

UPDATED ENERGY AND EMISSIONS PROJECTIONS

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Executive Summary

The Department of Energy and Climate Change produces regular updated projections of energy demand, supply and greenhouse gas (GHG) emissions. The last set of projections was published in July 2009¹ to support the Low Carbon Transition Plan (LCTP).

These updated projections reflect new data, revised assumptions of near- to medium-term economic growth reflecting the March 2010 Budget forecasts, revised carbon prices, and updated estimates of the impact of the package of policies set out in the LCTP and the Household Energy Management Strategy². **These updated projections do not take into consideration the policies announced in the 'The Coalition: our programme for government', which include a floor price for carbon. New policies will be incorporated once the exact details have been agreed.**

The emissions projections are presented on the net UK carbon account methodology against the first three carbon budget periods. The projections are illustrated in Chart 1 below and compared with the previous projections shown in Table 1. The results reflect the latest estimate of the EU Emissions Trading System (EU ETS) cap adjusted for changes to coverage in Phase III.

The updated projections suggest that the UK will meet its first three published carbon budgets. The level of emissions in the first carbon budget period is projected to be 15 MtCO₂e higher than in the July 2009 projections, however emissions are still projected to be 29 MtCO₂e below budget over the first period. Emissions in budgets 2 and 3 have decreased by 4 and 11 MtCO₂e respectively, compared to the July 2009 projections. Emissions are now projected to be 68 MtCO₂e below the level of the budget in period 2, and 50 MtCO₂e below the level of the budget in period 3.

The number of EU emission allowances (EUAs) projected to be purchased in the second and third carbon budget periods has increased. This increase is due to higher emissions projected from the traded sector due to changes in the projected electricity generation mix.

The change in the projected electricity generation mix reflects new independent cost estimates of power sector generation technologies and new DECC carbon price assumptions. Different assumptions would produce different generation mixes. The particular results shown in this report are not intended to represent a desired or preferred mix.

¹ <http://decc.gov.uk/en/content/cms/statistics/projections/projections.aspx>

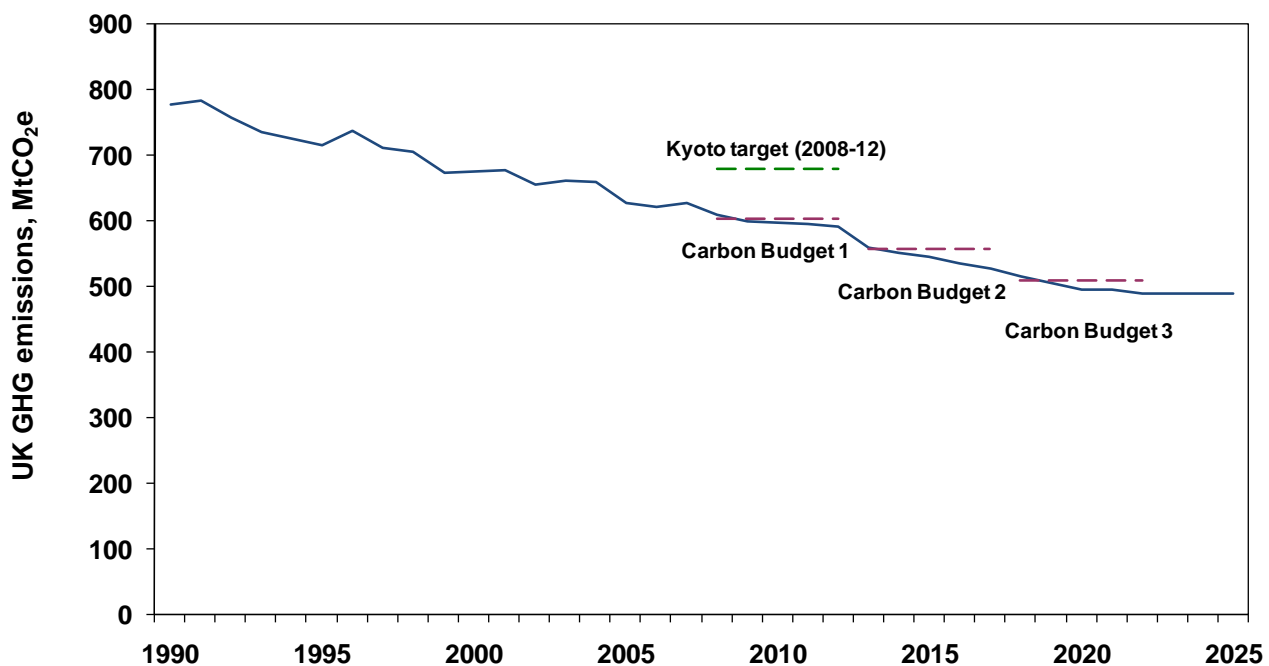
² http://www.decc.gov.uk/en/content/cms/what_we_do/consumers/saving_energy/hem/hem.aspx

Table 1 Projected net UK carbon account, using central assumptions (includes purchases/disposals of carbon units by EU ETS participants).

MtCO ₂ e	July 2009			June 2010		
Greenhouse gas emissions	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Traded sector (set at EU ETS cap)	1,233	1,078	985	1,233	1,073	983
Non-Traded sector	1,741	1,640	1,520	1,756	1,642	1,512
of which non-CO ₂	464	452	418	462	441	409
net UK Carbon Account	2,974	2,718	2,505	2,989	2,714	2,494
<i>Overall change from July 2009</i>				15	-4	-11
CARBON BUDGET	3,018	2,782	2,544	3,018	2,782	2,544
Shortfall (negative implies emissions under budget)	-44	-64	-39	-29	-68	-50
EUAs purchased (negative implies sold)	-19	23	-17	-33	55	20
EUA change from July 2009				15	-32	-37

It should be noted that the July 2009 projection is presented based on the 2007 inventory basis while the latest projection is on the 2008 inventory basis³.

Chart 1 The projected UK emissions of greenhouse gases on net carbon account basis (including purchase of allowances within the EU ETS) 1990-2025.



³ The UK GHG inventory is updated annually to meet legal requirements for reporting to the United Nations Framework Convention on Climate Change (UNFCCC) and the European Union.

Chapter 1: Introduction

The Climate Change Act 2008 introduced a legally binding target to reduce the UK's greenhouse gas (GHG) emissions to at least 80 per cent below 1990 levels by 2050, to be achieved through action at home and abroad. To drive progress towards this target the Act introduces five-year "carbon budgets", which will define the emissions pathway to the 2050 target by limiting the total GHG emissions allowed in each five year period, beginning in 2008. The first three carbon budgets – for 2008-2012, 2013-2017, and 2018-2022 – have now been set through secondary legislation⁴.

The carbon budgets set a limit on the level of the **net UK carbon account**. This is calculated by adjusting UK GHG emissions⁵ to account for any carbon units⁶ which have been brought in from overseas by Government and others to offset UK emission ('credits') and UK carbon units which have been disposed of outside the UK ('debits').

Projections of UK energy demand, supply and carbon dioxide emissions have been published by the Department of Energy and Climate Change (DECC) on a regular basis, to inform Government energy and environmental analysis, since 2000⁷. The DECC Energy and Emissions Model is used to project carbon dioxide emissions. These are combined with projections of non-CO₂ gases (provided by AEA Technology) and projections of emissions from the DECC Land Use model to form the UK emissions projections. These projections take into account the estimated impact of all policies prior to the publication of 'The Coalition: our programme for government' (the coalition programme).

These projections are used to model future levels of the net UK carbon account, and so help Government to monitor progress in meeting the carbon budgets. Projections of the net UK carbon account correspond to projected net UK emissions, taking into account the expected level of credits or debits due to the use or disposal of carbon units by UK participants in the EU ETS.

The last set of projections published in July 2009 used to inform and support the Low Carbon Transition Plan (LCTP) and provided the net UK carbon account emissions based on the LCTP policies and proposals.

These projections update the July 2009 projections and reflect new data including: revised assumptions of near- to medium-term economic growth reflecting the March 2010 Budget Treasury forecasts; revised carbon prices; updated estimates of the impact of the package of policies set out in the LCTP and the Household Energy Management Strategy⁸; and recent independent research into the capital costs of all major generation technologies⁹.

The rest of this document is structured as follows. The key assumptions are set out in Chapter 2. The projections are set out in the net UK carbon account methodology in Chapter 3 and

⁴ See www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/carbon_budgets/carbon_budgets.aspx

⁵ Allowing for removals from land use, land use change, and forestry.

⁶ The term carbon units covers allowances issued under cap and trade schemes such as the EU Emissions Trading System (EUAs), and credits representing emissions reductions in developing countries issued under the Clean Development Mechanism (CERs), as well as other types of units.

⁷ Current and previous Energy and Emissions projections are available on the DECC webpage

<http://decc.gov.uk/en/content/cms/statistics/projections/projections.aspx>

⁸ http://www.decc.gov.uk/en/content/cms/what_we_do/consumers/saving_energy/hem/hem.aspx

⁹ UK Electricity Generation Costs Update', produced by Mott MacDonald, available at

<http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx>

compared with the July 2009 projections. A detailed list of policies included in these projections is provided in Chapter 4. Uncertainty in the projections is considered in Chapter 5. Chapter 6 provides detail on electricity generation. Final and primary demand for energy is presented in Chapter 7. A number of downloadable tables provided in Excel format (the Annexes) are listed in Chapter 8.

Chapter 2: Assumptions

The DECC Energy and Emissions Model provides the basis for the carbon dioxide emissions projections and requires a set of key assumptions including the level of economic growth, international fossil fuel prices, and the size of UK population. The assumptions are based on official UK statistics where available, or agreed across government departments.

Projections of non-CO₂ greenhouse gas (GHG) emissions and GHG emissions from the Land Use, Land-Use Change and Forestry sector (LULUCF) are provided by other models, based on consistent assumptions, and added to the carbon dioxide projections to provide projections of total UK greenhouse gas emissions.

The results of the central emissions projections are generally quoted throughout this paper (unless otherwise stated). The results of a number of other projections based on different assumptions are provided in the Annex to this paper.

