic growth, households' incomes and consumer confidence. Changes in economic activity affect households' income and confidence, and ultimately their behaviour towards energy and gas consumption usage.

    - **Other factors** – declines in consumption are *indirectly* driven by lifestyle changes and households' increasing awareness of green and climate change issues, and in response to various Government led initiatives, for example the Energy Efficiency Commitment, the Carbon Energy Reduction Target the Boiler Scrappage Scheme and more recently the Green Deal and mandated rollout of smart meter across Great Britain from 2012 onwards. Households switching payment method, particularly from credit to prepayment has also being identified as another factor.

Figure 3.10 illustrates the impact of each of the above factors in determining gas consumption falls for the period 2006 to 2010.

Figure 3.10: Domestic gas consumption drivers, contribution to annual percentage change in consumption, 2006 to 2010



	2006	2007	2008	2009	2010
Direct effects	***-3.3%***	***-3.3%***	***-3.3%***	***-3.3%***	***-3.3%***
Energy efficient boilers	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%
Loft and cavity wall insulation	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%
- Cavity wall insulation	*-0.5%*	*-0.5%*	*-0.5%*	*-0.5%*	*-0.5%*
- Loft insulation	*-0.7%*	*-0.7%*	*-0.7%*	*-0.7%*	*-0.7%*
Energy efficiency advice	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%
Indirect effects	***-1.6%***	***2.8%***	***-3.0%***	***-4.1%***	***-2.0%***
Economic	1.3%	5.7%	-0.1%	-1.2%	0.9%
Other factors	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%
- Lifestyle/green awareness	*-2.7%*	*-2.7%*	*-2.7%*	*-2.7%*	*-2.7%*
- Credit to prepayment	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*
TOTAL	**-4.9%**	**-0.5%**	**-6.3%**	**-7.4%**	**-5.3%**

Source: British Gas, Cebr analysis

4 Scenarios for the period 2011to 2015

In this chapter we forecast future consumption patterns for British Gas' customer base based on the econometric model we constructed in the previous chapter and test a number of scenarios which examine the potential efficiency savings for British Gas' customer base and for Great Britain as a whole.

4.1 Scenario descriptions

Utilising Cebr's time-series econometric model, future consumption patterns between 2011 and 2015 have been forecast. The forecast considers potential efficiency savings to households between 2011 and 2015, as well as economic and other factors which could potentially impact domestic natural gas consumption. As illustrated in Table 4.1, Cebr has constructed four different scenarios, which forecast changes in regional domestic gas consumption for British Gas' customer base and for British households as a whole.

Table 4.1: Scenarios for British Gas customer base and British households, 2011 and 2015

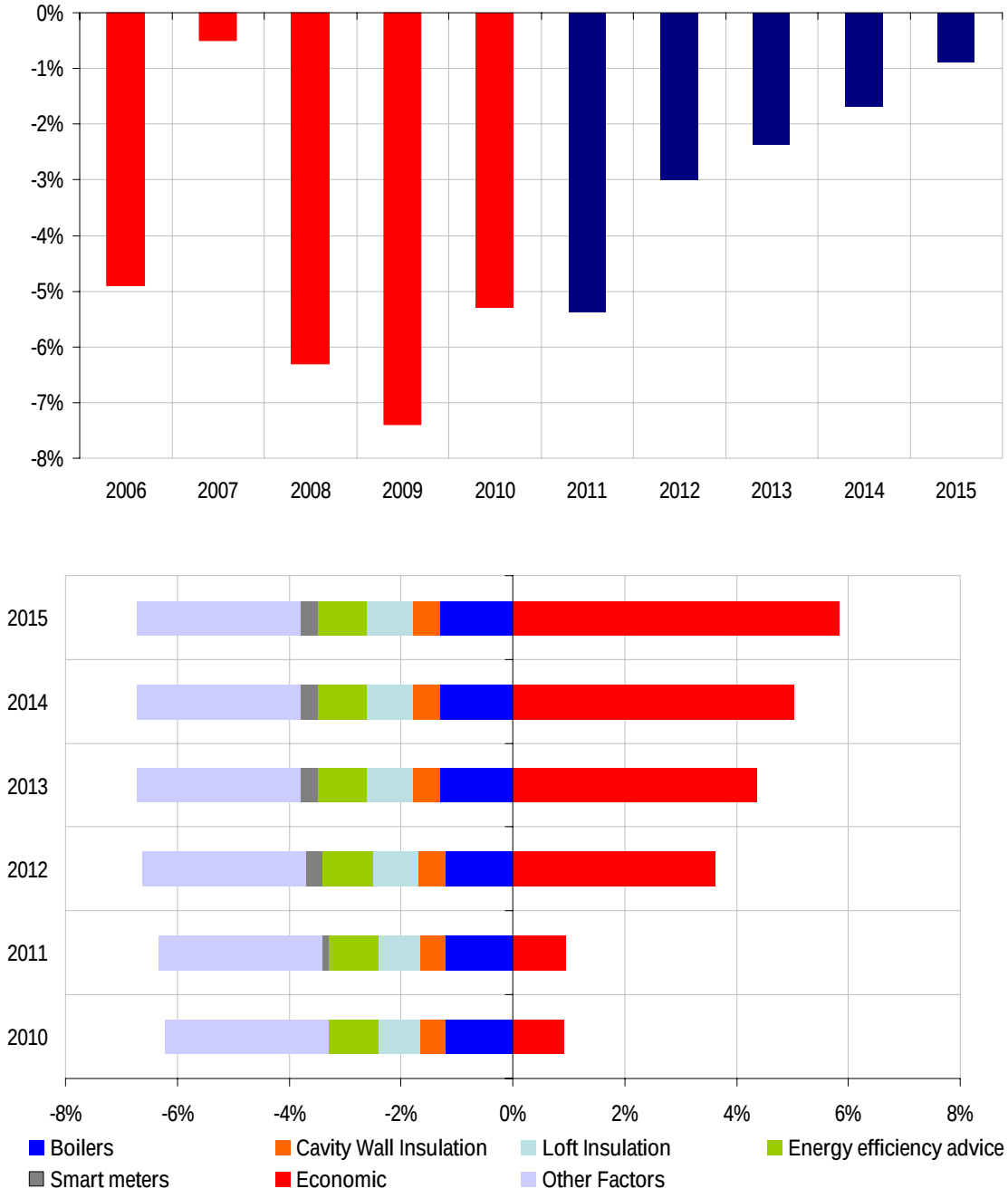
<table>
<tr><th rowspan="2">Population</th><th colspan="4">Scenario #</th></tr>
<tr><th>A
No efficiency measures</th><th>B
Energy efficient boilers only</th><th>C
Loft and cavity wall insulation only</th><th>D
All measures</th></tr>
<tr><td>British Gas customers</td><td rowspan="2">No further energy efficiency measures implemented between 2011 and 2015</td><td>600,000 new A-rated boilers installed annually</td><td>750,000 insulation installations annually</td><td rowspan="2">Both Scenarios B and C, including other measures (for example, smart meters and energy efficiency advice)</td></tr>
<tr><td>British households</td><td>All standard, back and non A-rated combination boilers replaced by A-rated boilers</td><td>All households suitable for virgin/top-up loft and cavity wall insulation upgraded</td></tr>
</table>

