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UK LOW CARBON TRANSITION PLAN EMISSIONS PROJECTIONS

JULY 2009

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SECTION 1: INTRODUCTION

EMISSIONS PROJECTIONS AND UK CARBON BUDGETS

The Climate Change Act 2008 creates a new approach to managing and responding to climate change in the UK. At the heart of the Act is a legally binding target to reduce the UK's greenhouse gas 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 greenhouse gas emissions allowed in each five year period, beginning in 2008. The first three carbon budgets – for 2008-12, 2013-17, and 2018-22 – have now been set through secondary legislation¹. In setting them, the Government took into account the advice of the independent Committee on Climate Change (CCC) published on 1 December 2008. Budget 2009 and the accompanying document *Building a low-carbon economy: implementing the Climate Change Act 2008* were the Government's high-level response to that advice.

The carbon budgets set a limit on the level of the **net UK carbon account**. This is calculated by adjusting net UK greenhouse gas emissions to account for any carbon units² 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 carbon dioxide emissions have been published by DECC (formerly BERR) on a regular basis, to inform Government energy and environmental analysis, since 2000³. The carbon dioxide projections are based on the DECC Energy and Emissions Model and combined with projections of non-CO₂ gases from a separate model and projections of emissions from a DECC Land Use model will form the UK emissions projections that will be used to model future levels of the net UK carbon account, to inform the Government's expectations for meeting our carbon budgets. As the Government has committed to aim not to use credits outside the EU Emissions Trading System (EU ETS) to meet carbon budgets, our expectations for the net UK carbon account correspond to our 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.

Previous projections were published in November 2008 and a partial update of these projections, on the net UK carbon account basis, was published in April 2009⁴. The April 2009 projections included assumptions of economic slowdown and re-estimates of carbon savings from existing policies. It also included an initial assessment of the possible impact of the policies set out in the consultation on the UK Renewable Energy Strategy. The April 2009 projections were based on the same fossil fuel price assumptions as the November 2008 projections.

This latest publication represents a completely updated set of projections using a revised set of fossil fuel price assumptions and revised estimates of the impact of the full package of proposals and policies set out in the UK Low Carbon Transition Plan, published on 15 July⁵. Further updated projections will be published in the autumn.

The projections are presented on the net UK carbon account basis, unless otherwise indicated.

¹ See www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/carbon_budgets/carbon_budgets.aspx.

² 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.

³ Energy and Emissions projections, current and previous projections, are available on the former BERR website REF and will be migrated to a new DECC UEP web page shortly.

⁴ Emissions projections were included in the Budget Ref and as an addendum Ref URN09D/547 <http://www.berr.gov.uk/whatwedo/energy/environment/projections/recent/page26391.html>

⁵ http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

The comparison between the current central projections and those published in April 2009 is shown in Table 1.1. The differences arise from revisions to fuel prices, re-estimation of existing policy savings, addition of further policy savings and a number of other revisions which are considered in more detail in Section 3.

The latest projections suggest that using central assumptions net UK greenhouse gas emissions⁶ will be 36% below 1990 emissions level by 2020. This central projection indicates that the UK will be well within the UK Kyoto greenhouse gas emissions reductions target of 12.5% between 2008-2012 and will be on a path to an 80% reduction by 2050 by being within the emissions limits set out by the first three carbon budget periods 2008-12, 2013-17 and 2018-2022.⁷ See chart 1.1. Projections into the future are always uncertain, and the level of uncertainty associated with this central projection is considered in Section 5.

Table 1.1 Projected net UK carbon account, using central assumptions (includes purchases/disposals of carbon units by EU-ETS participants)⁸

MtCO ₂ e	1990	2007	2010	2015	2020
April 2009 projection	776	633	601	556	508
July 2009 projection	776	611	594	544	496
Change since 1990		-21%	-23%	-30%	-36%

Note: April 2009 projections are presented based on the 2006 inventory basis while the latest projection is on the 2007 inventory basis⁹.

Figures shown in Table 1.1 for 1990 are 1990 emissions based on the 2007 Inventory.

⁶ The Kyoto basket of greenhouse gases consisting of Carbon dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Sulphur hexafluoride (SF₆), Hydrofluorocarbons (HFC) and Perfluorocarbons (PFC)

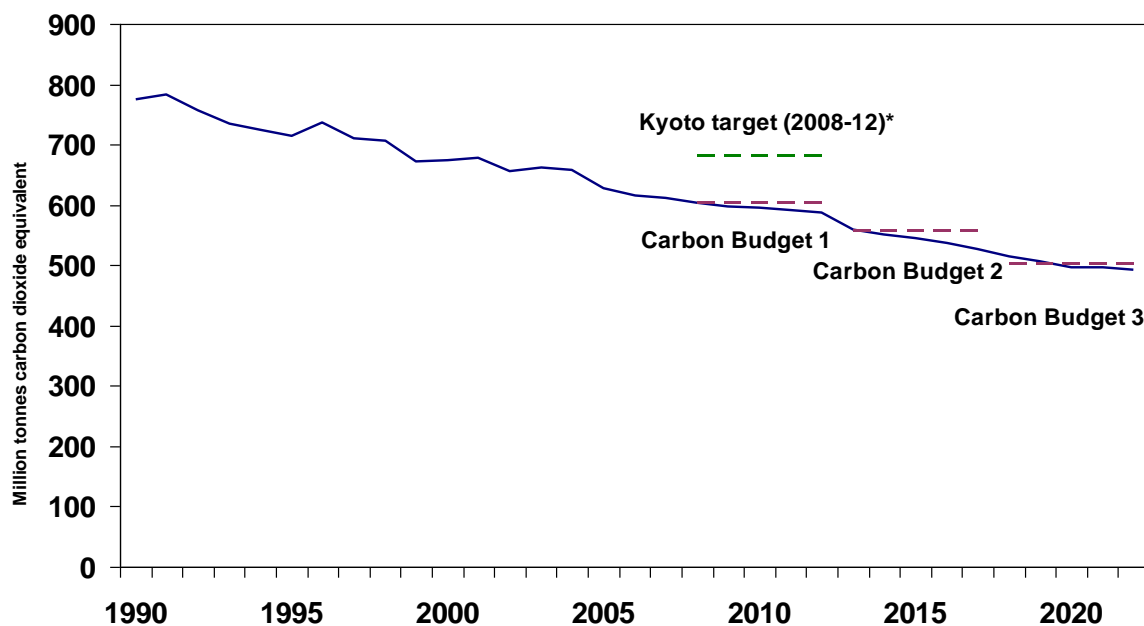
⁷ Under the Climate Change Act the UK is required to reduce greenhouse gas emissions by 80 per cent below 1990 levels by 2050. The carbon budgets set the trajectory to this reduction.

⁸ Figures for 2007 are actuals based on the 2007 Statistical Inventory

http://www.airquality.co.uk/reports/cat07/0905131425_ukghgi-90-07_main_chapters_Issue2_UNFCCC_CA_v5_Final.pdf

⁹ The UK greenhouse gas inventory is updated annually to meet legal requirements for reporting to the United Nations Framework Convention on Climate Change and the European Union.

Chart 1.1 UK Net carbon account projection¹⁰: 1990-2022



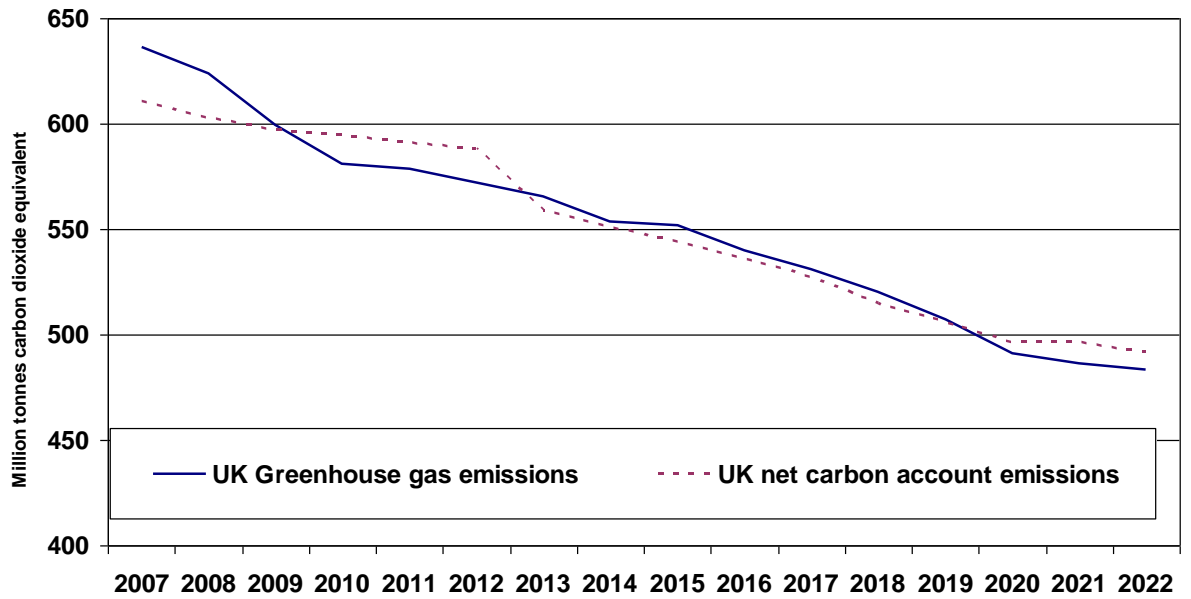
* Kyoto target is measured against the 1990 base year of 779.9 MtCO₂e

Companies participating in the EU Emissions Trading System can buy or sell carbon units, and the net UK carbon account must take account of this, whether it represents an overall credit against the budget (if, taken together, UK EU ETS participants buy more carbon units than they sell) or a debit (if they sell more than they buy). Domestic aviation enters the EU Emissions Trading Scheme in 2012.