Fossil fuel price assumptions and exchange rates

Assumptions of wholesale fossil fuel prices are produced by DECC based on analysis of the international market and informed by other forecasts published by international organisations.

The latest fossil fuel price assumptions were published in May 2009¹⁰ and reflected changes over the previous year in global oil markets. The fossil fuel projections are presented in four different scenarios of future global fuel markets. This range was considered sufficiently comprehensive of current wholesale price movements that no changes were made to these assumptions for the current set of projections.

The four fossil fuel worlds are:

- Reflecting low global energy demand (low)
- Reflecting timely investment and moderate demand (central)
- Reflecting high demand and producers' market power (high)
- Reflecting high demand and significant supply constraints (high-high).

The central energy and emissions projections presented here are based on the central price scenario.

The full range of price assumptions for all fossil fuels is contained in Annex F. Table 2.1 shows the central prices. Table 2.2 shows the crude oil price assumptions for all scenarios to illustrate the range of prices encompassed by these scenarios.

¹⁰ <http://www.decc.gov.uk/media/viewfile.ashx?filepath=statistics/projections/file51365.pdf&filetype=4>. The "low" scenario in these projections corresponds to scenario 1 in the fuel prices document, "central" to scenario 2, "high" to scenario 3 and "high-high" to scenario 4.

Table 2.1 Fossil fuel price assumptions for central scenario.

2008 prices	Crude oil \$/bbl	Natural gas NBP* p/therm	ARA* coal \$/tonne
2010	70	58	110
2015	75	63	80
2020	80	67	80
2025	85	71	80

* National Balancing Point (NBP) and Amsterdam-Rotterdam-Antwerp (ARA), standard trading locations for gas and coal respectively.

Table 2.2 Crude oil price assumptions for all scenarios.

Crude Oil (\$/bbl) (2008 prices)	low prices	central prices	high prices	high-high prices
2010	50	70	84	103
2015	58	75	102	142
2020	60	80	120	150
2025	60	85	120	150

The exchange rates used from 2010 are summarised in the Table 2.3. These are the average of the previous calendar year's market rates, and are held constant for the projection period.

Table 2.3 Exchange rate assumptions.

Currency	Exchange rate
£/\$	1.57
€/£	0.890

Economic growth¹¹

The growth assumptions for GDP are unchanged since the last projections except in 2009. Manufacturing growth is projected to be higher than the assumptions used for the previous projections. The longer-term assumptions (2013 onwards) are internal modelling assumptions but broadly consistent with HMT's assessment of economic prospects, as published in the March 2010 Budget. The figures shown in Table 2.4 are central projections based on the mid-point of ranges presented by HMT.

Table 2.4 Economic growth assumptions (per cent).

Percent per annum growth	2009	2010	2011	2012	2013	2014-2016	2017-2025
GDP Updated projection	-5.00	1.25	3.25	3.50	3.60	2.40	2.30

¹¹ See http://www.hm-treasury.gov.uk/d/budget2010_complete.pdf for GDP and manufacturing growth figures up to 2012.

Manufacturing Updated projection	-10.75	1.75	3.75	3.75	2.40	1.90	1.70
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Carbon price

Participants within the EU Emissions Trading Scheme (EU ETS), including the power generation sector, may either reduce carbon emissions or purchase allowances to meet an agreed national allocation of permits. Table 2.5 shows the price of allowances (the carbon price) assumed by DECC¹² based on a range of fossil fuel price scenarios. Table 2.5 also shows the carbon price used in the July 2009 projections.

Table 2.5 Carbon prices assumed (€/tonne CO₂).

€/tCO ₂	July 2009				June 2010			
	2010	2015	2020	2025	2010	2015	2020	2025
(2009 prices)								
Low Prices	19	18	20	34	8	9	10	24
Central Prices	22	32	35	66	16	17	18	49
High Prices	27	40	43	94	20	22	23	71
High-high Prices					27	29	31	94

The carbon price projections have been revised downwards reflecting the impact of the recession, and improved analysis of the abatement opportunities in the industrial sectors covered by the EU ETS.

The Updated Emissions Projections do not take account of policy to underpin the carbon price, as has been announced in the coalition programme.

Non-CO₂ emissions

Non-CO₂ emissions are not estimated by the DECC Energy and Emissions Model but projections of energy related and non-energy related non-CO₂ emissions are provided by AEA Technology under contract to DECC. Emissions of non-CO₂ GHGs are expressed as the amount of carbon dioxide that would have an equivalent global warming effect. For this reason the unit used in this paper for GHG emissions is million tonnes of carbon dioxide equivalent (MtCO₂e).

Table 2.6 Non-CO₂ GHG¹³ emissions (MtCO₂e).

MtCO ₂ e	2010	2015	2020	2025
July 2009	93.0	91.0	88.0	85.0
June 2010	91.7	89.8	87.0	84.7

¹² See [http://www.decc.gov.uk/media/viewfile.ashx?filepath=what we do/a low carbon uk/carbon valuation/1_20100608153345_e_@@_carbonvalues.pdf&filetype=4](http://www.decc.gov.uk/media/viewfile.ashx?filepath=what%20we%20do/a%20low%20carbon%20uk/carbon%20valuation/1_20100608153345_e_@@_carbonvalues.pdf&filetype=4), the High-high scenario carbon prices were created by an ad-hoc run of the DECC carbon price model.

¹³ Non-CO₂ GHGs include methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFC) and perfluorocarbons (PFC).

Land use, land use change and forestry (LULUCF)

Projections of GHG emissions resulting from forecast land use, land use change and forestry are required to calculate total UK GHG emissions. The emission projections are based on the central LULUCF projection, summarised in the Table 2.7.

The LULUCF sector is different from other sectors in that it contains both sources and sinks of GHGs. The sources, or emissions *to* the atmosphere, are given as positive values; the sinks, or removals *from* the atmosphere, are given as negative values.

Table 2.7 Land use and land use change and forestry emissions (MtCO₂e).

MtCO ₂ e	2010	2015	2020	2025
Central	-1.2	0.9	2.7	2.9

Inventory

The National Atmospheric Emissions Inventory (referred to as ‘the inventory’ in the remainder of this paper) is updated annually¹⁴. It contains updated emissions factors for fuels and emissions data for the previous year. The July 2009 projections were based on the 2007 inventory while the latest projections are based on the 2008 inventory. Figures for past years have been revised slightly in the most recent inventory and the figures for 2008 in the updated projection are now actuals.

Electricity generation

Detailed assumptions specific to the projection of the electricity generation mix are described in Chapter 6.

¹⁴ The UK greenhouse gas inventory is updated annually by AEA Technology to meet legal requirements for reporting to the United Nations Framework Convention on Climate Change and the European Union.

Chapter 3: Emissions projections

This chapter summarises and discusses the GHG emissions projections. Results are presented on two bases, which define the sectors that are used to disaggregate emissions. Regardless of the basis used, the projected value of the net UK carbon account in a particular year is the same – the basis only affects how this total is split into its components.

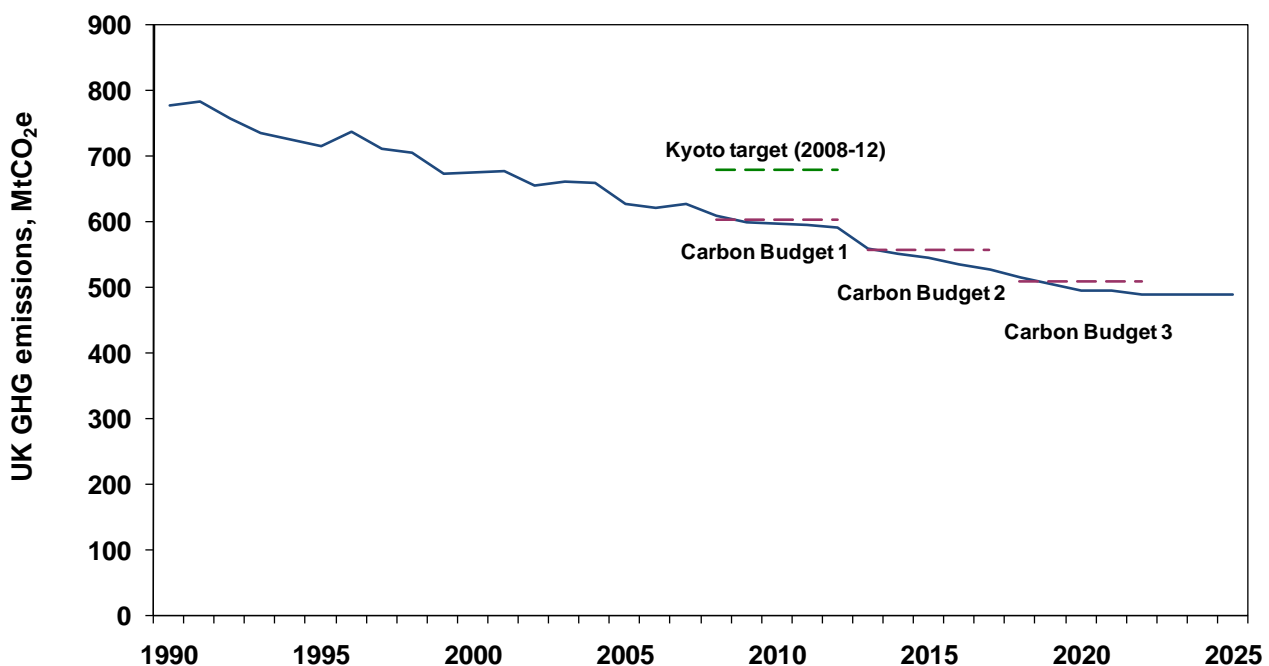
The National Communication (NC) basis is defined by the United Nations Framework Convention on Climate Change and used for reporting under this convention. The Updated Emissions Projections (UEP) basis is that used in previous DECC emissions projections and is consistent with the Digest of United Kingdom Energy Statistics (DUKES), an important source of input data for the DECC Energy and Emissions Model.

The first section of this chapter contains annual results, presented at five-yearly intervals on an NC basis. The second section of this chapter considers the carbon budgets, which are aggregated over 5 year periods, on a UEP basis. This chapter presents DECC's central emissions projections. Chapter 5 looks at the components of uncertainty of these central projections and describes the upper and lower range of the projections.