Source: Cebr analysis

4.2 Key findings for British Gas customers

Figure 4.1 presents Cebr's forecast of domestic gas consumption amongst British Gas customers under ***Scenario D – All measures***, which also includes other energy efficiency measures such as energy efficiency advice, and introduction of smart meters by British Gas from 2011 onwards, before mandated rollout in 2012.

Figure 4.1: Scenario D – Domestic gas consumption amongst British Gas customers, annual percentage change



Source: Cebr analysis

Table 4.2 summarises the contribution of the various drivers to the changes in overall domestic gas consumption amongst British Gas customers.

Table 4.2: Scenario D – Forecast impact on domestic gas consumption amongst British Gas customers, annual percentage change

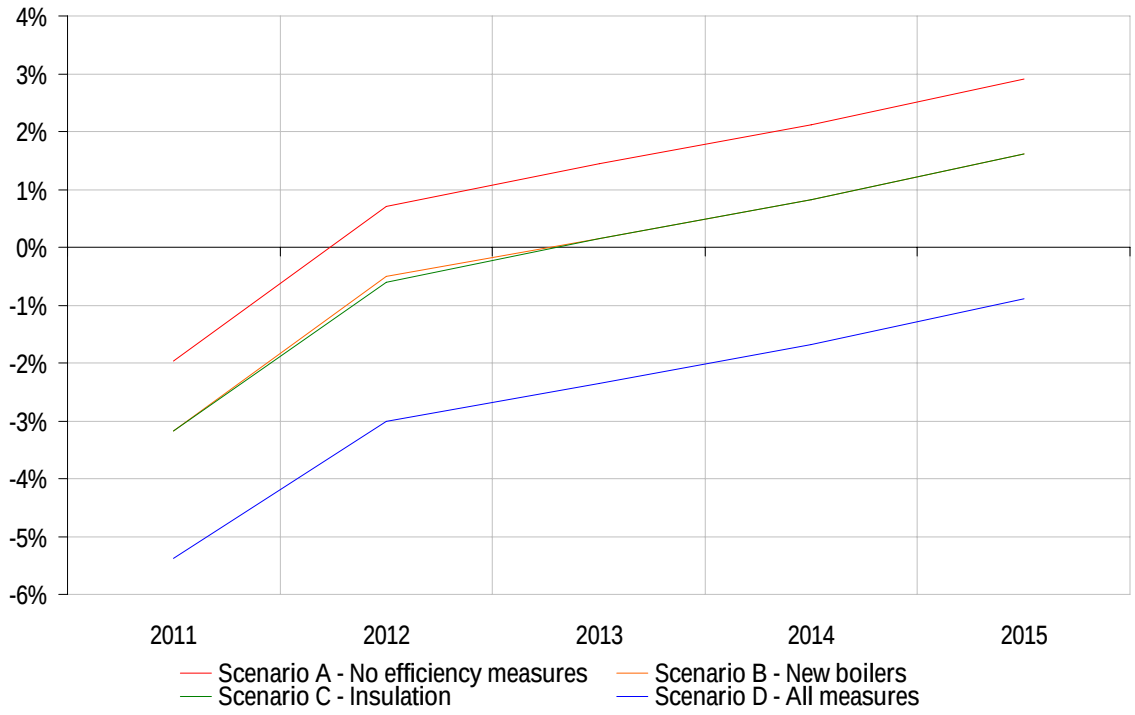
	2010 Actual	2011 Forecast	2012 Forecast	2013 Forecast	2014 Forecast	2015 Forecast
Direct effects	***-3.5%***	***-3.6%***	***-3.9%***	***-4.0%***	***-4.0%***	***-4.0%***
Energy efficient boilers	-1.2%	-1.2%	-1.2%	-1.3%	-1.3%	-1.3%
Loft and cavity wall insulation	-1.2%	-1.2%	-1.3%	-1.3%	-1.3%	-1.3%
- Cavity wall insulation	*-0.5%*	*-0.5%*	*-0.5%*	*-0.5%*	*-0.5%*	*-0.5%*
- Loft insulation	*-0.7%*	*-0.7%*	*-0.8%*	*-0.8%*	*-0.8%*	*-0.8%*
Energy efficiency advice	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%
Smart meters[29]	0.0%	-0.1%	-0.3%	-0.3%	-0.3%	-0.3%
Indirect effects	***-1.8%***	***-1.8%***	***0.9%***	***1.6%***	***2.3%***	***3.1%***
Economic	0.9%	0.9%	3.6%	4.4%	5.0%	5.8%
Other factors	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%
- Lifestyle/green awareness	*-2.7%*	*-2.7%*	*-2.7%*	*-2.7%*	*-2.7%*	*-2.7%*
- Credit to prepayment	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*	*-0.2%*
TOTAL	**-5.3%**	**-5.4%**	**-3.0%**	**-2.4%**	**-1.7%**	**-0.9%**

Source: Cebr analysis

Figure 4.2 illustrates the different impacts on British Gas' domestic natural gas consumption patterns for Scenarios A to D.