Chart 1.2 plots our projections for future levels of both the net UK carbon account and net UK greenhouse gas emissions, demonstrating that we expect that the UK will vary between being a net seller and a net purchaser of credits.

¹⁰ Taking account carbon units traded under the EU Emissions Trading Scheme. Figures shown for 2008-2022 are projections.

Chart 1.2 Comparison of projections of the net UK carbon account and net UK greenhouse gas emissions



UK EMISSIONS PROJECTIONS BY SECTOR

Table 1.2 illustrates the contributions of emissions from UK sectors to the total net emissions, based on central assumptions. UK projected emissions are expected to be 36 per cent below 1990 levels in 2020.

Table 1.2 Greenhouse¹¹ gas emissions by sector

MtCO ₂ e	Central Greenhouse Gas emissions			
	2007	2010	2015	2020
Carbon dioxide				
Power Stations	177	144	130	94
Refineries	15	16	17	17
Residential	78	77	65	56
Services	25	28	28	20
Industry	115	99	100	103
Road transport	122	112	107	97
Other transport (1)	13	13	14	14
Land use, land use change and forestry	-2	-1	1	3
Total carbon dioxide (CO₂)	543	488	461	404
Non-CO₂ Greenhouse Gases	94	93	91	88
UK Greenhouse Gases	636	581	552	491
Carbon units traded (EU ETS)	26	-13	7	-5
UK net carbon account	611	594	544	496
Change since 1990	-21%	-23%	-30%	-36%

(1) Other transport includes domestic aviation (2008-2011), rail, national navigation and military aviation & shipping. The UNFCCC National Communication definition of Transport is the sum of Road transport and Other transport categories shown in this table.

Non-CO₂ emissions projection has not been ascribed by sector for the purpose of this presentation.

¹¹ Further detail of the projections for individual gases is available in Section 8.

PROGRESS TOWARDS THE CARBON BUDGETS

Table 1.3 presents the same central projection illustrating the projected emissions to be below the carbon budget level in each of the three budget periods by 44MtCO₂e, 64MtCO₂e and 39MtCO₂e respectively. The non-traded sector emissions are the projected emissions estimated to be generated within the UK from the sectors not included in the EUETS. The traded sector emissions are set at the level of the UK share of the EUETS cap.

Table 1.3 Progress towards carbon budgets

MtCO ₂ e	July 2009		
Sector	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Greenhouse gases			
Traded sector (CO ₂)	1,233	1,078	985
Non-Traded sector (CO ₂)	1,276	1,188	1,082
Non CO ₂ Greenhouse gases	464	452	438
Net UK carbon account	2,974	2,718	2,505
CARBON BUDGET	3,018	2,782	2,544
Shortfall (negative implies emissions under budget)	-44	-64	-39

SECTION 2: SCENARIO ASSUMPTIONS AND PROJECTIONS

DECC MODEL SCENARIOS

The DECC Energy Model provides the basis for the carbon dioxide (CO₂) emissions projections and requires a set of key assumptions including the level of economic growth, international fossil fuel prices, size of UK population etc. The assumptions are agreed across government departments or based on official UK statistics. The near-term UK economic growth is provided by HMT Budget forecasts and for the longer-term DECC assumptions are used. Arrangement of assumptions provides a range of scenarios. Projections for energy demand and emissions out to 2022. Other assumptions include levels of policy delivery, where policy savings are assumed at low, central or high emissions reductions.

Examples of price, policy and growth. Scenarios include:

1. The central projection based on assumptions of central prices, central policy delivery, central growth
2. High price projection based on high prices, central policy delivery, central growth
3. Low growth projection based on central prices, central policy delivery and low growth.

Projections based on a range of fossil fuel prices, growth and policy delivery provide valuable information on the sensitivity of the projections to different key assumption and inform the levels of uncertainty associated with the central projections.

The results of the central emissions projections are generally quoted throughout this paper (unless otherwise stated). The results of a number of other scenarios are provided in the annex to this paper.

DECC BASELINE

An additional baseline scenario is provided which assumes central assumptions on prices and growth but excludes the package of policy measures set out in the UK Low Carbon Transition Plan. The baseline allows comparison with the other projection scenarios which include the policies set out in the UK Low Carbon Transition Plan.

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 CO₂ projections to provide projections of total UK greenhouse gas emissions out to 2022. Projections of LULUCF and non-CO₂ greenhouse gas emissions also provide a range considered "low, central or high".

Fossil fuel price assumptions

Assumptions of fossil fuel prices, updated at least annually, are produced by DECC based on analysis of the international market and informed by other forecasts published by international organisations.

New fossil fuel price assumptions published in May 2009 reflect changes over the last year in global oil markets. The four sets of assumptions reflect four different scenarios of potential future global fuel markets. Probabilities are not attached to these scenarios and none is more or less likely than any other, however the scenario representing timely investment and moderate demand has been selected to represent a "central" assumption.

The four fossil fuel worlds:

- Reflecting low global energy demand (scenario 1)
- Reflecting timely investment and moderate demand, (scenario 2)
- Reflecting high demand and producers' market power (scenario 3)
- Reflecting high demand and significant supply constraints(scenario 4) .

Table 2.1 Comparison of 2008 and 2009 oil price assumptions for all scenarios

Crude Oil (\$/bbl) (2008 prices)	2008 low prices	2009 Scen. 1 prices	2008 central prices	2009 Scen. 2 prices	2008 high prices	2009 Scen. 3 prices	2008 high-high prices	2009 Scen. 4 prices
2005	60	60	60	60	60	60	60	60
2010	46	50	66	70	87	84	110	103
2015	46	58	69	75	92	102	153	142
2020	46	60	72	80	97	120	153	150

The central energy and emissions projections presented here are based on the Scenario 2 prices which reflect timely investment and moderate energy demand.

Table 2.2 Comparison of 2008 and 2009 fossil fuel price assumptions for Scenario 2

2008 prices	Crude oil \$/bbl		Natural gas NBP p/therm		ARA coal £/tonne	
	2008 assumption	July 2009 assumption	2008 assumption	July 2009 assumption	2008 assumption	July 2009 assumption
2010	66	70	44	58	37	69
2015	69	75	45	63	32	50
2020	72	80	47	67	33	50

Our assumptions on oil prices in 2020 have increased from 72 \$/bbl to 80 \$/bbl (by 12 per cent). The impact these have within the UK is also determined by the exchange rate. Since 2008 the pound has weakened against the dollar causing higher retail prices within the UK.

Table 2.3 Economic growth assumptions

Percent per annum growth	2009	2010	2011	2012-2013	2014-2025
GDP Updated projection	-3.75 to -3.25	1.0 to 1.5	3.25 to 3.75	3.4 to 3.9	2.3
Manufacturing Updated projection	-12.75 to -12.25	0.25 to 0.75	2.0 to 2.5	2.2 to 2.9	1.7

The growth assumptions remain unchanged from the projections published in April 2009¹². Growth assumptions up to 2011 are those published by HM Treasury (HMT) in Budget 2009. The longer-term assumptions are internal modelling assumptions but broadly consistent with HMT's latest assessment of economic prospects, as set out in Budget 2009. The central projections are based on the mid-point of these ranges.

Table 2.4 Projection of household numbers

	2010	2015	2020
Households (millions)	26.9	28.4	30.0

These reflect the updated figures published for England by Department for Communities & Local Government in March 2009 combined with the latest available from the Devolved Administrations of Wales, Scotland and Northern Ireland.

¹² <http://www.berr.gov.uk/files/file51132.pdf>

Carbon price assumptions

Since the start of the EU Emissions Trading Scheme a price of carbon allowances operates and participants within the scheme may either reduce carbon emissions or purchase allowances to meet an agreed national allocation of permits. The power generation sector operates within the EU Emissions Trading System. The table below shows the carbon price assumed by DECC based on a range of fossil fuel price scenarios.

Table 2.5 Carbon prices assumed (£/tonne CO₂)

€/tCO ₂ (2008 prices)	2010	2015	2020
Low prices	17	18	20
Central prices	20	32	34
High prices	25	40	43

Land use, land use change and forestry

Projections of GHG emissions resulting from assumptions of forecast land use, land use change and forestry are required. The central projection is used.