Annual results

Chart 3.1 shows the latest projections of the net UK carbon account, and Table 3.1 shows the contributions of UK sectors to the total net emissions.

Chart 3.1 Net UK carbon account projection¹⁵: 1990-2025.



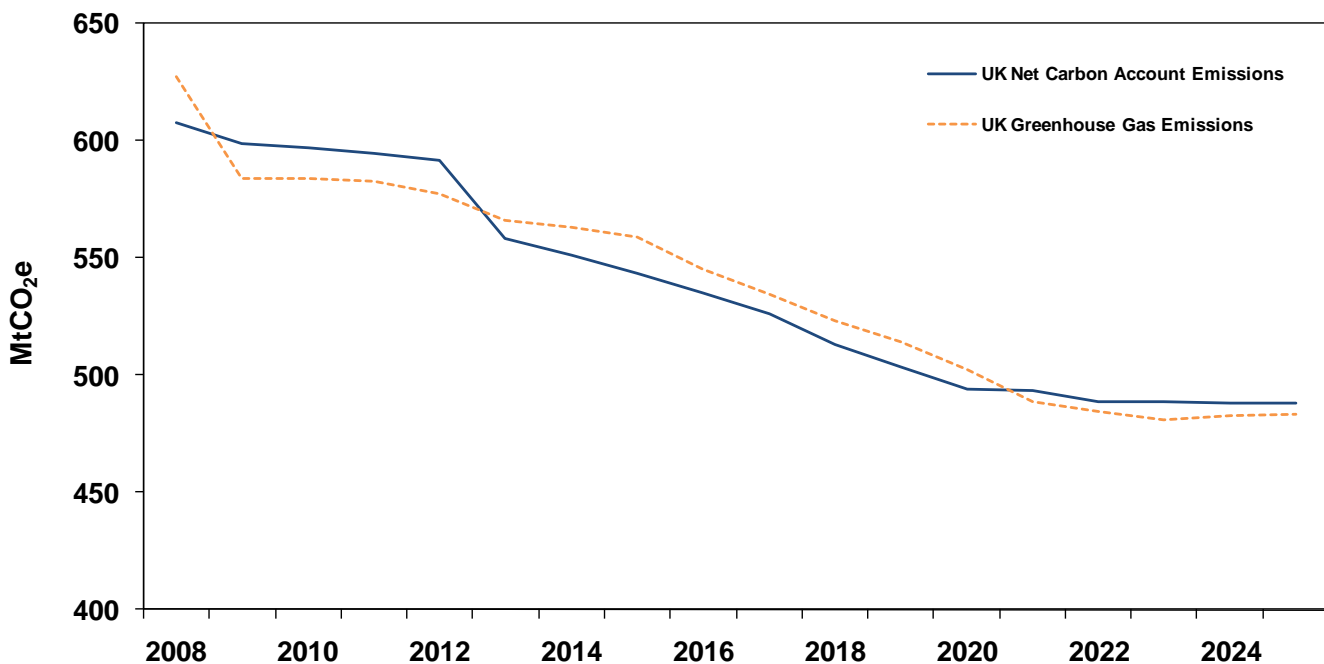
¹⁵ Taking account of carbon units traded under the EU ETS. Figures shown for 2008-2025 are projections.

The latest projections suggest that, using central assumptions, net UK GHG emissions¹⁶ will be 36 per cent below 1990 emissions level by 2020. This central projection indicates that the UK will be well within the UK Kyoto GHG emissions reductions target of 12.5% between 2008-2012. The Kyoto baseline is fixed to the 2004 inventory and has a slightly different geographical coverage to these projections. For more details see the latest statistical release on GHG emissions¹⁷. The 1990 base year emissions are 777.4 MtCO₂e.

Companies participating in the EU ETS can buy or sell carbon units¹⁸, and the net UK carbon account must take account of this, whether it represents an overall credit against the account (if, taken together, UK EU ETS participants buy more carbon units than they sell) or a debit (if they sell more than they buy) .

Chart 3.2 plots projections for future levels of both the net UK carbon account and net UK GHG emissions. Between 2009 and 2012, the net UK carbon account exceeds the level of UK GHG emissions, implying that the UK is a net seller of carbon credits. After 2012, this position is reversed, and the UK becomes a net buyer of credits.

Chart 3.2 Comparison of projections of the net UK carbon account and net UK GHG emissions.



¹⁶ The Kyoto basket of greenhouse gases consisting of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFC) and perfluorocarbons (PFC).

¹⁷ www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2008_final/2008_final.aspx

¹⁸ See footnote 6.

UK Emission projections by sector

Table 3.1¹⁹ Projected net UK carbon account, using central assumptions (includes purchases/disposals of carbon units by EU ETS participants)²⁰ broken down by sectors. All data refers to the updated projections (June 2010); the July 2009 projection is given only for comparison.

MtCO ₂ e	Central Greenhouse Gas emissions*					
	1990	2008	2010	2015	2020	2025
Net UK Carbon Account						
July 2009 projection	776	603	594	544	496	480
June 2010 projection	776	608	597	543	494	488
Change since 1990		-22%	-23%	-30%	-36%	-37%
UK Greenhouse Gases		628	584	559	502	483
EUA Purchases		20	-13	16	8	-5
Sectors:						
Energy Supply		220	194	185	153	133
Business		96	86	86	83	84
Industrial Processes		17	16	16	17	16
Transport		132	128	123	112	111
Residential		84	80	68	60	63
Public		10	9	9	8	8
Agriculture		48	49	50	47	47
Land Use Change		-2	-1	1	3	3
Waste Management		23	22	22	20	20

* It should be noted that figures in this and subsequent tables have been rounded. Totals are calculated from the un-rounded data and therefore may not appear to be the sum of the component parts.

The Energy Supply sector is projected to reduce emissions between 2008 and 2020 by 67 MtCO₂e (30%). Residential emissions are projected to fall by 25 MtCO₂e (29%) over the same period. The transport and business sectors are projected to contribute 19 MtCO₂e and 13 MtCO₂e of savings respectively with 2 MtCO₂e from other sectors.

¹⁹ In Table 3.1 the United Nations Framework Convention on Climate Change (UNFCCC) National Communication definition of the transport sector is used. This is the sum of road transport and other categories including domestic aviation (between 2008 and 2011), rail, national navigation and military aviation and shipping.

²⁰ Figures for 2008 in the updated projection http://www.airquality.co.uk/reports/cat07/0905131425_ukghqi-90-07_main_chapters_Issue2_UNFCCC_CA_v5_Final.pdf

Progress towards the carbon budgets

The statutory independent Committee on Climate Change (CCC) was established by the Climate Change Act 2008 with the principal aim of advising the Government on setting levels for the five-year carbon budgets, which set a trajectory for UK GHG²¹ emission reductions towards the long-term target of at least an 80% reduction in emissions by 2050.

The levels of the first three carbon budgets were set in Budget 2009²² at the “interim” level recommended by the CCC prior to global agreement on emissions reductions. The carbon budgets require a reduction in greenhouse gas emissions of 34%, against 1990 levels, by the third budget period (2018-2022). In line with the advice of the CCC, the budget levels will be tightened following a satisfactory new global agreement.

The UK emissions projections, including the projection of the carbon dioxide equivalent of the Kyoto basket of non-CO₂ GHGs, provides the basis for assessing progress against meeting the UK carbon budgets. In this section, the emissions are presented on the net UK carbon account basis and shown for the first three carbon budget periods of 2008-12, 2013-2017, and 2018-2022.

Traded and non-traded sectors

The total UK emissions projections are split into the traded and non-traded sectors for the first three budget periods. Emissions from installations within the EU ETS including allowances traded within the system fall within the “traded sector”. Emissions from sectors and installations not participating in the EU ETS are termed the “non-traded” sector. Under the carbon accounting regulations for UK carbon budgets the net contribution to the UK carbon account from the traded sector is equal to the UK share of the EU ETS cap. The difference between the July 2009 estimated EU ETS cap and the current cap reflects changes in the estimated coverage of the ETS, for example to cover small emitters and some non-CO₂ gases.

The traded sector emissions projections comprise emissions from the energy industries including power stations, refineries, offshore oil and gas, some combined heat and power (CHP) installations and a few service sector participants. From 2012 domestic aviation emissions will be included within the EU ETS.

The non-traded sector comprises emissions from the residential sector, the transport sectors, the majority of commercial and public sectors, land use change and the carbon dioxide equivalent of the non-greenhouse gas emissions projection (excluding those gases which are categorised as traded in Phase III).

The split between traded and non-traded emissions has been revised since the July 2009 projections to reflect the 2008 verified emissions²³ and the expansion in EU ETS participation in Phase III.

Table 3.2 summarises the updated projections and compare them to the previous projections published in July 2009 on the net carbon account basis used for the UK carbon budgets.

²¹ In the context of the CCC and the carbon budgets, GHG refers to the Kyoto basket of gases.

²² http://www.hm-treasury.gov.uk/bud_bud09_carbon.htm

²³ http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2008_final/2008_final.aspx

Table 3.2 Carbon budget July 2009 and June 2010 projection headline results.

MtCO ₂ e	July 2009			June 2010		
	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Greenhouse gas emissions						
Traded sector (set at EU ETS cap)	1,233	1,078	985	1,233	1,073	983
Non-Traded sector	1,741	1,640	1,520	1,756	1,642	1,512
of which non-CO ₂	464	452	418	462	441	409
net UK Carbon Account	2,974	2,718	2,505	2,989	2,714	2,494
Overall change from July 2009				15	-4	-11
CARBON BUDGET	3,018	2,782	2,544	3,018	2,782	2,544
Shortfall (negative implies emissions under budget)	-44	-64	-39	-29	-68	-50
EUAs purchased (negative implies sold)	-19	23	-17	-33	55	20
EUA change from July 2009				15	-32	-37

The updated projections (Table 3.2) continue to show that all three budgets will be met under the central scenario. The level of emissions in the first carbon budget period is projected to be 15 MtCO₂e higher than in the July 2009 projections, however emissions are still projected to be 29 MtCO₂e below budget over the first period. Emissions in budget periods 2 and 3 have decreased by 4 and 11 MtCO₂e respectively, compared to the July 2009 projections. Emissions are now projected to be 68 MtCO₂e below the level of the budget in period 2, and 50 MtCO₂e below the level of the budget in period 3.