[29] The household impact of smart meters is expected to be 2.0 per cent decline in gas consumption resulting from behavioural changes such as turning the thermostat down.

Figure 4.2: Scenarios A to D – Domestic natural gas consumption amongst British Gas customers, annual percentage change



Source: Cebr analysis

The scenario testing shows a significant difference in gas consumption growth between the different energy efficiency measures that can be implemented amongst British Gas customers. On average, the residential gas consumption growth rate would be as much as 3.7 percentage points higher every year as a result of no efficiency measures being implemented between 2011 and 2015. Table 4.3 illustrates changes in gas consumption for each scenario.

Table 4.3: Scenarios A to D – Annual changes in gas consumption by scenario, annual percentage change

Scenario #	Description	2011	2012	2013	2014	2015	2011-2015 CAGR[30]
A	No efficiency measures	-2.0%	0.7%	1.4%	2.1%	2.9%	1.0%
B	Energy efficient boilers only	-3.2%	-0.5%	0.1%	0.8%	1.6%	-0.2%
C	Loft and cavity wall insulation only	-3.2%	-0.6%	0.1%	0.8%	1.6%	-0.2%
D	All measures	-5.4%	-3.0%	-2.4%	-1.7%	-0.9%	-2.7%

Source: Cebr analysis

Scenario A – No efficiency measures examines a scenario where no further efficiency measures are implemented amongst British Gas customers. Under this scenario, gas

[30] Compound Annual Growth Rate

consumption in 2011 will fall by 2.0 per cent, before growing at a compound annual growth rate of 1.8 per cent between 2012 and 2015.

Scenario B – Energy efficient boilers only examines a scenario where 600,000 new energy-efficient boilers are installed annually by British Gas customers. Under this scenario, gas consumption is expected to fall by a compound annual rate of 0.2 per cent between 2011 and 2015, which leads, on average, to the consumption growth rate being 1.2 percentage points lower annually compared to no efficiency measures being implemented.

Scenario C – Loft and cavity wall insulation only examines a scenario where 750,000 insulation installations are made annually by British Gas customers. Under this scenario, gas consumption is expected to fall by compound annual rate of 0.2 per cent between 2011 and 2015, which leads, on average, to the consumption growth rate being 1.2 percentage points lower annually compared to no efficiency measures being implemented.

Scenario D – All measures examines a scenario where both Scenario B and C are implemented, and includes roll out of smart meters from 2011, and efficiency measures implemented from the energy efficiency advice (e.g. double-glazing, pipe and floor insulation etc.). Under this scenario, gas consumption is expected to fall by a compound annual rate of 2.7 per cent between 2011 and 2015, which leads, on average, to the consumption growth rate being 3.7 percentage points lower annually compared to no efficiency measures being implemented.

4.2.1 Average gas bill savings for British Gas customers from 2011 to 2015 efficiency measures

Cebr has forecast the potential savings to British Gas customers' annual bills arising from each of the scenarios that have been tested. Cebr has used standard Tier 2 tariffs in order to calculate monetary savings for households, which are based on DECC forecasts to 2015. Table 4.4 illustrates standard Tier 2 tariffs between 2010 and 2015 for each region.

Table 4.4: Standard Tier 2 tariffs from 2011 to 2015, Pence per kWh

Region	2010	2011	2012	2013	2014	2015
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	3.78	3.92	4.04	4.19	4.42	4.52
Scotland	3.72	3.86	3.98	4.13	4.35	4.45
North East	3.78	3.92	4.04	4.19	4.42	4.52
North West	3.78	3.92	4.04	4.19	4.42	4.52
Yorkshire and The Humber	3.72	3.86	3.98	4.13	4.35	4.45
East Midlands	3.78	3.92	4.04	4.19	4.42	4.52
West Midlands	3.84	3.98	4.11	4.26	4.49	4.59
East of England	3.84	3.98	4.11	4.26	4.49	4.59
London	3.84	3.98	4.11	4.26	4.49	4.59
South East	3.81	3.96	4.08	4.23	4.46	4.56
South West	3.72	3.86	3.98	4.13	4.35	4.45
GREAT BRITAIN	**3.78**	**3.92**	**4.04**	**4.19**	**4.42**	**4.52**

Source: DECC, British Gas, Cebr analysis

Based on previously published DECC data (June 2010), over the period 2011 to 2015, average annual domestic gas retail prices are expected to increase by 3.7 per cent per year.

Table 4.5 illustrates total annual savings on gas bills to British Gas customers from implementing all efficiency measures in Scenario D.

Table 4.5: Scenario D – All measures, average annual saving on gas bill to British Gas customers, pounds per year

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	303	309	321	339	365	385	344
Scotland	315	321	334	352	380	400	357
North East	303	309	321	339	365	385	344
North West	306	312	325	343	369	390	348
Yorkshire and The Humber	311	317	330	348	375	395	353
East Midlands	304	311	323	341	367	387	346
West Midlands	309	315	327	345	372	393	350
East of England	332	339	353	372	401	423	377
London	305	311	323	341	367	387	346
South East	325	332	345	364	392	414	369
South West	246	251	261	275	297	313	279
GREAT BRITAIN	**308**	**314**	**326**	**344**	**371**	**391**	**349**

Source: Cebr analysis

From implementing all measures described in Scenario D, British Gas customers could save £391 in 2015.

Appendix C provides a breakdown of the average saving on gas bills to British Gas customers for scenarios B and C.

Cebr have estimated the total annual monetary savings for British Gas customers below.