The LULUCF sector is different from other sector in that it contains both sources and sinks of greenhouse gases. 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 2.6 Land use change emissions (MtCO₂e)

MtCO ₂ e	2010	2015	2020
Low	-2.6	-2.8	-3.6
Central	-1.2	0.9	2.7
High	0.3	4.2	8.1

Non-CO2 emissions

Non-CO2 emissions are not estimated by the DECC model but projections of energy related and non-energy related non-CO2 emissions are provided by AEA Energy & Environment under contract to DECC and are consistent with the DECC energy model results. The projections of non-CO2 gases are added to the CO2 projection and the LULUCF projection to produce projections of total greenhouse gases expressed as carbon dioxide equivalent.

Table 2.7 Non-CO2 Greenhouse gas¹³ emissions (MtCO₂e)

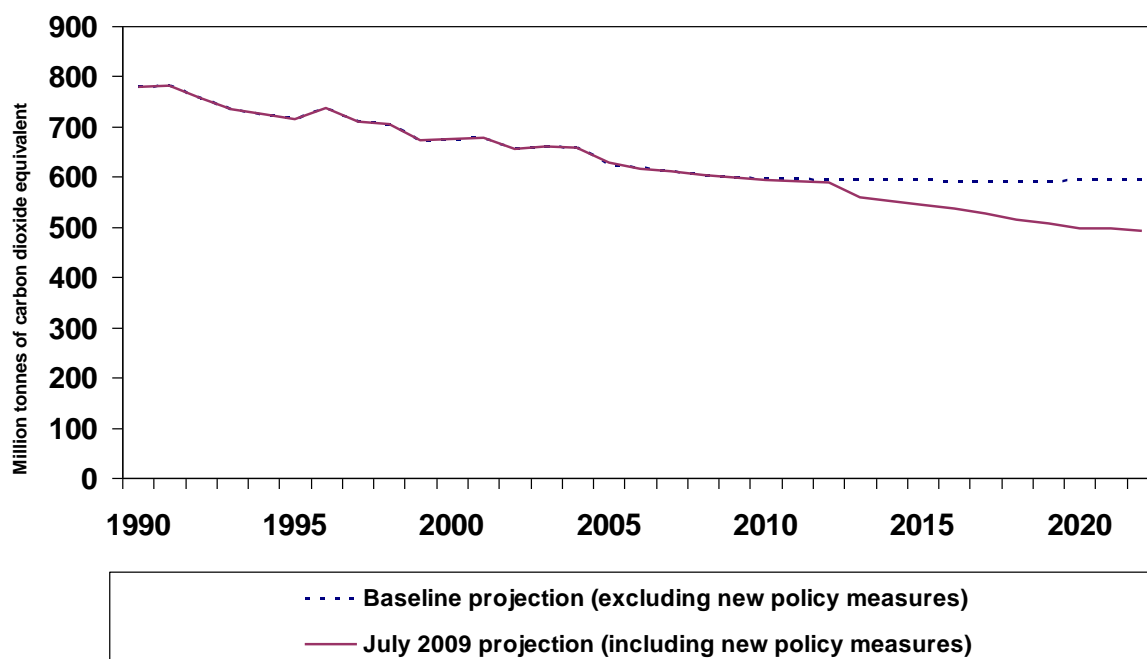
MtCO ₂ e	2010	2015	2020
Low	75	72	68
Central	93	91	88
High	111	109	106

¹³ Non-CO2 Greenhouse gases include Methane (CH₄), Nitrous Oxide (N₂O), Sulphur hexafluoride (SF₆), Hydrofluorocarbons (HFC) and Perfluorocarbons (PFC)

EMISSIONS PROJECTIONS BASED ON CENTRAL ASSUMPTIONS (with and without UK Low Carbon Transition Plan policies)

Chart 2.1 illustrates the impact of the UK Low Carbon Transition Plan policy on the net UK carbon account by comparison of the central baseline greenhouse gas emissions projection excluding the proposed policy measures set out in the UK Low Carbon Transition Plan with the projection including the policy savings as set out in Section 4.

Chart 2.1 Net UK carbon account projection including and excluding policy measures outlined in the UK Low Carbon Transition Plan



NET UK CARBON ACCOUNT IMPACT OF ALTERNATIVE SCENARIOS

Table 2.8 compares the budget shortfalls (or surpluses) based on a range of scenarios (including UK Low Carbon Transition Plan policies), illustrating the impact of alternative assumptions of price and growth the Net UK carbon account.

Table 2.8 Comparison of alternative scenarios on net UK carbon account MtCO₂e

MtCO ₂ e	Emissions			Budget shortfall		
	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Central prices, Central growth	2,974	2,718	2,505	-44	-64	-39
High prices, Central growth	2,965	2,700	2,481	-53	-82	-63
Low prices, Central growth	2,990	2,745	2,530	-28	-37	-14
Central prices, High growth	2,976	2,725	2,512	-42	-57	-32
Central prices, Low growth	2,972	2,714	2,501	-46	-68	-43
"Worst case" Low prices, High growth, Low policy	2,993	2,755	2,548	-25	-27	4

The "worst case" is based on a combination of assumptions which are considered to produce the highest level of carbon emissions including policy estimates which achieve the minimum level of emissions reduction.

SECTION 3: NET UK CARBON ACCOUNT TRADED and NON-TRADED EMISSIONS PROJECTIONS

The statutory independent Committee on Climate Change (CCC)¹⁴ was established by the Climate Change Act with the principal aim of advising the Government on setting levels for the five-year carbon budgets, which set a trajectory for UK greenhouse gas emissions¹⁵ reductions towards our long-term target of at least an 80% reduction in emissions

The levels of the first three carbon budgets were set in Budget 2009¹⁶ 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 carbon dioxide equivalent of the Kyoto basket of non-CO2 greenhouse gases¹⁷ provides the basis for assessing progress against meeting the UK carbon budgets. The emissions, in this section, 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 Emissions Trading System including allowances traded within the system fall within the “traded sector” while emissions from sectors and installations not participating in the EU ETS are termed the “non-traded” sector. The projections are split into traded and non-traded sectors and 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 traded sector emissions projections comprise emissions from the energy industries including power stations, refineries, offshore, some Combined Heat and Power 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 non-carbon dioxide equivalent of the non-greenhouse gas emissions projection.

The proportional split of the DECC sector emissions projections into traded and non-traded sectors averaged over the three budget periods is illustrated in Table 3.1. The level of non-traded emissions depends on the particular projection (e.g. which set of assumptions on economic growth or fossil fuel prices, policies etc.) but is illustrated here based on the July 2009 central projection.

¹⁴ The Committee on Climate Change was appointed in shadow form in March 2008 and became a statutory committee in Dec 2008 with the Climate Change Act passing into law.

¹⁵ The basket of greenhouse gas emissions are those of the Kyoto basket of GHGs namely CO₂,

¹⁶ http://www.hm-treasury.gov.uk/bud_bud09_carbon.htm

¹⁷ The non-CO₂ greenhouse gases include methane (CH₄), nitrous Oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFC) and perfluorocarbons (PFC)

Table 3.1 Percentage share of traded/non-traded carbon dioxide emissions by source

	Approx %Traded	Approx %Non-Traded (excluding GHG)
Power Stations	100%	0%
Refineries	97%	3%
Residential	0%	100%
Services	7%	93%
Industry	72%	28%
Road transport	0%	100%
Other transport (1)	15%	85%
Land use change	0%	100%

(1) Other transport includes domestic aviation, rail, national navigation and military aviation & shipping

CHANGES FROM PREVIOUS PROJECTIONS (on net UK Carbon Account basis)

The net UK carbon account for each carbon budget period implied by the April 2009 (central) projection published in the Budget Report 2009 is compared with the most recent projections in the table below.

Table 3.2 Carbon budget April 2009 and July 2009 projection headline results

MtCO ₂ e	April 2009			July 2009		
	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Sector						
Greenhouse gases						
Traded sector (CO₂)	1,233	1,078	985	1,233	1,078	985
Non-Traded sector (CO₂)	1,294	1,230	1,133	1,276	1,188	1,082
Non CO₂ Greenhouse gases	482	467	451	464	452	438
TOTAL Greenhouse gases	3,009	2,775	2,569	2,974	2,718	2,505
CARBON BUDGET	3,018	2,782	2,544	3,018	2,782	2,544
Shortfall (negative implies emissions under budget)	-9	-7	25	-44	-64	-39
Overall change				-35	-57	-63

The projected shortfall in the third budget period of 25MtCO₂e is now -39MtCO₂e implying that under this scenario all three budgets will be met.