Sector Emissions

Table 3.3 shows the emissions projections from each of the traded and non-traded sectors by budget period.

Table 3.3 Greenhouse gas emissions by sector.

MtCO ₂ e	June 2010		
Sector	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Traded Sector Emissions			
Power stations CO ₂	767	685	545
Refineries CO ₂	77	80	83
Services CO ₂	11	11	11
Industry CO ₂	342	334	343
Traded Aviation CO ₂	2	13	14
Non-CO ₂ traded Emissions	0	6	7
Total traded emissions	1,200	1,128	1,003
Traded sector cap under EU ETS	1,233	1,073	983
EUAs Purchased (negative implies sold)	-33	55	20
Non-Traded sector			
Refineries CO ₂	2	2	3
Residential CO ₂	383	326	290
Services CO ₂	120	118	102
Industry CO ₂	164	157	152
Transport CO ₂	631	593	543
Land use and forestry CO ₂	-6	4	12
Non-Traded non-CO ₂ emissions	462	441	409
TOTAL NON-TRADED EMISSIONS	1,756	1,642	1,512
net UK Carbon Account			
CARBON BUDGET	3,018	2,782	2,544
Shortfall (negative implies emissions under budget)	-29	-68	-50

In Tables 3.4 and 3.5 the contributions to the changes in these updated projections from the projections published in July 2009 are considered.

Table 3.4 Indicative contribution of changes in the non-traded projections to the overall change in each of the carbon budget periods in MtCO₂e. Negative implies lower emissions in the non-traded sector.

MtCO ₂ e	Non-traded sector changes		
	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Residential	-1	-2	2
Policy	1	-8	-8
Revision to solid fuel	-3	6	10
Services	9	6	1
Policy including products policy	-2	-7	-23
Revision to statistics and growth /CHP projection, including inventory transfer from transport	11	13	24
Industry	56	51	38
Inventory	1	2	2
Policy	0	4	8
Traded/NT split revised methodology, including CHP projection	8	8	8
Higher than expected manufacturing growth	19	16	1
Inventory transfers from transport	28	20	19
Transport	-46	-44	-45
Re-allocation inventory transfers: off-road to industry/services and other transport	-48	-44	-44
Inventory	0	0	0
Prices	1	0	0
Growth	-1	2	1
Stats/re-modelling	1	-3	-3
Other Transport	-2	-2	-1
Rail	3	3	2
Shipping	1	0	0
Non-CO₂ GHGs	-2	-10	-9
TOTAL NON-TRADED	16	0	-12

Table 3.4 illustrates how changes between the current and previous projections are attributed to inventory changes, policy changes and revisions to data. As shown in Table 3.4 the largest changes come from industry. These arise largely from inventory changes. The smaller inventory change is due to revisions to emissions factors, while the larger change, 'Inventory transfers from transport', reflects changes to categorisation rather than an overall increase in emissions. The other large change arises from the correction of a somewhat pessimistic assumption made in the July 2009 projections for the effect of the economic downturn on industry. This assumption is corrected in the current projections as actual data of the impact of the recession on the manufacturing sector has emerged.

Table 3.5 Contribution of changes in the traded projections. Positive implies higher emissions in the traded sector, resulting in additional EUAs being purchased.

MtCO ₂ e	Traded sector changes		
	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Power Stations	6	50	62
Higher generation	8	18	40
Nuclear generation	-2	2	10
New CCGT efficiencies	2	3	3
Revised CO ₂ price assumption	5	31	21
Revised emissions factors	2	2	1
New coal efficiencies	0	1	4
Imported electricity	3	1	-1
Outturn fuel prices	-8	0	0
Renewables generation	-5	-16	-9
Other including compound interactions	0	7	-8
Industry (traded)	-18	-27	-32
Iron and Steel	-17	-24	-24
CHP traded	7	1	-20
Traded/non-traded splits, revised methodology	-8	-4	12
Refineries	-1	0	-1
Non-CO₂ Traded	0	6	7

Table 3.5 shows that the main changes in the power sector come from a projected increase in the demand for electricity relative to previous projections and the impact of revised carbon prices. Revised combined heat and power (CHP) projections have initially higher capacity but lower growth than the July 2009 projections. This leads to higher generation and hence emissions from CHP in budget periods 1 and 2 but lower generation and emissions from CHP in budget period 3. The effect of reduced generation from CHP in budget period 3 is to increase demand for electricity from power stations.

Comparison with other emissions projections

Cambridge Econometrics (CE) also publish projections of GHG emissions. CE's most recent projections²⁴ showed emissions slightly exceeding the carbon budgets in the first and second budget periods and significantly exceeding the budget in the third period. This contrasts with the results presented here that show emissions below the level of the budget in all three periods in our central scenario.

The DECC Energy and Emissions Model and the CE model are different models with different assumptions. A key difference is that the DECC model takes into account policies announced by the Government to be introduced by a particular period, while CE only include those policies which they consider have been 'set out in full detail'. Consequently CE's latest projections exclude the impact of the RHI, the CRC, the CERT and the FIT. If the impact of these policies (as assumed by DECC) is taken into account, CE's projections for carbon dioxide would be lower than DECC's for the second and third budget period.

Another key difference is the projection of non-CO₂ emissions used. The DECC Energy and Emissions Model uses a projection from independent consultants AEAT, which shows a decrease in non-CO₂ emissions over the projection period. This is consistent with the historical trend, which shows a fall in non-CO₂ emissions every year since 1990. The CE projection of non-CO₂ emissions increases by around 5% over the projection period. This is because CE have projected an increase in non-energy non-CO₂ emissions in line with the official projection of an increase in the UK population²⁵. This approach is at odds with the historical data, which between 1990 and 2008 shows a 48% *fall* in non-CO₂ emissions²⁶, and a 7% *rise* in UK population²⁷.

²⁴ See <http://www.camecon.com/UK/UKEnergy/PressRelease-UKEnergy.aspx> for main results.

²⁵ See section 2.4.4 of http://hmccc.s3.amazonaws.com/docs/CE%20Final%20Report_110809.pdf

²⁶ For data from 1990 to 2009, see

http://www.decc.gov.uk/media/viewfile.ashx?filepath=statistics/climate_change/1_20100325084230_e_@@_2009provisionaldataables.xls&filetype=4

²⁷ See e.g. table 3.3 of

http://www.decc.gov.uk/media/viewfile.ashx?filepath=statistics/publications/energyconsumptionintheuk/1_20090729114634_e_@@_domestic2009.xls&filetype=4

Chapter 4: Policies included in the projections

These emissions projections include all policies prior to the publication of the coalition programme. The evaluation of these policies is undertaken according to DECC-HMT policy appraisal guidelines²⁸ consistent with the most recent projection baseline, and taking account of existing policies.

Where possible, policies are modelled and incorporated into the DECC Energy and Emissions Model. Other policies enter the model as exogenous demand reduction or in a few cases as off-model adjustments. Re-evaluations of policy are made periodically and savings adjusted where appropriate. Newly announced policies are included at each update of the emissions projections. Policy overlaps and double counted savings are excluded.

These projections include all policies introduced before July 2009 and further measures outlined in the UK Low Carbon Transition Plan (LCTP) in July 2009 and the more recent Household Energy Management Strategy (March 2010). This recent package replaces the previous Supplier Obligation, CERT, CESP and Domestic Smart Meters and includes some other new policies including an extension of CERT to 2012. Since the July 2009 projections the estimated savings attributed to various policies have also been revised including the RHI and FIT.

Policies that were in effect prior to the LCTP are the baseline policies listed in Table 4.1. The measures in the LCTP and later policies are shown, by sector, in Table 4.2. In Table 4.3, the savings from the proposals in the LCTP are shown. Policies' savings are shown here for non-traded emissions. A full listing of policy savings for traded and non-traded sectors included in these projections is set out in Annex G.

The figures given in the table for the existing measures represent the appraised carbon savings. Second-round effects are not fully accounted for and the carbon savings from individual policies will not therefore add up to the difference between the baseline projection and the central projection.

For consistency and to aid comparisons between policies, this chapter contains details of the savings of individual policies in MtCO₂e. Therefore it contains the effect of the policy on the output of the model, rather than the inputs used in the modelling process.

Future policies as announced in the coalition programme have not been taken account of in these projections. New policies will be incorporated once the exact details have been agreed.

²⁸ This guidance supplements the HMT Green Book (http://www.hm-treasury.gov.uk/data_greenbook_index.htm) that provides general guidance on how to conduct appraisal and evaluation of energy use and greenhouse gas emissions.

Table 4.1 Savings of policy measures included in the baseline (pre-UK LCTP)²⁹.

MtCO ₂ e	Non-traded		
	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3
Residential sector	30.6	41.5	44.8
EEC1& EEC2 (re-evaluated)	8.0	7.8	6.7
Building regulations (re-evaluated)	19.0	30.2	34.6
Warm Front and fuel poverty programmes	3.6	3.5	3.5
Business/ Public sector	15.9	17.6	18.0
Building regulations (re-evaluated)	4.0	5.6	5.9
Carbon Trust measures total	1.4	0.7	0.7
Climate Change Agreement (excluding overlaps)	10.3	10.6	10.6
Revolving loan	0.2	0.7	1.0
Industry	0.8	1.4	1.5
Building regulations (re-evaluated)	0.5	0.7	0.8
Carbon Trust measures total	0.3	0.7	0.7
Transport	42.4	62.0	63.5
RTFO savings (5% by volume)	16.6	25.5	25.1
EU Voluntary Agreements on new car CO ₂ to 2009, including supporting fiscal measures	25.8	36.5	38.4

²⁹ Measures in the baseline (but not shown in this table) include the Climate Change Levy, with projected savings of 4 MtCO₂e by 2020, and the Fuel Duty Escalator, which ran from 1993 to 1999, projected to save an estimated 7 MtCO₂e by 2020.