Table 4.6: Scenario D – Total annual savings to British Gas customers, millions of pounds per year

Region	2010	2011	2012	2013	2014	2015	2011-2015 Total
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	9.3	9.8	11.0	11.9	12.8	13.5	59.0
Scotland	36.2	38.1	43.0	46.5	50.1	52.8	230.4
North East	19.8	20.8	23.5	25.4	27.4	28.8	125.9
North West	12.7	13.4	15.1	16.4	17.6	18.6	81.1
Yorkshire and The Humber	18.4	19.3	21.8	23.6	25.4	26.8	117.0
East Midlands	18.7	19.6	22.1	24.0	25.8	27.2	118.7
West Midlands	19.3	20.2	22.8	24.7	26.6	28.1	122.5
East of England	28.4	29.9	33.7	36.5	39.3	41.4	180.7
London	11.8	12.4	14.0	15.1	16.3	17.2	74.9
South East	37.5	39.4	44.5	48.1	51.8	54.6	238.4
South West	4.8	5.0	5.7	6.1	6.6	7.0	30.4
GREAT BRITAIN[31]	216.9	227.9	257.2	278.3	299.8	315.9	1,379.0

Source: Cebr analysis

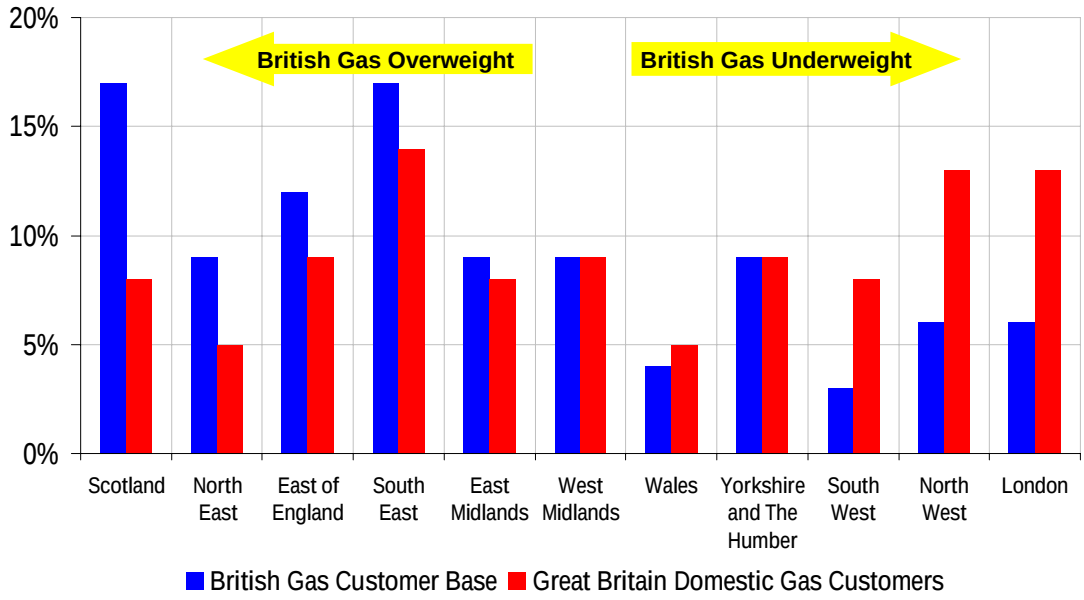
Overall, British Gas customers can save as much as £1.4 billion in gas bills between 2011 and 2015 through implementing all efficiency measures described in Scenario D. This equates to an annual monetary saving of as much as £316 million for British Gas customers by 2015.

[31] Great Britain totals may not sum precisely due to rounding.

4.3 Key findings for British households

Figure 4.3 compares the British Gas regional customer base to the population of Great Britain as a whole.

Figure 4.3: British Gas customer base and Great Britain domestic gas customers by region, regional share

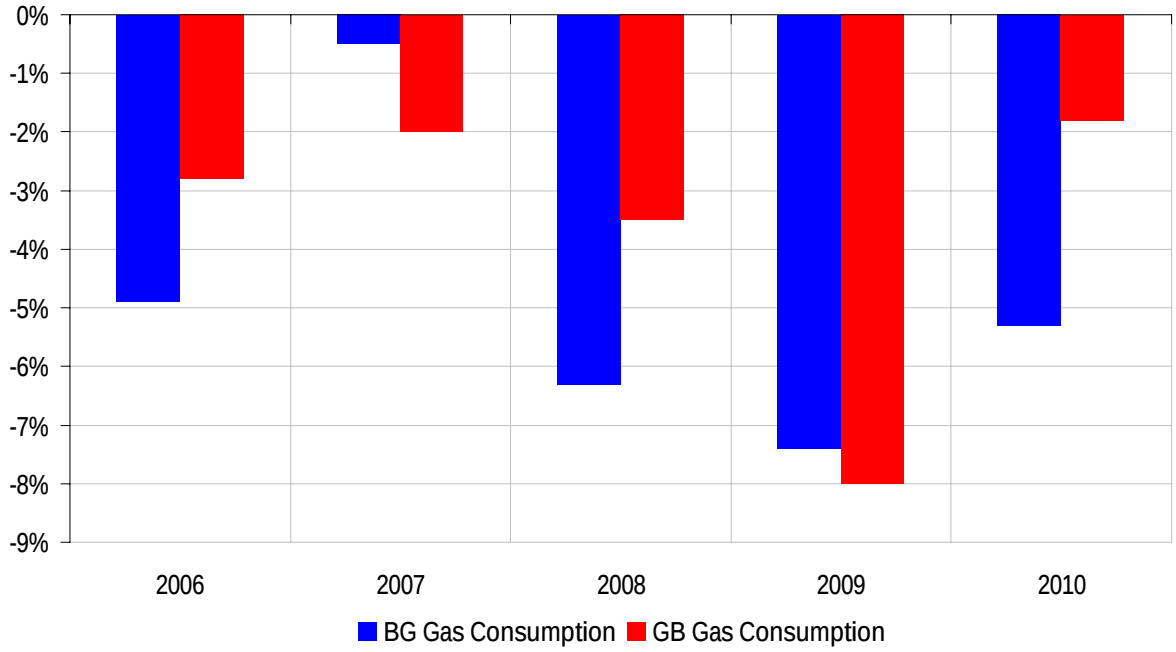


Source: DECC, British Gas, Cebr analysis

Figure 4.3 illustrates that British Gas has a high proportion of customers in Scotland, North East, Eastern and South East regions of Great Britain compared to the total stock of British households. Conversely, British Gas has a lower proportion of customers in London, North West and South West regions of Great Britain.