The updated projections in July 2009 include changes to fossil fuel price assumptions, revised non-carbon dioxide greenhouse gas projections, revised modelling on car ownership and CHP projections and refined estimates of the impact on some existing Climate Change Programme policy and estimated savings from the proposed Renewable Energy Strategy (RES). The projections have also been re-based to the 2007 Inventory¹⁸. The higher fossil fuel price assumptions contribute to the lower projected emissions in all three budget periods which is offset by lower savings estimated by the revised policy delivery impacting in the second and third budget periods. The revision to building regulations has reduced savings

¹⁸ The UK Greenhouse Gas Inventory is reviewed every year, and the whole historical data series is revised to incorporate methodological improvements and new data. The most notable changes to the 2007 Inventory have been linked to changes in the emissions factors used to estimate emissions attributable to specific activities.

significantly in the third budget period. Projected emissions of non-CO2 have been revised down following research commissioned by DECC contributing to lower emissions over all three budget periods. The contributions from the changes are shown in Table 3.3. Overall the projections are lower in all budget periods by, 35 MtCO₂e in the first, 57 MtCO₂e in the second and 63 MtCO₂e in the third.

Table 3.3 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	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Policy revisions			
Products policy: Further products policy analysis suggested the fuel saved was mainly electricity rather than gas as was originally estimated thus increasing the saving in the traded sector and reducing the non-traded saving	2.0	5.2	9.0
Supplier Obligation: Re-estimated saving from proposed policy	0.7	4.5	4.9
Buidling Regulations: Net adjustment to estimated savings from existing regulations.	0.1	4.2	18.4
EEC and CERT: Revision to estimated savingsbased on revised delivery estimates	1.6	-3.0	1.6
Renewable Energy Strategy: Lower heat delivery suggested by further analysis	-0.2	0.5	3.9
Renewable Energy Strategy: Revision to estimated impact of bio-fuels in transport sector.	0.3	7.0	4.0
Renewable Energy Strategy: Revision to bio-fuel in heat sector.	3.0	1.6	0.5
Other off-model policy measures	-2.3	-21.5	-67.9
Non-CO2 projection change			
2007 inventory CO ₂ : April 2009 projection was 2006 Inventory based.	0.4	0.3	0.2
Non-CO ₂ GHG: Impact of revised projection	-18.2	-14.7	-12.9
Other changes			
Fossil fuel price assumptions: Increased fossil fuel price assumptions since April 2009 projections (including higher fuel duty)	-16.0	-26.0	-27.0
Revised estimated projection of CHP	-3.0	2.0	13.0
Private road transport demand, revision to car ownership projection	-6.0	-13.0	-12.0
Compound interaction effects	2.2	-4.2	1.1
Total change in projection	-35.5	-57.1	-63.2

Non-CO₂ GHG projection change

Projections of non-CO₂ GHG included in the April 2009 projection were based on the 2006 inventory. The major changes to the non-CO₂ (non-traded) emissions projection result from the switch to the 2007 inventory. The inventory change provides a significantly lower projected emission of methane (CH₄) gas from road transport, together with small increases in emissions of CH₄ and and nitrous oxide (N₂O) from agriculture due to changes in carbon emissions factors and methodological changes. New Scottish data on waste emissions has increased CH₄ emissions slightly but not enough to outweigh the changes in road transport. Other changes include increased N₂O emissions from industry due to Adipic acid production and changes in levels of hydrofluorocarbons (HFC) carbon equivalent due to new data for industrial refrigeration and air-conditioning but these are relatively small.

SECTOR EMISSIONS (on net UK carbon account basis)

Emissions from the traded and non-traded sectors are shown by budget period for the central projection.

Table 3.4 Greenhouse gas emissions by sector

MtCO ₂ e	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Carbon Dioxide (CO₂)			
Traded sector	1,233	1,078	985
Non-Traded sector			
Refineries	2	2	3
Residential	384	327	288
Services	130	129	96
Industry	142	134	141
Road Transport	560	536	488
Other Transport (1)	63	55	55
Land use, land use change and forestry	-6	4	12
Non CO₂ Greenhouse gases	464	452	438
TOTAL Greenhouse gases	2,974	2,718	2,505
CARBON BUDGET	3,018	2,782	2,544
Shortfall	-44	-64	-39

(1) Other transport includes domestic aviation (2008-2011), rail, national navigation and military aviation & shipping

UK TRADED SECTOR EMISSIONS

Table 3.5 Summary of traded sector emissions and allowances traded.

MtCO ₂ e	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Traded sector			
Power sector	761	638	486
Refineries	78	80	83
Services	10	10	10
Industry	363	360	375
Domestic aviation (from 2012)	2	13	14
Total UK traded emissions	1,214	1,101	968
TOTAL traded CO₂	1,233	1,078	985
Allowances traded	-19	23	-17

SECTION 4: CLIMATE CHANGE MITIGATION POLICIES INCLUDED IN THE EMISSIONS PROJECTIONS

Policies included in the emissions projections include policies announced in the Climate Change Programmes of 2000 and 2006 as well as more recent policies.

Since the April 2009 projections the estimated savings attributed to various policies have been revised and are shown in Tables 4.1 (baseline or pre UK Low Carbon Transition Plan policies) and Table 4.2 UK Low Carbon Transition Plan policies.

All policy savings are expressed in MtCO₂ and split by traded and non-traded emission saving.

The policies included in the July 2009 projections include the existing policies in the baseline listed in Table 4.1 plus the additional measures in the UK Low Carbon Transition Plan which are shown by sector in Table 4.2. Further details of the proposed policies is available in the UK Low Carbon Transition Plan.

Table 4.1 Policy measures included in the baseline (pre UK Low Carbon Transition Plan)¹⁹

MtCO ₂ e	Non-traded (MtCO ₂ e)			Traded (MtCO ₂ e)		
	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3
Residential sector	30.7	41.5	44.8	17.5	17.6	12.7
EEC1 & EEC2 (re-evaluated)	8.1	7.7	6.7	8.8	7.1	2.2
Building Regulations (re-evaluated)	19.0	30.2	34.6	0.9	1.1	1.2
Warm front and fuel poverty programmes	3.6	3.5	3.5	7.9	9.3	9.3
Business/ Public Sector	15.3	17.6	17.8	15.2	14.6	14.8
Building regulations (re-evaluated)	4.0	5.6	5.9	3.9	2.5	2.6
Carbon Trust measures total	0.5	0.7	0.7	0.8	1.2	1.2
Climate Change Agreement (excluding overlaps)	10.3	10.6	10.6	9.7	9.9	9.9
Revolving loan	0.5	0.7	0.7	0.8	1.1	1.1
Industry	0.7	1.0	1.0	3.2	4.5	4.6
Building regulations (re-evaluated)	0.5	0.7	0.8	2.1	2.9	3.0
Carbon Trust measures total	0.2	0.2	0.2	1.1	1.6	1.6
Energy Industry	-	-	-	52.1	74.7	93.9
Renewables Obligation	-	-	-	52.1	74.7	93.9
Transport	42.6	61.5	63.1	-	-	-
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	26.0	36.0	38.0			

¹⁹ The figures given in the table for the existing measures represent the appraised carbon savings. Interaction effects are not fully accounted for and the carbon savings from individual policies should not therefore be added up. Measures in the baseline (but not shown in this table) include the Climate Change Levy, with projected savings of 4 MtCO₂ by 2020, and the Fuel duty escalator, which ran from 1993 to 1999, projected to save an estimated 7 MtCO₂ by 2020.

Table 4.2 UK Low Carbon Transition Plan: Policies and Proposals

MtCO ₂ e	Non-traded (MtCO ₂ e)			Traded (MtCO ₂ e)		
	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3
Residential sector	10.0	35.0	60.8	14.7	40.8	63.4
Domestic Energy Efficiency package	0.9	17.1	35.9	0.6	11.1	23.3
Zero carbon homes	0.1	0.6	2.1	0.1	0.7	1.4
CERT uplift	8.5	13.3	10.0	6.8	9.8	12.0
Better billing and smart metering	0.9	2.1	1.8	2.5	6.4	6.1
Product policy	-0.8	-2.4	-4.5	4.4	12.5	20.3
Community Energy Saving Prog. (CESP)	0.2	0.1	0.1	0.3	0.3	0.3
Renewable Heat Incentive	0.3	4.2	15.4			
Business/ Public Sector	0.1	9.5	33.1	5.8	24.1	52.5
Carbon Reduction Commitment	0.3	2.4	4.6	0.8	6.7	12.6
Energy Performance of Buildings Directive	0.0	0.3	0.7	0.1	0.7	1.5
Product policy	-1.1	-2.5	-3.9	4.2	10.1	15.8
Smart meters for SMEs	0.1	2.2	4.7	0.0	0.4	0.9
Loans for SMEs	0.2	0.2	0.0	0.2	0.2	0.0
Loans to public sector	0.1	0.0	0.0	0.1	0.0	0.0
Renewable Heat Incentive (business)	0.2	2.4	9.7	0.0	0.2	0.9
Renewable Heat Incentive (public)	0.2	2.6	10.7			
Renewable Heat Incentive (industry)	0.1	1.8	6.8	0.3	5.8	20.7
Energy Industry	-	-	-	0.5	51.2	148.3
CCS Demonstration Project	-	-	-	0.0	5.4	20.9
Renewable Energy Strategy	-	-	-	0.5	45.8	127.4
Transport	0.0	14.2	50.2	-	-	-
EU new car average fuel efficiency standards of 130gCO ₂ /km	0.0	5.1	20.1	-	-	-
Additional bio-fuel	0.0	9.1	30.1	-	-	-
Low carbon emission buses	0.0	0.2	0.9	-	-	-
SAFED training for bus drivers	0.4	1.0	1.0	-	-	-
Additional policy proposals	1.3	17.0	59.6	-	-	-
TOTAL POLICY SAVINGS	11.3	75.7	203.7	20.9	116.1	264.2

SECTION 5: UNCERTAINTY IN THE NET UK CARBON ACCOUNT PROJECTIONS

Forecasting UK emissions into the future is understandably subject to considerable uncertainty. Total UK CO₂ emissions are driven by energy use and economic activity. 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, number of UK households and vehicle projections. Land use change and non-CO₂ greenhouse gas emissions projections which contribute to the net UK carbon account projections are also subject to uncertainty.