Table 4.2 UK LCTP: Policy Savings.

MtCO ₂ e	Non-traded		
	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3
Residential sector	8.9	43.0	68.9
Household Energy Management Strategy	9.1	37.1	47.6
Products policy	-0.6	0.7	3.4
DCLG Zero-carbon homes	0.1	0.6	2.1
Residential RHI	0.2	4.5	15.9
Business/ Public sector	-0.2	13.2	54.1
Products policy	-1.3	-3.3	-5.2
Energy Performance of Buildings Directive	0.0	0.3	0.7
Smart meters (SME)	0.1	2.0	3.8
Carbon Reduction Commitment	0.4	3.1	7.5
RHI	0.6	11.1	47.4
Transport	0.5	15.4	52.0
Interim Voluntary Agreement target to 130g/km CO ₂	0.0	5.1	20.1
RES Transport bio-fuel (from 5% volume to 10% by energy)	0.0	9.1	30.1
Low carbon buses	0.0	0.2	0.9
SAFED bus driver training	0.4	1.0	1.0
Agriculture & Waste	0.0	0.8	1.7
Landfill tax (non-CO ₂)	0.0	0.8	1.7
TOTAL ADDITIONAL NON-TRADED POLICY SAVINGS	9.1	72.4	176.8

Table 4.3 UK LCTP Proposals savings.

MtCO ₂ e	Non-traded		
	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3
Business/ Public sector	0.0	8.0	8.0
Energy-intensive industry (new CCAs)	0.0	8.0	8.0
Transport	1.3	9.0	33.3
EU 95gCO ₂ /km for 2020 target	0.0	1.0	18.5
Complementary measures for cars	0.3	2.6	3.7
Possible new EU van regulation	1.0	5.2	9.3
Low rolling resistance tyres for HGVs	0.0	0.1	1.1
Electricification of 750km of rail line	0.0	0.0	0.8
Agriculture & Waste	0.0	0.0	18.3
Defra Agriculture policy (non-CO ₂)	0.0	0.0	15.0
Defra Waste policy (non-CO ₂)	0.0	0.0	3.3
TOTAL ADDITIONAL PROPOSAL SAVINGS	1.3	17.0	59.6

Chapter 5: Uncertainty in the projections

Projecting UK emissions is subject to considerable uncertainty. The DECC emissions projections capture some of this uncertainty through the use of scenarios which use different assumptions of the levels of key variables.

Total UK carbon dioxide emissions are driven by economic activity and energy use. The carbon intensity of this energy depends on the particular fuel used and the efficiency with which it is used. Coal is most carbon intensive, oil and gas less carbon intensive, while renewables contribute little carbon. The carbon intensity of electricity depends on the generating plant technology used and the efficiency of this generation. The price of individual fuels, including their relative prices determine the choice and level of each fuel used.

Other factors impacting on overall UK emissions projections include external temperature, which provides a driver for household use of energy for heating, the number of UK households, and vehicle ownership projections.

Assuming a range of fossil fuel price projections, economic growth and policy delivery provides an indication of the sensitivity of the projections to changes in these key variables. Providing projections of land use change and non-CO₂ GHG emissions under a range of assumptions also provides an indication of the expected variation in projections of these elements of the total UK emissions.

An additional important source of uncertainty derives from the assumption that the model captures the degree to which historic data predicts the future. This uncertainty is referred to as 'modelling uncertainty'.

Selecting a suitable range on which to vary the key assumptions is critical to developing a range of uncertainty. The range of growth assumptions is shown in Table 2.4 and variants of price assumptions are provided in Annex F.

Traded and non-traded sector uncertainty

Traded sector uncertainty

Emissions from participants in the EU ETS are subject to a cap. Under the carbon accounting rules for carbon budgets³⁰ these emissions are assumed to be equal to the UK cap. Consequently it is assumed that there is no uncertainty associated with traded sector emissions for carbon accounting purposes.

Non-traded sector uncertainty

With emissions from the traded sector set equal to the cap, all the uncertainty relating to the UK meeting its carbon budgets arises from the non-traded sector.

³⁰ See the document "Guidance on Carbon Accounting and the net UK carbon account" at http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/carbon_budgets/carbon_budgets.aspx

Table 5.1 illustrates the components of uncertainty for the net UK carbon account over the three carbon budget periods and so indicates the marginal contribution in terms of emissions of changes to the assumptions. To obtain the higher bound, all assumptions have been set so as to maximise the emissions (low fossil fuel prices, high growth, low policy delivery, and high values for LULUCF and non-CO₂ GHG emissions). To obtain the lower bound, all assumptions have been set so as to minimise the emissions.

The largest component of this uncertainty is associated with the projection (by AEAT under contract to DECC) of the non-CO₂ GHG component of the non-traded sector. Although this is a relatively small part of the total emissions, the projections are subject to a large degree of uncertainty.

The other major component of the uncertainty is modelling uncertainty (the ability of an econometric model to capture historic behaviour and project this into the future). Policy uncertainty is also a source of uncertainty when delivery of policy is estimated to lower energy use or reduce emissions. Higher levels of uncertainty are assumed for proposed policy than already existing policy. Uncertainty around fuel prices and economic growth contributes to uncertainty in non-traded emissions through energy use in homes and decisions regarding travel, both of which are based on income levels and relative prices of energy. Uncertainty associated with the projections of land use change will also contribute to uncertainty in the net UK carbon account projections.

Table 5.1 Components of uncertainty (non-traded sector).

	2008-2012	2013-2017	2018-2022
Central non-traded projections (MtCO₂e)	1756	1642	1512
Upper range of projections (MtCO₂e)	1863	1775	1684
Difference from central (MtCO₂e)	107	134	172
COMPONENTS OF UNCERTAINTY (upper)			
MODELLING UNCERTAINTY	45%	29%	17%
FOSSIL FUEL PRICES - low prices	3%	5%	3%
GROWTH - high	1%	3%	2%
Policy - low delivery	2%	16%	50%
LUC - high	1%	2%	2%
NON-CO ₂ GHG - high	48%	45%	26%
TOTAL	100%	100%	100%
Lower range of projection (MtCO₂e)	1652	1515	1381
Difference from central (MtCO₂e)	-104	-127	-131
COMPONENTS OF UNCERTAINTY (lower)			
MODELLING UNCERTAINTY	44%	29%	26%
FOSSIL FUEL PRICES - high prices	3%	12%	12%
GROWTH - low	0%	0%	1%
POLICY - high delivery	3%	4%	7%
LUC - low	1%	2%	6%
NON-CO ₂ GHG - low	50%	52%	49%
TOTAL	100%	100%	100%

It is not possible to assign exact probabilities to the ranges given in Table 5.1. This is because the ranges associated with values of the key assumptions are not themselves assigned probabilities (rather they are viewed as possible scenarios). However, the wide scope encompassed by these scenarios means that it is probable that the net UK carbon account for the non-traded sector will fall within this range.

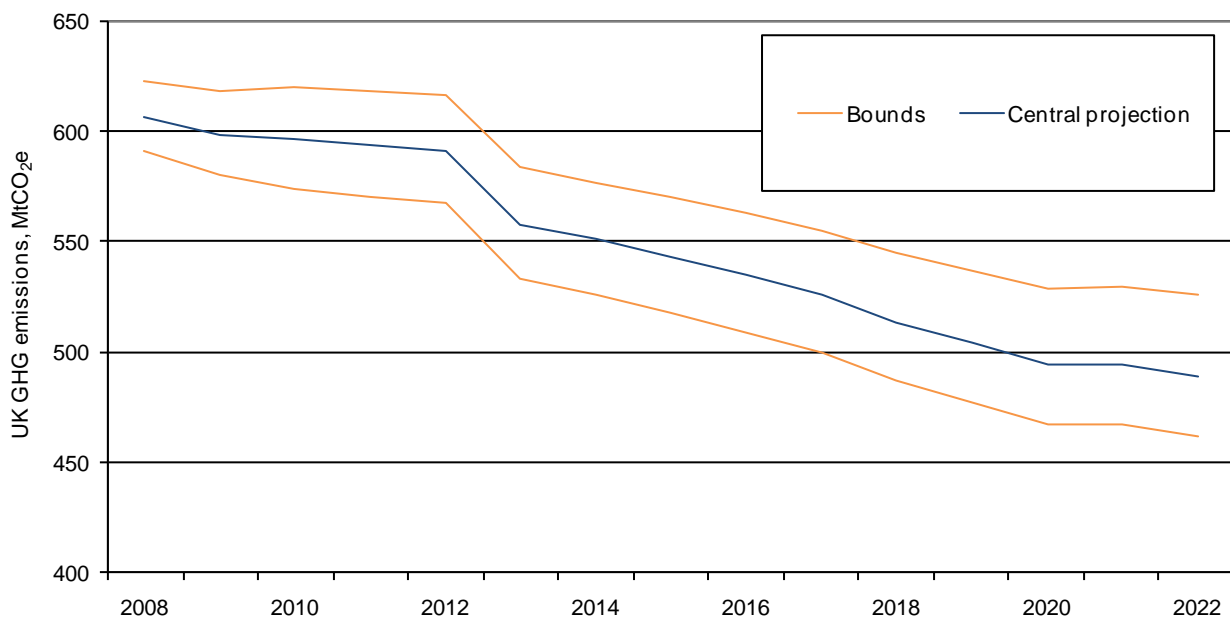
Setting traded sector emissions equal to the cap, and adding the total uncertainty range from the components listed above provides the range of possible total emissions for the first three budget periods. This is shown in Table 5.2.

Table 5.2 Uncertainty impact on net UK carbon account.

MtCO ₂ e	2008-2012	2013-2017	2018-2022
Upper range	3,096	2,848	2,666
Central projection (traded & non-traded)	2,989	2,714	2,494
Lower range	2,885	2,588	2,363
Budget	3,018	2,782	2,544
Range of outcomes			
Over Budget	78	66	122
Under Budget	-133	-194	-181

Applying the same methodology for each year in the first three carbon budgets the indicative annual ranges for the net UK carbon account can be calculated. These are required under the Climate Change Act 2008.