Figure 4.4 below illustrates the domestic gas consumption trends in Great Britain, and compares and contrasts this with British Gas customers' consumption patterns.

Figure 4.4: British Gas and Great Britain domestic natural gas consumption trends, annual change



Source: DECC, British Gas, Cebr analysis

Note: GB Gas Consumption 2010 – Cebr forecast

Domestic natural gas consumption amongst British Gas customers and British households has been on a downward trend between 2006 and 2010. Average annual falls in gas consumption have been markedly larger amongst British Gas customers compared to Great Britain as a whole. British Gas customer consumption has fallen at an annual compound rate of 4.9 per cent compared to 3.7 per cent for Great Britain as a whole over the period from 2006 to 2010. Overall, for British Gas customers, consumption has fallen by 22.2 per cent over the whole period compared to 17.0 per cent for Great Britain as whole. British Gas customers have saved the UK 5.47 million tonnes of CO_2[32].

In 2010, Cebr forecasts consumption for Great Britain as a whole to fall year-on-year by 1.8 per cent, this is significantly lower than the 2010 actual consumption fall amongst British Gas customers of 5.3 per cent.

As figure 4.3 illustrates, British Gas has a higher proportion of gas customers within higher-consuming regions such as Scotland, North East and East of England compared to overall distribution of British households. As such, British Gas is more susceptible to recent consumption falls which have been triggered by both economic change and efficiency measures introduced by British Gas. Efficiency measures would be a significant factor in explaining the difference in consumption falls over this period. Nevertheless, there are other

[32] The savings in gas consumption have been converted into CO_2 emissions savings using the Department for Environment and Food Affairs' Green House Gas conversion factors, which state that a kWh is equal to 0.18485 kg CO_2.

factors which influence consumption changes for Great Britain as a whole, which include population, the size of households and the age of housing stock which are discussed in chapter 2 of this report.

Cebr have estimated the potential savings to British households from implementing a range of efficiency measures which have been formalised in the scenarios outlined in section 4.1.

The table below describes the scenarios, for which we present the key findings in this section.

Table 4.7: Great Britain scenario description

#	Scenario	Potential Market Size	Scenario Tested
A	**No efficiency measures**	-	Baseline scenario - no further energy efficiency measures implemented
B	**New energy efficient boilers**	15.8 million boilers upgradeable[33]	3.2 million new energy efficient A-rated boilers installed annually up to 2015
C1	**Loft insulation only**	55.2 per cent of households (14.0 million dwellings[34])	2.8 million dwellings insulated per year up to 2015
C2	**Cavity wall insulation only**	36.4 per cent of households (9.3 million dwellings)	1.9 million dwellings insulated per year up to 2015
D	**All measures**	Both B and C, plus other energy efficiency measures	Both Scenarios B and C implemented, with other energy efficiency measures across whole of Great Britain (e.g. Smart meters and energy efficiency advice)

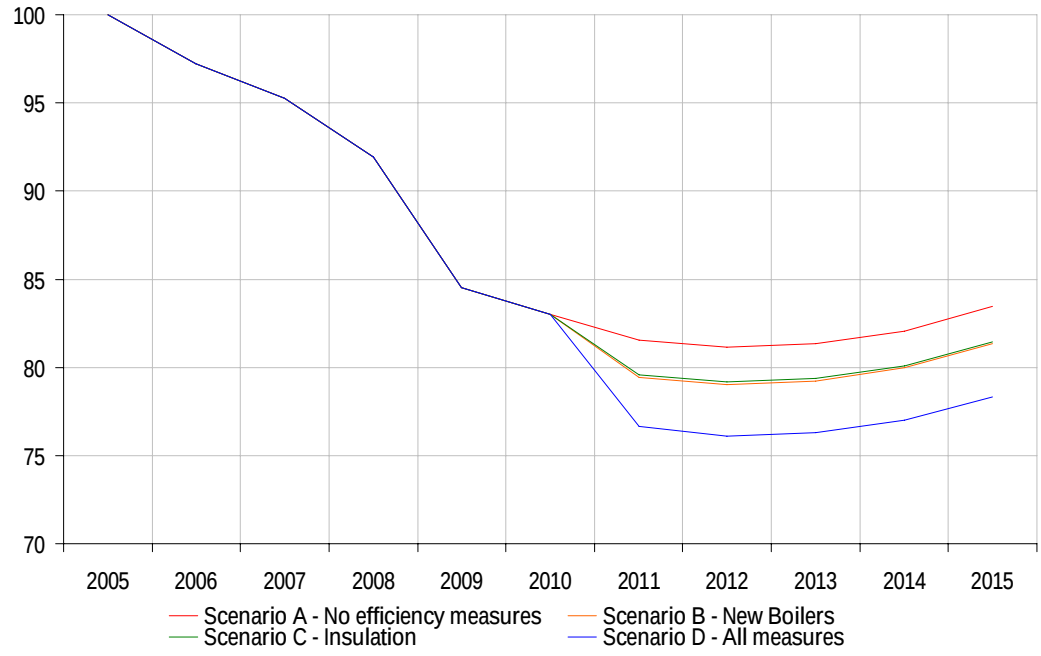
Source: Cebr analysis

Figure 4.5 illustrates forecast domestic gas consumption for Great Britain as a whole under the different scenarios.

[33] Total includes 4.5 million G-rated boilers.

[34] Figure includes dwellings requiring top-up (13.0 million) as well as virgin (1.0 million) loft insulation measures.

Figure 4.5: Indexed domestic gas consumption, forecast values from 2011 onwards



Source: Cebr analysis

The scenario testing shows a significant difference in gas consumption growth between the different energy efficiency measures that can be implemented amongst British households. On average, the residential gas consumption growth rate would be as much as 1.8 percentage points higher every year as a result of no efficiency measures being implemented between 2011 and 2015. Table 4.8 illustrates changes in gas consumption for each scenario.