The DECC emissions projections capture some of this uncertainty through the use of scenarios which use alternative assumptions of the levels of key variables. 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 emissions under a range of assumptions also provides an indication of the expected variation in projections of these elements of the total UK emissions. Another important source of uncertainty derives from the assumption that the model captures the degree to which historic data predicts the future. This uncertainty can be approximated as “modelling uncertainty”.

Selecting a suitable range on which to vary the assumptions is key to developing a range of uncertainty. The range of growth assumptions is shown in table 2.3 and variants of price assumptions are provided in Annex E.

TRADED & NON-TRADED SECTOR UNCERTAINTY

Participation in the EUETS provides certainty in the emissions attributed to the traded sector under the carbon accounting rules for carbon budgets²⁰ and these emissions are assumed to be equal the level of the UK cap.

Non-traded sector uncertainty

With the traded sector capped the emissions uncertainty associated only with the non-traded sector becomes important in terms of the UK meeting its carbon budgets. Analysis of this uncertainty suggests a large component is modelling uncertainty (the ability of an econometric model to capture historic behaviour and project this into the future), however, uncertainty associated with the projection of non-CO₂ greenhouse gas component of the non-traded sector is even larger. Policy uncertainty is also a factor where delivery of policy is estimated to lower energy use or reduce emissions and we assume higher levels of uncertainty for proposed policy than existing policy. Fuel price and economic growth uncertainty contributes to non-traded emissions through energy use in homes and decisions regarding travel 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 illustrates the components of uncertainty as differences from a central projection indicate the marginal contribution in terms of emissions of changes to the assumptions.

²⁰ 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 Components of uncertainty

<i>Percentages and MtCO_{2e}</i>	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Modelling UNCERTAINTY	44%	32%	20%
FOSSIL FUEL PRICE -low prices	4%	4%	2%
GROWTH -high	1%	3%	2%
Policy uncertainty -low delivery	0%	7%	41%
LUC -high	1%	2%	3%
NON-CO ₂ GHG -high	50%	52%	33%
TOTAL	100%	100%	100%
Upper probabilistic 95% range (MtCO ₂)	106	129	165
Modelling UNCERTAINTY	44%	32%	28%
FOSSIL FUEL PRICE -High prices	1%	2%	3%
GROWTH -low	0%	1%	1%
Policy uncertainty -high delivery	1%	2%	8%
LUC -low	1%	2%	6%
NON-CO ₂ GHG -low	54%	61%	55%
TOTAL	100%	100%	100%
Lower probabilistic 95% range (MtCO ₂)	-101	-120	-132
Upper range of projection	1,847	1,768	1,685
Central Non-Traded projection	1,741	1,640	1,520
Lower range of projection	1,639	1,519	1,389

The probabilistic ranges illustrated in Table 5.1 suggest the range within which the net UK carbon account is most likely to fall. Applying the same methodology of uncertainty ranges for each year in the first three carbon budget periods, along similar lines to that explained above, has been used to generate the indicative annual ranges for the net UK carbon account that are required under the Climate Change Act 2008 and are published in an Annex to the UK Low Carbon Transition Plan.

The total uncertainty range from the components listed above for the three carbon budget periods is shown in Table 5.2 and provides a range of differences between budget period emissions projections and level of budgets.

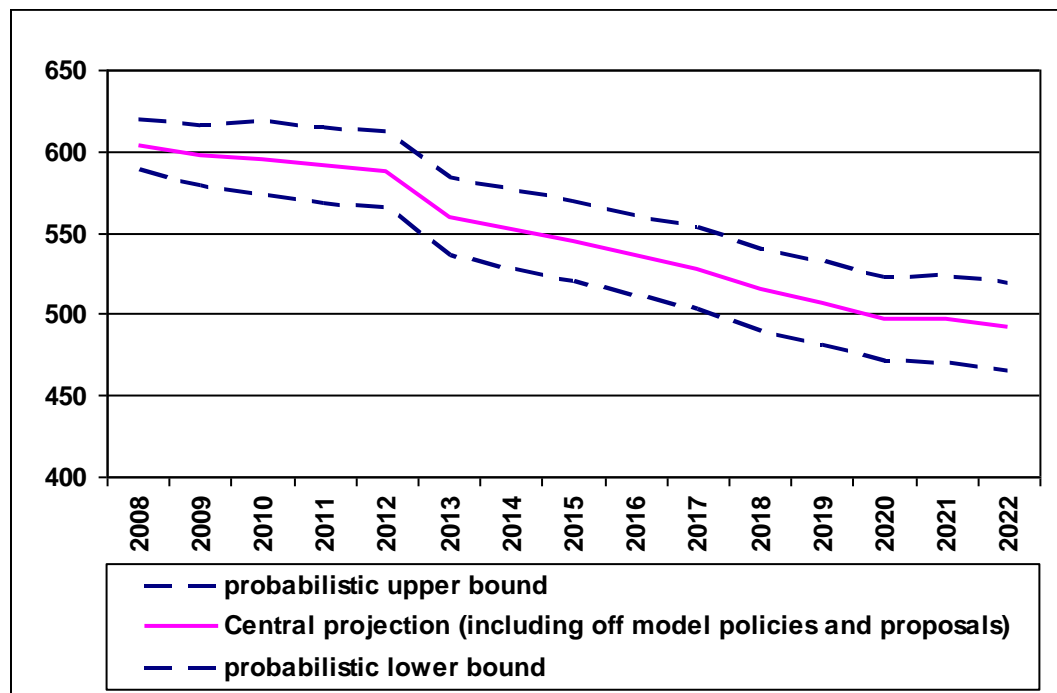
Table 5.2 Uncertainty impact on net UK carbon account

MtCO _{2e}	Budget 1 2008-2012	Budget 2 2013-2017	Budget 3 2018-2022
Upper range	3,080	2,847	2,670
Central projection (Traded & non-traded)	2,974	2,718	2,505
Lower range	2,873	2,598	2,374
Budget	3,018	2,782	2,544
Range of shortfall / surplus (+implies shortfall)			
from	62	65	126
to	-145	-184	-170

Traded sector uncertainty

In terms of the net UK carbon account the projected emissions from the traded sector are controlled within the cap set under the EU ETS. The uncertainty is assumed to be zero and the projection equal to the level of the cap. Changes in emissions from the traded sector result in compensating changes in purchases or sales of EU ETS allowances. Analysis based on a range of generation mix assumptions suggests that UK emissions variability from the generating sector is some +/- 6% near term and +/- 12% longer term or some +/- 8MtCO₂e, in budget period 1; +/- 11MtCO₂e in second budget period and +/- 9MtCO₂e in third budget period. Other sources of uncertainty associated with the traded sector are levels of offshore, refinery and industry output and potential for CHP construction.

Chart 5.1 Total GHG from 1990 to 2022 including uncertainty bounds



SECTION 6: FINAL 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 UK Low Carbon Transition Plan.²¹ Table 6.1 is based on central price and growth assumptions and provides dis-aggregated demand for each energy source and major sector. Figures are presented on a consistent basis with the Digest of UK Energy Statistics (DUKES) and includes all fuel sold within the UK and the Crown Dependencies of Guernsey, Jersey and the Isle of Man.