Chart 5.1 Total GHG emissions (MtCO₂e) from 1990 to 2022, including uncertainty bounds.



Chapter 6: Electricity generation

In this chapter, as in the rest of the paper, results from the central scenario are presented. The generation mix is sensitive to the fossil fuel price, technology costs and the carbon price. Different scenarios will lead to generation from different fuels at different times, and different profiles of new build of generating capacity. Full results from other fossil fuel price scenarios can be found in annexes D and E.

Electricity Demand

The recession has reduced the demand for electricity significantly. Demand is provisionally estimated to fall by around 7.5% between 2008 and 2009. Notwithstanding the effects of the recession, demand had exhibited a declining trend in recent years, falling continuously between 2005 and 2008.

Electricity demand is projected to grow by around 2% between 2009 and 2020, with growth restrained by energy efficiency policies. Demand growth is slightly higher thereafter, as the effects of economic growth begin to outweigh the impact of energy efficiency policy, whose effects tend to peak by around 2020. The final energy demand projections are discussed in Chapter 7.

Power stations

The projections and discussion in this section relates to major power producers³¹ (MPPs), and all renewables plants. The projections for total electricity generation are shown in Chart 6.4.

Assumptions

The power station projections are dependent on a number of specific assumptions. Using different assumptions will lead to different results. **The particular results shown here reflect a set of assumptions on fossil fuel and carbon prices and costs. They do not reflect a desired or preferred outcome for Government. In particular, these results in no way reflect Government's views on the need for different types of electricity generation or determine what will be said on need in the National Policy Statements.**

Other key assumptions are as follows:

- **Plant-specific assumptions:** These have been updated to reflect the results of recent consultancy work by Mott MacDonald³² which analysed power station costs, including revisions to both capital costs and plant efficiencies. The projected generation mix is sensitive to relative capital and running cost assumptions. The revisions to assumptions tend to make the electricity sector more carbon intensive by 2020 than was the case in the July 2009 projections.

³¹ Major Power Producers are defined as in the Digest of UK Energy Statistics (DUKES) 2009 section 5.58.

³² UK Electricity Generation Costs Update', produced by Mott MacDonald, available at <http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx>

- **Market arrangements:** The projections of electricity generation assume that current market arrangements and structures continue for the projection period. These projections do not take into consideration new policies announced in the coalition programme.
- **Renewables:** It is assumed that by 2020 around 30% of UK electricity will come from renewables consistent with the target in the Renewable Energy Strategy.
- **Investor plans:** the projections do not take account of any announcements made by energy companies about planned investment in new plant. However the projections do make allowance for plants whose construction has already begun.
- **Carbon Capture and Storage (CCS):** It is assumed that four CCS demonstration plants proceed as part of a larger overall increase in new coal-fired capacity, with the first commencing operation in 2014. CCS technology is assumed to be proven in the first half of the next decade, and the non-CCS component of new coal build up to that time is assumed to convert to full CCS in 2025. Any new coal build is then assumed to be fully CCS.
- **Industrial Emissions Directive (IED):** The final details of the IED have yet to be agreed. For modelling purposes, it is assumed that a 'Transitional National Plan' (TNP) or similar scheme is available to operators, allowing some flexibility in managing plant operations between 2016 and the end of 2020. The TNP provisions allow flexibility in the continued operation of plants while meeting the aims of the IED in terms of reducing emissions. Post-2020, it is assumed that some plants will be able to operate at low load factor, thereby allowing continued operation. This will assist with system flexibility as more intermittent forms of generation form an important part of overall supply.

The model will be further refined once the final details of the Directive are known

- **Carbon Values:** The projections uses the latest DECC traded carbon values to 2020. The projections do not take into consideration the floor price for carbon announced in the coalition programme.

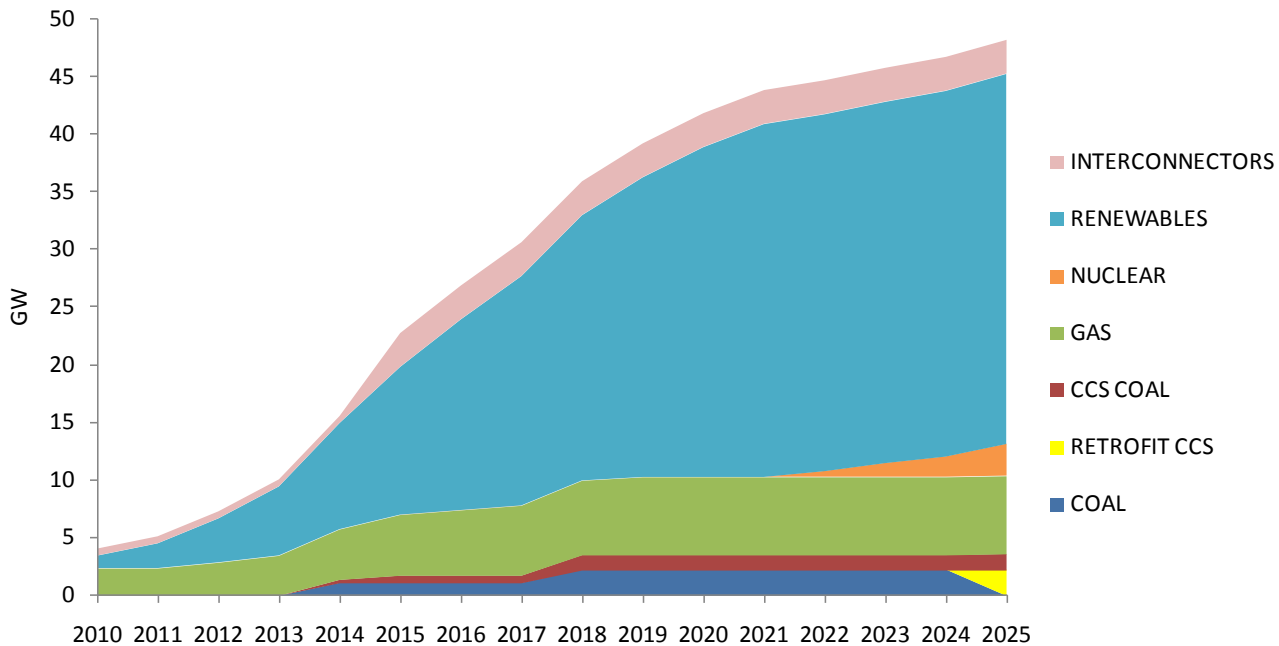
Major Power Producers (MPP)³³

Despite some recovery in national economic output in 2010, total electricity demand is projected to be lower than in 2009. Demand over the next decade is restrained by the impact of energy efficiency programmes, and a projected high electricity price in the long term. Beyond 2020, the impact of economic growth outweighs the impact of energy efficiency policy, whose effects tend to peak by around 2020.

The requirement for generation from MPPs is also influenced by the generation from combined heat and power (CHP) plants operating outside of the electricity generation sector in sectors such as services and industry. The projected increase in the generation of CHP plants contributes to a slight reduction in generation by MPPs over the next decade.

Chart 6.1 shows projected cumulative new build by plant type. While there is contribution from a number of generation technologies, the major expansion in generating capacity over the projection period comes from renewables.

³³ Major Power Producers are defined as in the Digest of UK Energy Statistics (DUKES) 2009 section 5.58.

Chart 6.1 Projected cumulative new build by plant type for MPPs, 2010 to 2025.

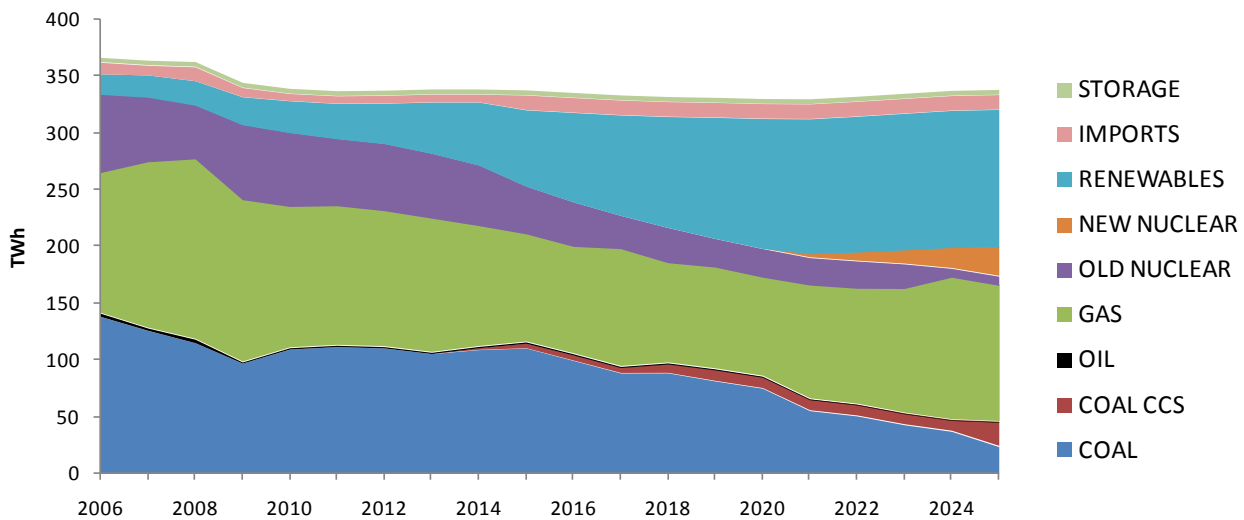
There is much uncertainty as to the underlying shares of generation, but based on the assumptions in these updated projections, the share of coal in generation is expected to increase marginally from 2009 levels in the short and medium term. This arises partly because of the increased competitiveness of coal against gas due to the fossil fuel price movements.

The commencement of operations at the CCS demonstration plants, including the unabated component, serves to support coal-fired generation in the second half of the decade, while the share of coal-fired generation accounted for by existing coal stations falls over the same period. Beyond 2020 in particular, the IED is assumed to act to restrict the operations of a number of plants to that of low load and probably seasonal, mode.