Table 4.8: Scenarios A to D – Annual changes in gas consumption by scenario, annual percentage change

Scenario #	Description	2011	2012	2013	2014	2015	2011-2015 CAGR
A	No efficiency measures	-1.8%	-0.5%	0.2%	0.9%	1.7%	0.1%
B	Energy efficient boilers only	-4.3%	-0.5%	0.2%	0.9%	1.7%	-0.4%
C	Loft and cavity wall insulation only	-6.7%	-0.5%	0.2%	0.9%	1.7%	-0.9%
D	All measures	-10.2%	-0.7%	0.2%	0.9%	1.7%	-1.7%

Source: Cebr analysis

Scenario A – No efficiency measures examines a scenario where no further efficiency measures are implemented amongst British households. Under this scenario, gas consumption in 2011 and 2012 will fall by compound annual rate of 1.1 per cent, before growing at a compound annual rate of 0.9 per cent between 2013 and 2015.

Scenario B – Energy efficient boilers only examines a scenario where 3.2 million new energy efficient boilers are installed annually between 2011 and 2015. Under this scenario, gas consumption is expected to fall by a compound annual rate of 0.4 per cent over the same period, which leads, on average, to the consumption growth rate being 0.5 percentage points

lower annually compared to no efficiency measures being implemented. By 2015, consumption will be 2.6 per cent lower than in Scenario A as a result of all households being upgraded with new energy efficient boilers.

Scenario C – Loft and cavity wall insulation only examines a scenario where all households which are not insulated, and are suitable for loft and cavity wall insulation are serviced. Around 55 per cent[35] and 36 per cent[36] of all British households are available for virgin/top-up loft insulation and cavity wall insulation respectively. We have assumed that all British households will be insulated by 2015.

Under this scenario, gas consumption is expected to fall by a compound annual rate of 0.9 per cent between 2011 and 2015, which leads, on average, to the consumption growth rate being on 1.0 percentage points lower annually compared to no efficiency measures being implemented. By 2015, consumption is expected to be 5.0 per cent lower as a result of all households having loft and cavity wall insulation installed.

Scenario D – All measures examines a scenario where both Scenario B and C are implemented, and includes roll out of smart meters from 2011, and efficiency measures implemented from energy efficiency advice (e.g. double-glazing, pipe and floor insulation etc.). Under this scenario, gas consumption is expected to fall by a compound annual rate of 1.7 per cent between 2011 and 2015, which leads, on average, to the consumption growth rate being 1.8 percentage points lower annually compared to no efficiency measures being implemented. By 2015, consumption is expected to be 8.8 per cent lower as a result of all energy efficiency measures being implemented.

Cebr has estimated the potential savings on gas bills to British households under each scenario.

The following table illustrates the potential savings on gas bills for British households through adopting all efficiency measures under ***Scenario D – All measures***.

[35] According to Energy Savings Trust figures for top-up insulation and DECC for virgin insulation.

[36] According to DECC figures

Table 4.9: Great Britain Household savings from Scenario D – All measures, pounds per year

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	274	284	293	304	320	328	306
Scotland	290	301	310	321	339	346	323
North East	283	294	303	315	331	339	316
North West	282	292	301	313	329	337	314
Yorkshire and The Humber	280	291	300	311	327	335	313
East Midlands	280	291	300	311	328	335	313
West Midlands	280	291	300	311	328	336	313
East of England	283	293	302	314	331	338	316
London	276	287	295	306	323	330	308
South East	283	294	303	314	331	338	316
South West	242	252	259	269	284	290	271
GREAT BRITAIN	**277**	**288**	**297**	**308**	**325**	**332**	**310**

Source: Cebr analysis

The largest savings on gas bills occur in regions where gas consumption is structurally higher, namely Scotland, East of England and the South East. The average saving to British households from implementing all energy efficiency measures rises to £332 in 2015.

Appendix D provides a breakdown of the annual regional savings on gas bills for Great Britain's households for scenarios B and C.

Table 4.10 below compares 2009 regional average consumption levels for Great Britain as whole, and for British Gas customers. Appendix E replicates data published by British Gas which ranks its customers average gas usage based on postcodes.

Table 4.10: 2009 Average annual consumption per customer for Great Britain and British Gas customers, kWh per customer

Region	Great Britain	Rank	British Gas customers	Rank
Wales	15,187	9	18,376	9
Scotland	16,302	1	19,394	3
North East	15,715	3	18,387	8
North West	15,616	4	18,597	5
Yorkshire and The Humber	15,760	2	19,154	4
East Midlands	15,532	6	18,483	6
West Midlands	15,315	8	18,452	7
East of England	15,434	7	19,866	1
London	15,070	10	18,212	10
South East	15,536	5	19,572	2
South West	13,650	11	15,156	11
GREAT BRITAIN	**15,384**		**18,675**	

Source: DECC, British Gas, Cebr analysis

4.4 Aggregate savings to British Households

Cebr has estimated the total aggregate monetary saving to all British households under each scenario. This is presented in table 4.11:

Table 4.11: Aggregate saving to British households, millions of pounds per year

#	Scenario	2011	2012	2013	2014	2015	2011-2015 Total[37]
B	**New energy efficient boilers**	349	360	373	393	402	1,878
C	**Insulation only**	648	668	693	730	747	3,487
C1	**Loft insulation only**	346	356	370	389	398	1,859
C2	**Cavity wall insulation only**	303	312	324	341	349	1,628
D	**All measures**	**1,134**	**1,197**	**1,241**	**1,308**	**1,338**	**6,217**

Source: Cebr analysis

Our findings show that the aggregate saving to British households could reach as much as £1.3 billion by 2015. Overall, British households could save an aggregate of £6.2 billion from energy efficiency measures over the next five years. Of this £6.2 billion, British Gas customers could save an aggregate of £3.6 billion from energy efficiency measures, equivalent to an annual saving of £714 million.

[37] Totals may not sum precisely due to rounding.