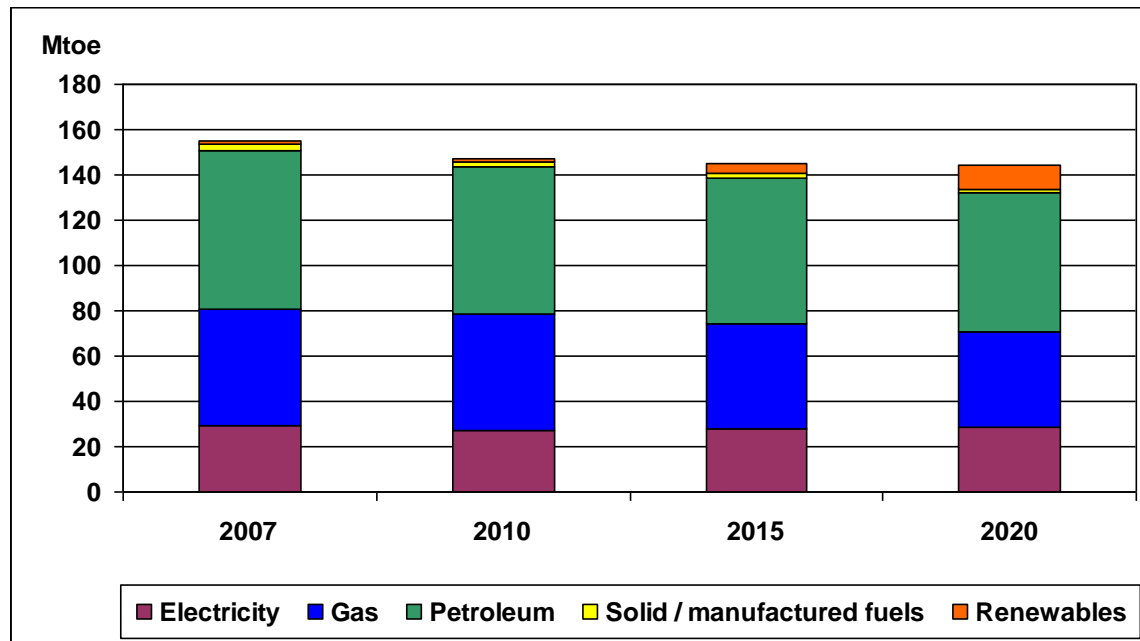
Table 6.1 Energy demanded by final user²², updated projection with central fossil fuel prices, central policy and central growth.

Mtoe	2007	2010	2015	2020
Industry				
Electricity	10	9	9	10
Gas	13	11	11	10
Petroleum	7	6	5	4
Solid / manufactured fuels	2	2	2	1
Renewables	0	0	1	3
Total energy	32	27	27	28
Domestic				
Electricity	10	9	9	9
Gas	30	31	26	23
Petroleum	3	3	2	1
Solid / manufactured fuels	1	0	0	0
Renewables	0	0	1	2
Total energy	44	44	38	36
Services				
Electricity	9	9	9	8
Gas	9	9	10	9
Petroleum	2	1	1	1
Solid / manufactured fuels	0	0	0	0
Renewables	0	0	1	2
Total energy	19	20	20	20
Transport				
Electricity	1	1	1	1
Aviation fuel	14	14	15	17
Petroleum (Rail)	1	1	1	1
Petroleum (Shipping)	2	1	2	2
Petroleum (Road transport)	42	39	38	37
Bio-fuel	0	1	2	4
Total energy	60	57	59	61
Total				
Electricity	29	27	28	28
Gas	51	51	47	42
Petroleum	70	65	64	62
Solid / manufactured fuels	3	2	2	1
Renewables	1	2	4	11
Total energy	155	147	145	145

²¹ Some off-model adjustments are made in terms of CO2 emissions only therefore the figures quoted for energy will be higher than if these adjustments were included.

²² On energy supplied basis, excludes non-energy uses, and excludes fuel used for transformation in Industrial sector. Services sector includes Commercial. Aviation fuel includes fuel used for both Domestic and International flights.

Chart 6.1 Final energy demand by fuel type



Total final energy demand is projected to fall by 8 per cent from 155 million tonnes of oil equivalent (mtoe) in 2007 to 145 mtoe in 2020. The largest contributions are from gas and petroleum which fall by 9 mtoe and 8 mtoe respectively. Renewable final energy demand increases from 1 mtoe to 11 mtoe, about one third of this is from road transport fuels.

Chart 6.2 Final energy demand by fuel type

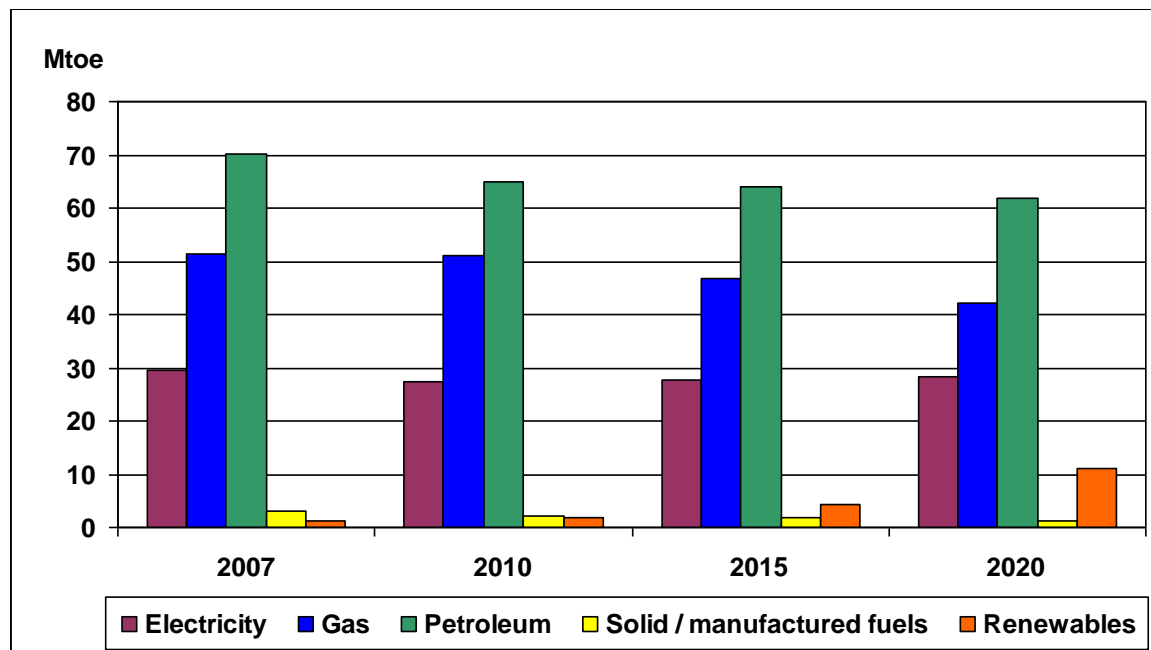


Chart 6.3 Final energy demand by sector²³

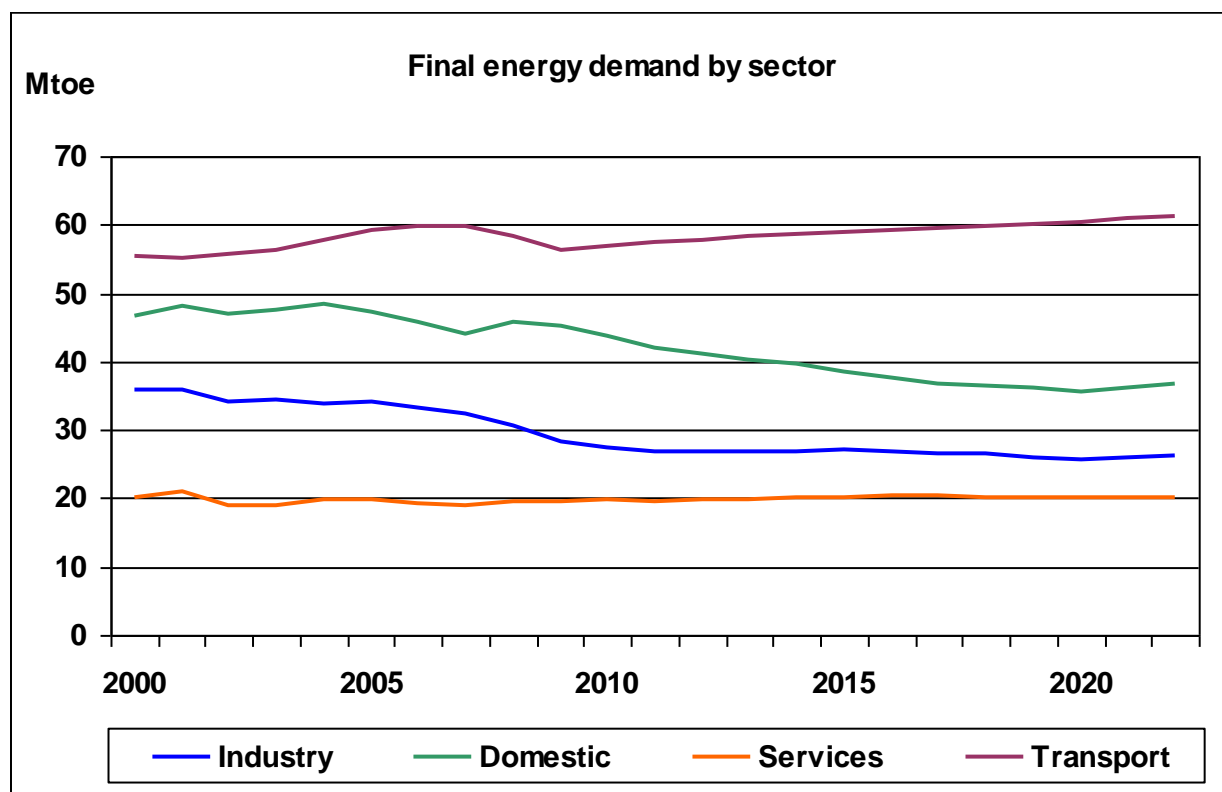


Chart 6.3 shows the projected trends in energy demand by sector. The domestic sector is projected to decrease by 19 per cent between 2007 and 2020. This is driven by energy efficiency measures. The declining trend in industrial demand is accelerated by the economic recession with demand projected to fall by 15 per cent between 2007 and 2010. Transport fuel is projected to increase from 2010 after a slight fall following the high prices and economic recession.