Renewables generation is assumed to increase towards 2020 so that by 2020 30% of UK electricity come from renewables consistent with the target in the Renewable Energy Strategy. After 2020, with no additional incentives to boost renewables capacity, generation from renewables grows slowly.

The impact of the increase in renewables generation is to significantly reduce the size of the market available for fossil fuels. As new coal and gas plants come on stream the impact falls mainly on existing coal and gas plants, whose load factors fall significantly. Nonetheless these plants are available as backup for periods when intermittent sources of generation are not operating.

Chart 6.2 below shows the generation mix of MPPs in the central scenario. The revision to assumptions about the costs of building power stations means that, compared to the July 2009 projections, nuclear plants are slightly less competitive with CCGTs as a source of new generation. This is modelled to lead to nuclear plants commencing generation in 2021 in the central scenario, as compared with 2018 in the July 2009 projections. However, it is important to note that these results are very sensitive to the underlying assumptions, as described above. For example, in the high and high-high fossil fuel price scenarios nuclear comes online in 2019 and 2018 respectively.

Chart 6.2 Electricity supplied³⁴ by fuel for the MPPs, 2006 to 2025.

Combined heat and power capacity

Combined heat and power (CHP) systems offer highly efficient fossil fuel use with low associated emissions per unit of energy output. In recognition of this in 1999 the government set a target of 10 GW installed capacity by 2010 and developed a strategy and incentives in order to achieve this. Since then CHP development has been well below the necessary level to meet this target primarily as a result of unfavourable price differentials for gas and electricity and uncertainty in heat markets.

Projected CHP capacity is provided by AEA Technologies under contract to DECC. The projections are based on a bottom-up model that considers the economic case for individual sites.

The current projections are based on improved modelling and data that incorporates behavioural aspects of the decision making process, estimates of economic viability and a Monte Carlo model of industry attitudes towards risk. Revised projections of installed capacity are shown in Table 6.1 and compared with the previous projections.

Table 6.1: Updated projection of installed capacity of CHP.

Capacity, GW	2010	2015	2020
June 2010 projection	6.3	9.4	12.7
July 2009 projection	6.2	10.3	15.5

Since the projections of July 2009, more up-to-date data has become available on capital costs and rates of return. Taken together with the effects of the recession and improved data on short-term development plans, the effect of these changes is to reduce the projected capacity, particularly in later years and for smaller sites. Nevertheless, there remains potential for growth in CHP in the UK with much of the projected increase residing in the energy industries sector,

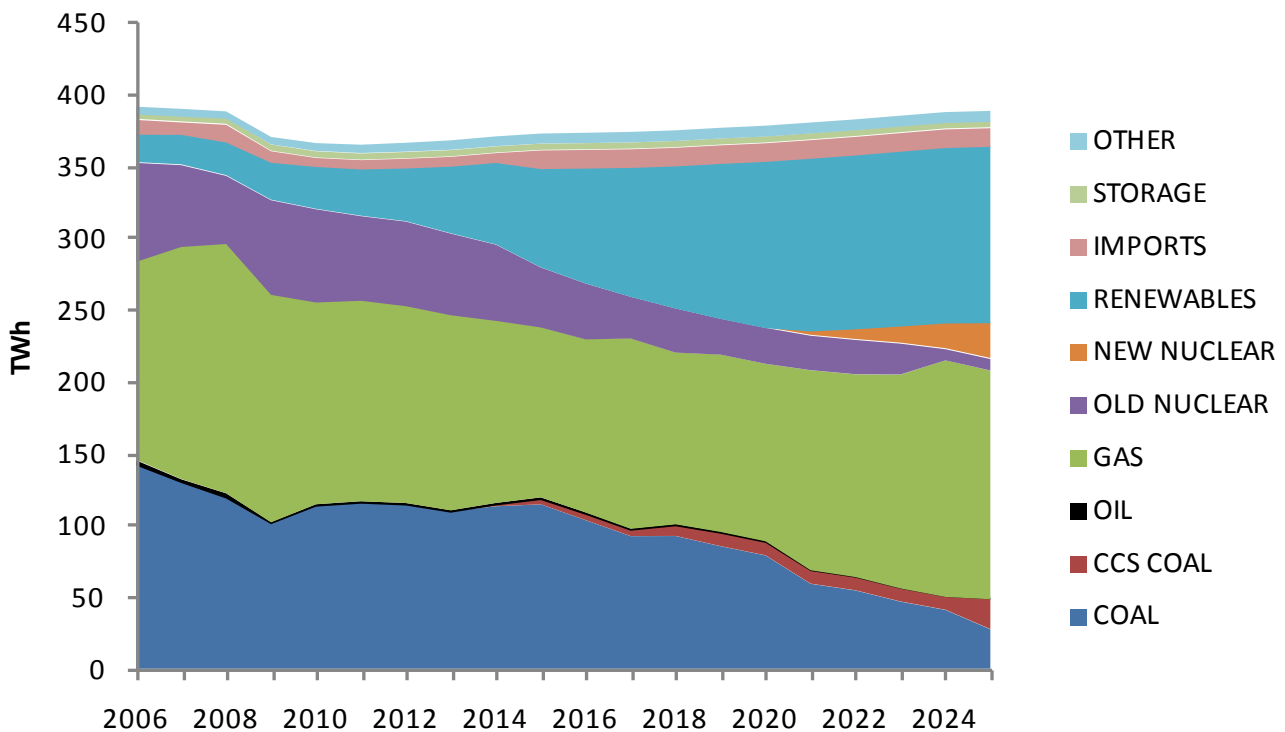
³⁴ Electricity supply is defined as gross generation less the amount of electricity used on station sites (own use). It therefore corresponds to the term 'Supplied (gross)' used in DUKES Table 5.6.

where the major use of these units will be in the re-gasification of liquefied natural gas imported from abroad.

All electricity supply

Chart 6.3 below shows the total electricity demand and generation mix under the central scenario including MPP, CHP and auto-generators. The projected growth in CHP generation is from gas-fired plants and this partially offsets the dip in gas-fired generation which occurs in the MPP sector. In the central scenario, total supply from gas-fired plants declines between 2010 and 2020, increasing thereafter.

Chart 6.3: Electricity supply³⁵ by fuel for all generators.



³⁵ Electricity supply is defined as gross generation less the amount of electricity used on station sites (own use). It therefore corresponds to the term 'Supplied (gross)' used in DUKES Table 5.6.

Chapter 7: Demand for energy

Demand for energy can be considered on final energy demand or primary demand basis. Final energy demand is energy used by final consumers (households, businesses etc). Primary energy demand is energy from raw fuels that has not been subjected to any transformation (for example fuel used to produce electricity).

In this chapter projections of final energy demand are presented first. These can be used, together with the results on electricity generation contained in Chapter 6, to calculate projections of primary energy demand.

Final Energy Demand

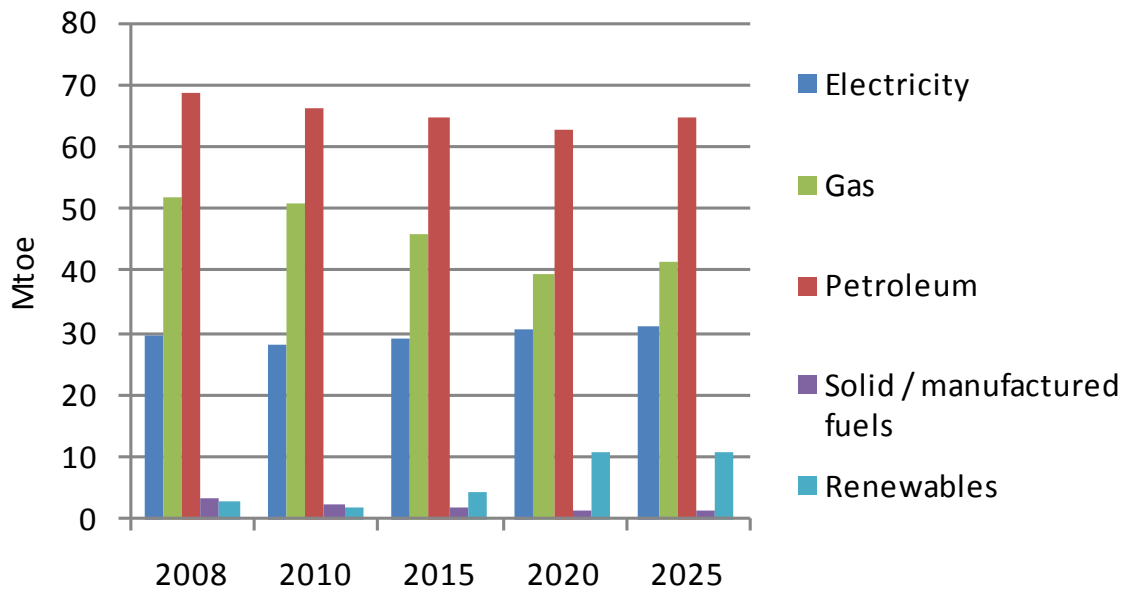
The results are arranged on the basis of final energy demand by final user and across all sectors and include the estimated impact of the policy measures included in the LCTP³⁶. Table 7.1 is based on central price assumptions and provides dis-aggregated demand for each energy source and major sector. Figures, in million tonnes of oil equivalent (Mtoe), are presented on a consistent basis with the Digest of UK Energy Statistics (DUKES) and include all fuel sold within the UK or exported to the Crown Dependencies of Guernsey, Jersey and the Isle of Man.

³⁶ Additional policy proposals are made in terms of carbon dioxide emissions only therefore the figures quoted for energy will be higher than if these adjustments were included.

Table 7.1 Energy demanded by final user³⁷, updated projection with central fossil fuel prices, central policy and central growth.