Appendix A – Cebr's gas consumption econometric model

Cebr has developed an econometric model which can be summarised as follows:

$$\textbf{Gas Consumption}_{t} = \alpha + \beta\ \textbf{GDP}_{t} + \gamma\ \textbf{Income}_{t-1} + \delta\ \textbf{Savings}_{t}$$

Where

GDP is quarter-on-quarter growth in real UK Gross Domestic Product

Income is lagged quarter-on-quarter growth in UK real household disposable income

Savings is the quarterly percentage point change in the UK household savings ratio

Table A.1 below shows the results of the econometric analysis and Cebr's findings:

Table A.1: Results of Cebr's time-series econometric analysis

Coefficient	Economic variable	Coefficient value	Cebr's findings
A	Constant	-0.001	A negative constant indicates that there has been general quarterly declines in consumption independent of economic activity and financial health
B	Gross Domestic Product	1.387	Economic growth is the most important driver of gas consumption
Γ	Household Disposable Income	0.523	Higher incomes drive discretionary expenditure on energy
Δ	Household Savings Ratio	0.314	Higher savings indicate greater financial strength
R^2	R-squared	0.72	The model accounts for 72% of variations in natural gas consumption

Source: Cebr analysis

Appendix B – Energy efficiency breakdown of annual saving on gas bills for British Gas customers 2006 to 2010

The table below illustrates the average annual savings on British Gas customers' gas bills from installing new energy efficient boilers.

Table B.1: Average saving on gas bills to British Gas customers from installing new energy efficient boilers, pounds per year

Region	2006	2007	2008	2009	2010	2006-2010 Average
Wales	130	133	130	125	122	128
Scotland	135	139	135	130	127	133
North East	130	134	130	125	123	128
North West	131	135	131	126	124	130
Yorkshire and The Humber	133	137	133	128	126	131
East Midlands	130	134	130	125	123	129
West Midlands	132	136	132	127	125	131
East of England	142	147	142	137	134	141
London	130	134	131	125	123	129
South East	139	143	139	134	132	138
South West	105	108	105	101	99	104
GREAT BRITAIN	**132**	**136**	**132**	**127**	**124**	**130**

Source: Cebr analysis

The installation of a new energy efficiency boiler accounts for the largest monetary benefit of all British Gas energy efficiency measures, saving an average of £130 per year for British Gas customers. Table B.2 illustrates the average saving on gas bills from insulating customers' lofts.

Table B.2: Average saving on gas bills to British Gas customers from loft insulation, pounds per year

Region	2006	2007	2008	2009	2010	2006-2010 Average
Wales	99	102	99	96	94	98
Scotland	103	106	103	99	98	102
North East	99	102	100	96	94	98
North West	101	104	101	97	95	99
Yorkshire and The Humber	102	105	102	98	96	101
East Midlands	100	103	100	96	94	99
West Midlands	101	104	101	97	96	100
East of England	109	112	109	105	103	108
London	100	103	100	96	94	99
South East	107	110	107	103	101	105
South West	81	83	81	78	76	80
GREAT BRITAIN	**101**	**104**	**101**	**97**	**95**	100

Source: Cebr analysis

Loft insulation saved an average of £100 annually for British Gas customers over the period from 2006 and 2010. Loft insulation saves households an average of 13.8% in gas consumption every year[38].

Table B.3 illustrates the average saving on gas bills from insulating customers' cavity wall.

Table B.3: Average customer saving on gas bill to British Gas customers from cavity wall insulation, pounds per year

Region	2006	2007	2008	2009	2010	2006-2010 average
Wales	132	136	132	127	124	130
Scotland	137	141	137	132	129	135
North East	132	136	132	127	125	130
North West	133	137	133	128	126	132
Yorkshire and The Humber	135	139	135	130	128	134
East Midlands	133	136	133	127	125	131
West Midlands	134	138	135	129	127	133
East of England	145	149	145	139	137	143
London	133	137	133	128	125	131
South East	142	146	142	136	134	140
South West	107	110	107	103	101	106
GREAT BRITAIN	**134**	**138**	**134**	**129**	**127**	132

Source: Cebr analysis

Cavity wall insulation saved an average of £132 for British Gas customers annually between 2006 and 2010. Cavity wall insulation saves households an average of 18.3 per cent in gas consumption every year[39].

[38] British Gas analysis

[39] British Gas analysis

Appendix C – Energy efficiency breakdown of annual saving on gas bills for British Gas customers 2011 to 2015

The table below illustrates the average annual saving to British Gas customers from ***Scenario B – Energy efficient boilers only***, which assumes that 600,000 new energy efficient boilers are installed annually.

Table C.1: Scenario B – Energy efficient boilers only, average annual saving on gas bills to British Gas customers, pounds per year

Region	2010	2011	2012	2013	2014	2015	2011-15 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	122	125	130	137	148	156	139
Scotland	127	130	135	142	154	162	145
North East	123	125	130	137	148	156	139
North West	124	126	131	139	149	158	141
Yorkshire and The Humber	126	128	133	141	152	160	143
East Midlands	123	126	131	138	148	157	140
West Midlands	125	127	132	140	151	159	142
East of England	134	137	143	150	162	171	153
London	123	126	131	138	149	157	140
South East	132	134	140	147	159	167	149
South West	99	101	106	111	120	127	113
GREAT BRITAIN	**124**	**127**	**132**	**139**	**150**	**158**	**141**

Source: British Gas, Cebr analysis

The installation of new energy efficient boilers would save £158 for British Gas customers in 2015. The figures below illustrate the potential savings from loft and cavity wall insulation.

Table C.2: Scenario C – Insulation, average annual saving on gas bills to British Gas customers, pounds per year

Loft Insulation

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	94	96	100	105	113	119	107
Scotland	98	100	104	109	118	124	111
North East	94	96	100	105	113	119	107
North West	95	97	101	106	115	121	108
Yorkshire and The Humber	96	98	102	108	116	123	109
East Midlands	94	96	100	106	114	120	107
West Midlands	96	98	102	107	115	122	109
East of England	103	105	109	115	124	131	117
London	94	96	100	106	114	120	107
South East	101	103	107	113	122	128	115
South West	76	78	81	85	92	97	87
GREAT BRITAIN	**95**	**97**	**101**	**107**	**115**	**121**	108

Cavity Wall Insulation

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	124	122	123	125	128	132	126
Scotland	129	127	128	130	133	138	131
North East	125	122	123	125	128	132	126
North West	126	124	125	127	130	134	128
Yorkshire and The Humber	128	126	127	129	132	136	130
East Midlands	125	123	124	126	129	133	127
West Midlands	127	125	126	128	131	135	129
East of England	137	134	135	138	141	145	139
London	125	123	124	126	129	133	127
South East	134	131	133	135	138	142	136
South West	101	99	100	102	104	107	103
GREAT BRITAIN	**127**	**124**	**125**	**127**	**130**	**134**	128

Source: British Gas, Cebr analysis

Loft and cavity wall insulation are expected to save £108 and £128 respectively in annual gas bills for British Gas customers over the period 2011 to 2015.