²³ Sectors used here are on the same basis as the Digest of UK Energy Statistics and are not comparable with sectors described in earlier sections.

SECTION 7: ENERGY INDUSTRIES

KEY POWER STATION ASSUMPTIONS

There are a number of assumptions underlying the power station²⁴ projections. The key ones are as follows:

Renewables: The Renewable Energy Strategy delivers a much higher level of electricity supply from renewable sources by 2020, equivalent to 37 per cent of MPP power supply and around 30 per cent of total electricity supply across the full range of scenarios examined.

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 around 2020, so the non - CCS component of new coal build up to that time is assumed to convert to full CCS within five years. Once proven, any new coal build is then assumed to be fully CCS. The capacity for coal (with and without CCS) does not fully reflect the proposals in the consultation: A framework for the development of clean coal, published on 17th June 2009.

Nuclear: Assumption of one station of around 1.6GW operating in 2020, up to one new station per year thereafter.

The projected generation²⁵ and capacity figures for the central case are shown in Tables 7.1 and 7.2.

Table 7.1: Updated projections of electricity supply, TWh²⁶

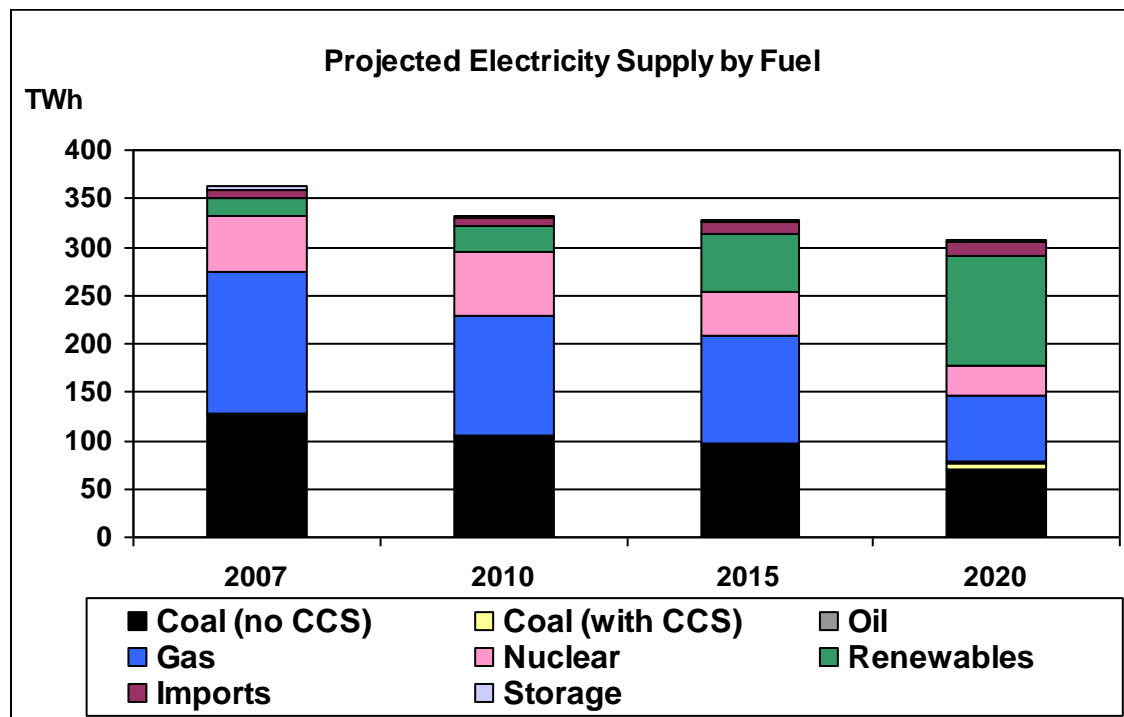
TWh	2007	2010	2015	2020
Coal (no CCS)	126	104	94	70
Coal (with CCS)	0	0	1	7
Oil	2	1	1	1
Gas	146	124	112	69
Nuclear	57	67	44	30
Renewables	20	25	60	115
Imports	9	9	13	13
Storage	4	3	3	3
Total	363	333	328	307

²⁴ The coverage of the ‘power station’ sector is major power producers (MPPs) plus all other renewables generators.

²⁵ Electricity generation is defined here 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.

²⁶ Some off-model adjustments are made in terms of CO2 emissions only therefore the figures quoted for energy will be higher than if these adjustments were included.

Chart 7.1: Gross electricity supply by source, TWh



The projection reflects an initial increase in CCGT capacity, followed in later years by the build up of renewables, new CCS (and non-CCS) coal, with new CCGT acting as a residual to meet both demand and to supply further capacity in order to provide back up capacity in the face of a growing intermittent component within overall capacity. The call on the grid falls sharply initially because of the recession but never recovers to any extent, due to continued downward pressure from measures, a significant increase in the generation of electricity from new CHP plants and also to some extent, from a projected high level of electricity prices in the long term.

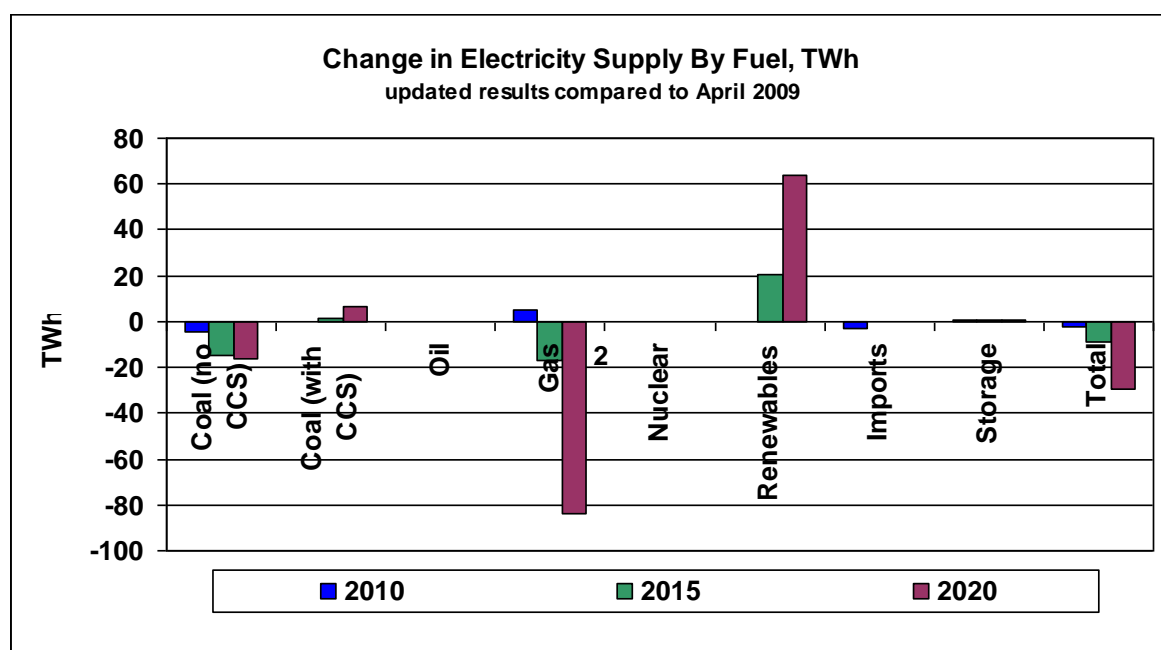
The combination of fossil fuel prices and carbon prices is such that coal enjoys a favourable competitive position against gas and thus its share of generation holds up reasonably well in the projection, while that of gas falls. The pattern of the longer - term trend in generation seems to be a feature of some other non – DECC modelling.

The longer – term trend towards lower amounts of electricity supplied from gas partially reflects the projection of a significant increase in the supply of electricity from new gas – based CHP plants.

Nuclear generation falls in the medium term, as plants retire from the system, but from around 2020 onwards, generation from nuclear plants rises again as new plants are constructed.

Chart 7.2 shows a comparison of MPP electricity supply by fuel for the updated central case results and the central case projections from 2008.

Chart 7.2: Changes in supply mix since April 2009 projection



In the previous projections (April 2009) the Renewable Energy Strategy (RES) was applied as an off-model adjustment to the emissions. This is now treated on model and affects the total generation and generation mix. Chart 7.2 clearly shows the switch from gas to renewables. Total generation has reduced by 29TWh in 2020 due to additional energy savings and the growing supply from other generators.