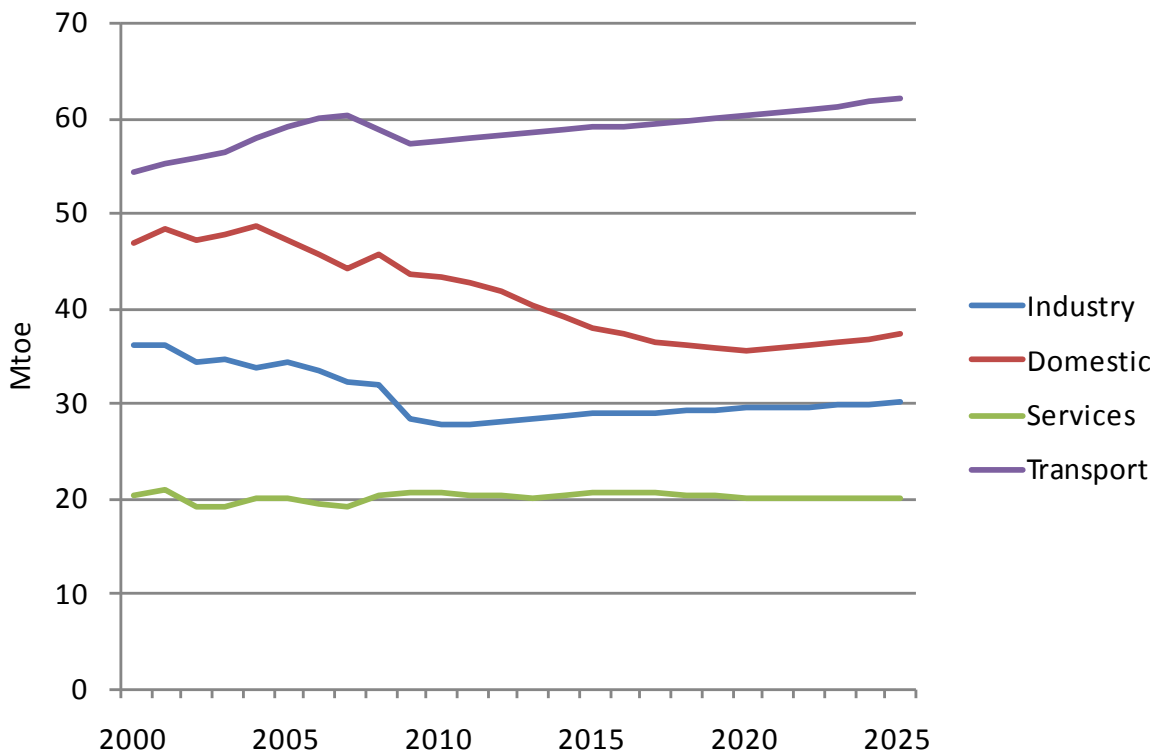
Mtoe	2008	2010	2015	2020	2025
Industry					
Electricity	10	9	10	11	11
Gas	13	11	11	9	10
Petroleum	7	6	6	5	5
Solid / manufactured fuels	2	2	2	2	2
Renewables	0	0	1	3	2
Total energy	32	28	29	29	30
Domestic					
Electricity	10	10	9	10	10
Gas	31	30	26	23	25
Petroleum	3	3	2	1	1
Solid / manufactured fuels	1	0	0	0	0
Renewables	0	0	1	1	1
Total energy	46	43	38	36	37
Services					
Electricity	9	9	9	9	9
Gas	10	10	9	7	7
Petroleum	1	2	1	1	1
Solid / manufactured fuels	0	0	0	0	0
Renewables	0	0	1	3	3
Total energy	20	21	21	20	20
Transport					
Electricity	1	1	1	1	1
Aviation fuel	13	14	15	17	18
Petroleum (Rail)	1	1	1	1	1
Petroleum (Shipping)	2	1	2	2	2
Petroleum (Road transport)	41	40	39	36	37
Bio-fuel5	1	1	2	4	4
Total energy	59	57	59	60	62
Total					
Electricity	29	28	29	30	31
Gas	54	51	46	40	41
Petroleum	68	66	65	63	65
Solid / manufactured fuels	3	2	2	2	2
Renewables	2	2	4	11	11
Total energy	156	149	147	145	150

³⁷ On an energy supplied basis, excluding non-energy uses, and including fuels used to generate heat sold under contract to third parties. Services sector includes Commercial and Public Administration. Aviation fuel includes fuel used for both Domestic and International flights.

Chart 7.1 Final energy demand by fuel type.

Total final energy demand is projected to fall by 6 per cent from 156 Mtoe in 2008 to 145 Mtoe in 2020. The largest contributions are from gas and petroleum which fall by 14 Mtoe and 5 Mtoe respectively. Renewable final energy demand increases from 2 Mtoe to 11 Mtoe, about one third of this is from road transport fuels.

Chart 7.2 shows the projected trends in energy demand by sector. The domestic sector is projected to decrease by 21 per cent between 2008 and 2020. This is driven by energy efficiency measures. The declining trend in industrial demand has been accelerated by the recession with demand projected to fall by 13 per cent between 2008 and 2010. Transport fuel is projected to increase from 2010 after a slight fall following the high prices and economic recession.

Chart 7.2 Final energy demand by sector³⁸.

Primary Energy Demand

The central case projection shows an overall decrease in primary energy demand to 212.4 Mtoe in 2020, compared with 234.4 Mtoe in 2008. The use of oil products is projected to remain broadly flat to 2020, but there are marked declines for other fossil fuels. The use of renewables increases significantly. The downward trend in the demand for coal and gas towards 2020 is due to a number of factors, including the reduction in the overall electricity generation market for fossil fuels as a result of the increase from renewable sources.

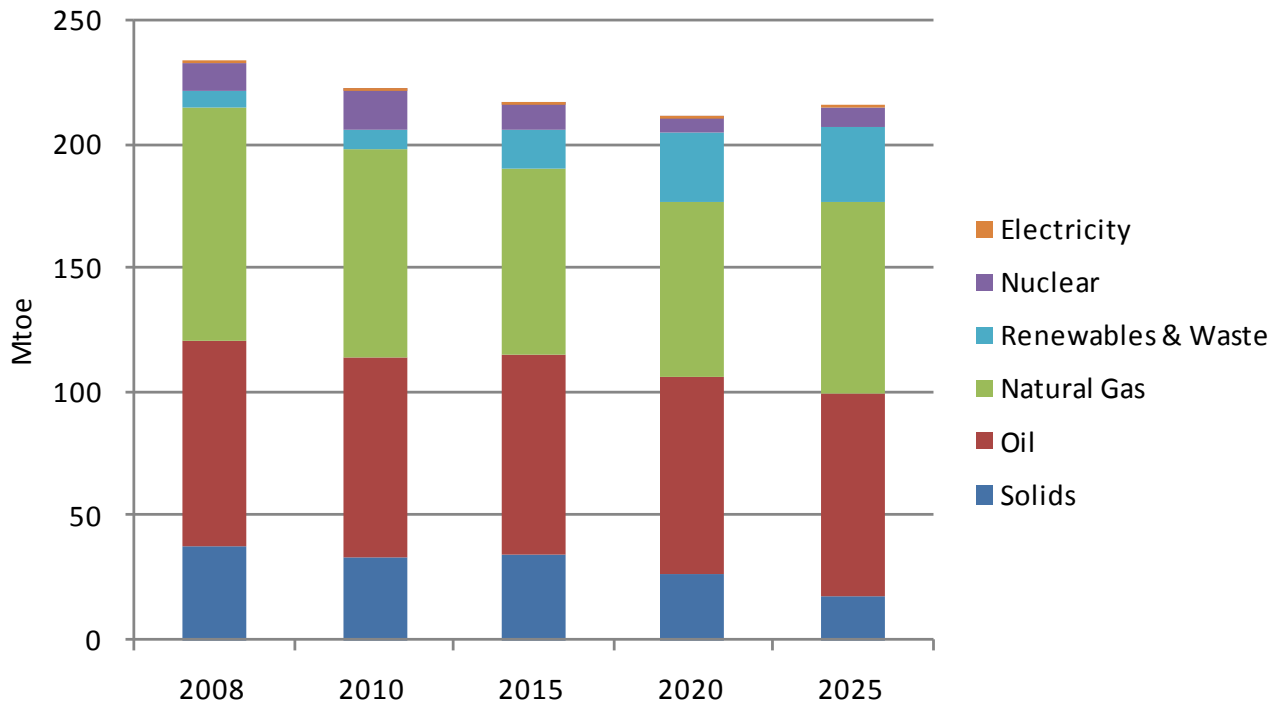
Gas demand is projected to fall through the next decade to 2020 as more renewable energy is used and energy efficiency measures take effect. The key factors driving the fall in gas demand in the central projection is a combination of energy efficiency measures, the successful implementation of the Renewable Energy Strategy, and the short term effects of the economic downturn. The measures in the renewable energy strategy could enable 12% of heat, and around 30% of electricity, to be generated from renewables. The rise in demand after 2020 comes about when the impact of economic growth in increasing demand for gas begins to offset the effect of the earlier policy initiatives in reducing demand.

Compared with the July 2009 projections, projected demand for gas is lower in the years approaching 2020. This is largely as a result of a reduction in demand for electricity (reducing gas consumption in power stations) due to higher estimated policy savings. In 2020 and later years, revised economic assumptions continue to boost demand and are supplemented by lower nuclear generation, lower gas plant efficiencies and the modelled effects of the Industrial

³⁸ Sectors used here are on the same basis as the Digest of UK Energy Statistics and are not comparable with sectors described for emissions in earlier sections.

Emissions Directive (IED). The IED could have effects on some gas-fired power stations, but it is likely to impact more significantly on existing coal-fired plants.

Chart 7.3: projections of primary energy demand^{39,40}.



³⁹ In this chart, all renewable energy is included in the category 'renewables & wastes', whereas in DUKES, some renewables are included in other categories, for example, hydro and wind are included with 'primary electricity' in the overall energy balances.

⁴⁰ Electricity here refers to net imports of electricity.

Chapter 8: List of supporting tables

The following data tables can be downloaded providing individual year projections for a range of scenarios.

Annex A: Greenhouse gas emissions by source

Annex B: Carbon dioxide emissions by source

Annex C: Final energy demand

Annex D: Major Power Producers generation by source

Annex E: Total electricity generation by source

Annex F: Fossil fuel and retail price assumptions

Annex G: Policy savings included in the projections

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