Appendix D – Energy efficiency breakdown of annual regional savings on gas bills for Great Britain's households 2011 to 2015

Table D.1 illustrates the forecast regional savings from **Scenario B – New boilers** being implemented.

Table D.1: Great Britain household savings from Scenario B – Energy efficient boilers only, pounds per year

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	103	107	111	115	121	124	115
Scotland	109	113	117	121	128	131	122
North East	107	111	114	119	125	128	119
North West	106	110	114	118	124	127	119
Yorkshire and The Humber	106	110	113	117	123	126	118
East Midlands	106	110	113	117	124	126	118
West Midlands	106	110	113	117	124	127	118
East of England	107	111	114	118	125	128	119
London	104	108	111	116	122	125	116
South East	107	111	114	118	125	128	119
South West	91	95	98	102	107	109	102
GREAT BRITAIN	**105**	**109**	**112**	**116**	**122**	**125**	**117**

Source: Cebr analysis

British households could save £125 through new energy efficient boilers in 2015.

Table D.2 illustrates the potential savings on gas bills as a result of British households installing loft and cavity wall insulation.

Table D.2: Great Britain household savings from Scenario C – Insulation, pounds per year

Loft insulation

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	79	82	85	88	93	95	88
Scotland	84	87	90	93	98	100	94
North East	82	85	88	91	96	98	92
North West	81	85	87	90	95	97	91
Yorkshire and The Humber	81	84	87	90	95	97	90
East Midlands	81	84	87	90	95	97	90
West Midlands	81	84	87	90	95	97	91
East of England	82	85	87	91	96	98	91
London	80	83	85	89	93	95	89
South East	82	85	87	91	96	98	91
South West	70	73	75	78	82	84	78
GREAT BRITAIN	**80**	**83**	**86**	**89**	**94**	**96**	90

Cavity wall insulation

Region	2010	2011	2012	2013	2014	2015	2011-2015 Average
	Actual	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Wales	105	109	112	117	123	126	115
Scotland	111	115	119	123	130	133	122
North East	109	113	116	121	127	130	119
North West	108	112	116	120	126	129	118
Yorkshire and The Humber	107	111	115	119	126	128	118
East Midlands	107	112	115	119	126	128	118
West Midlands	108	112	115	119	126	129	118
East of England	108	113	116	120	127	130	119
London	106	110	113	117	124	127	116
South East	108	113	116	120	127	130	119
South West	93	97	99	103	109	111	102
GREAT BRITAIN	**106**	**110**	**114**	**118**	**124**	**127**	117

Source: Cebr analysis

British households could save £90 and £117 through loft and cavity wall insulation respectively over the period 2011 to 2015.

Appendix E – British Gas customers average domestic natural gas consumption by postcode[40], kWh, July to October 2010

East Midlands

Ipswich	1658.695
Norwich	1688.246
Lincoln	1799.627
Colchester	1812.484
Peterborough	1876.587
Doncaster	1900.075
Cambridge	1965.953
Nottingham	2002.541
Derby	2024.983
Leicester	2039.589

London

London EC	904.026
London WC	1145.329
London West	1573.322
London SW	1611.897
London SE	1620.047
London East	1758.757
London North	1785.687
London NW	1835.236
Romford	1844.223
Dartford	2019.73
Enfield	2075.861
Twickenham	2102.462
Croydon	2164.145
Watford	2174.546
Sutton	2188.348
Southall	2211.176
Bromley	2239.716
Ilford	2266.66
Kingston-upon-Thames	2300.514
Harrow	2521.909

[40] Data collected from five million British Gas customers between July and October 2010. Average consumption based on the median value of at least 300 British Gas customers residing in a particular area.

North East

Hull	1855.084
Wakefield	1915.31
York	1928.808
Cleveland	1977.751
Leeds	1998.288
Sheffield	2008.216
Darlington	2035.152
Newcastle	2040.328
Harrogate	2141.351
Durham	2180.143
Sunderland	2210.615

North West

Glasgow	1990.882
Edinburgh	2015.788
Paisley	2030.426
Galashiels	2067.254
Dundee	2105.462
Falkirk	2122.418
Dumfries	2135.356
Kilmarnock	2150.584
Perth	2252.875
Motherwell	2283.292
Kilkaldry	2331.027
Inverness	2446.823
Aberdeen	2489.991

South East

Portsmouth	1574.477
Brighton	1589.568
Canterbury	1656.456
Southampton	1788.273
Medway	1805.103
Southend-on-sea	1941.505
Tonbridge	1943.733
Stevenage	1957.359
Milton Keynes	1975.283
Oxford	2002.592
Reading	2040.211
Chelmsford	2047.158
Redhill	2074.784
St. Albans	2085.173
Hemel Hemstead	2162.073
Luton	2167.815
Slough	2225.915
Guildford	2263.331

South West

Truro	1294.021
Plymouth	1306.039
Dorchester	1434.611
Exeter	1435.83
Torquay	1496.773
Taunton	1497.465
Bristol	1636.114
Bath	1687.899
Gloucester	1709.346
Bournemouth	1717.183
Swindon	1789.165
Salisbury	1822.931

Wales

Llandudno	1697.781
Shrewsbury	1703.144
Llandrindod	1751.103
Swansea	1883.488
Cardiff	1976.588
Newport	2005.799

West Midlands

Hereford	1595.569
Worcester	1688.984
Telford	1793.171
Northampton	1845.696
Coventry	1860.514
Dudley	1960.663
Walsall	2065.05
Stoke on Trent	2068.891
Wolverhampton	2075.261
Birmingham	2080.032