Table 7.2: Updated projections of electricity capacity, GW²⁷

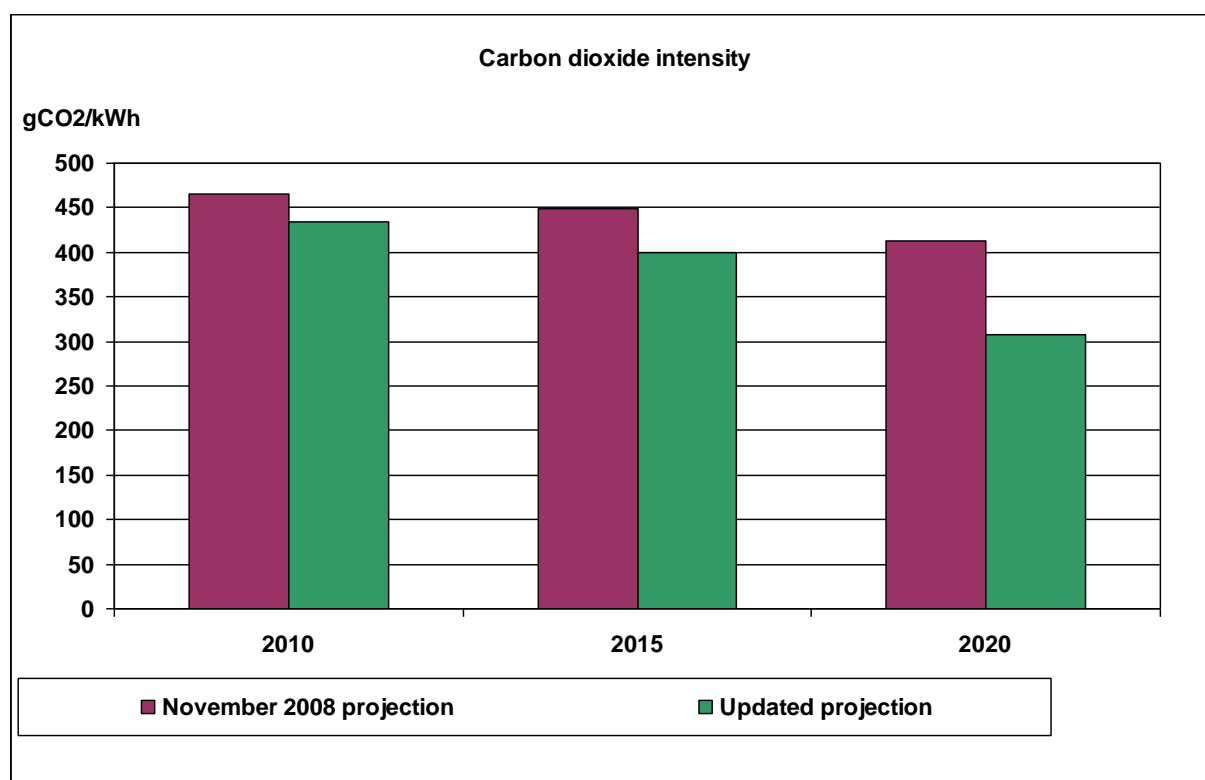
GW	2007	2010	2015	2020
Coal (no CCS)	27.9	28.3	21.8	16.4
Coal (with CCS)	0.0	0.0	0.5	1.0
Oil	4.2	4.0	2.0	0.9
Gas	27.8	32.2	34.2	34.2
Nuclear	11.0	10.8	7.0	5.4
Renewables	5.7	6.5	17.7	33.1
Imports	2.6	3.2	5.5	5.5
Storage	2.7	2.8	2.8	2.8
Total	81.9	87.8	91.5	99.3

Capacity is projected to rise to 99 GW by 2020. The growth comes from renewables rising to 33 GW with reduction in coal (no CCS), nuclear and oil. Gas retains about a third of capacity in 2020 despite contribution less than a quarter of generation. This capacity is important for security of supply to back up for intermittency of renewables.

The capacity for coal (with and without CCS) does not fully reflect the proposals in the consultation: A framework for the development of clean coal, published on 17th June 2009.

²⁷ Capacity shown is for Major Power Produces including all renewable generators. Plant capacity of other generators is not included.

Chart 7.3 Carbon intensity of the power sector



The RES provides low carbon generation and produces large emissions savings. Pre-RES the carbon intensity in 2020 was 414 gCO₂/kWh. Under RES this reduced to 308 gCO₂/kWh.

COMBINED HEAT AND POWER (CHP)

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. 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 probabilistic view of industry attitudes towards risk. Revised projections of installed capacity are shown in Table 7.3 and compared with the previous projections.

Table 7.3: Updated projection of installed capacity of CHP

Capacity, GW	2010	2015	2020
July 2009 projection	6.2	10.3	15.5
April 2009 projection	7.1	9.1	12.1

In the near term, the differences in projected capacity since the previous projections result from a combination of the prevailing economic conditions and uncertainties in the commissioning periods of large CHP units in the energy industries sector where the major use of these units will be in the re-gasification of liquefied natural gas imported from abroad.

In the longer-term, as this market becomes saturated, other sectors will respond to price signals and expand take-up. In particular, improved spark spread is anticipated over previous projections, resulting in more favourable investment conditions for both new units and for further CHP development at existing sites. These latest results suggest progress towards

meeting the UK's potential for CHP identified in the governments analysis published in October 2007²⁸

OIL REFINERIES

Table 7.4 Carbon dioxide emissions from refineries

MtCO ₂	2010	2015	2020
July 2009 projection	16.4	16.8	17.3
April 2009 projection	16.1	16.5	17.0

The current projections are very similar to those published previously as the increased energy consumption balances decreased throughput. Whilst it is thought that crude quality may decrease over the period of the projections, there is no evidence that this currently affects energy use and the effect has been ignored.

²⁸ <http://www.defra.gov.uk/environment/climatechange/uk/energy/chp/pdf/potential-report.pdf>

SECTION 8: PRIMARY ENERGY DEMAND

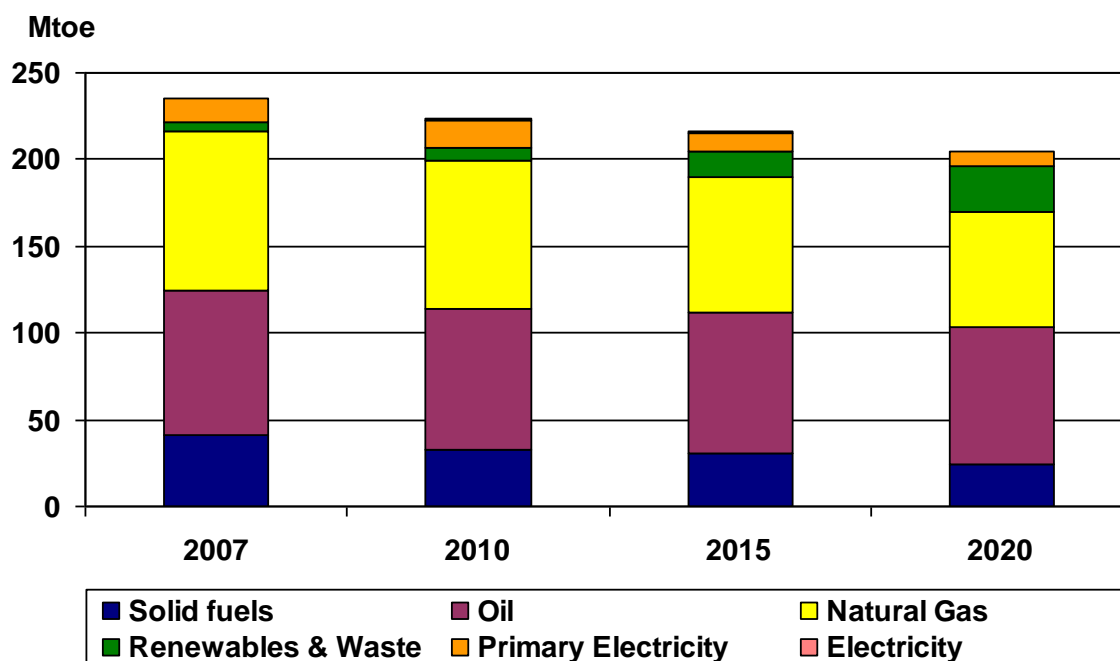
Projections in the central case, including the UK Low Carbon Transition Plan²⁹, show an overall decrease in primary energy demand to 205 mtoe in 2020, compared to 236 mtoe in 2007, a change composed of reductions in demand for all fuels except renewables and waste.

The downward trend in demand for coal and gas is due to the squeeze on fossil fuel use in power generation, while demand for nuclear energy decreases then increases in line with the pattern of station closures and subsequent new build. In contrast, the Renewable Energy Strategy is affecting an increase in demand for renewables and waste to 27 mtoe in 2020, up from 4 mtoe in 2007

Table 8.1: Projection of primary energy demand³⁰

Mtoe	2007	2010	2015	2020
Solid fuels	41	33	31	25
Oil	84	81	81	79
Natural Gas	91	86	79	66
Renewables & Waste	6	7	14	27
Primary Electricity	14	16	11	8
Electricity	0	1	1	1
Total	236	224	216	205

Chart 8.1: Projection of primary energy demand



²⁹ Some off-model adjustments are made in terms of CO₂ emissions only therefore the figures quoted for energy will be higher than if these adjustments were included.

³⁰ In this table, 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'."

SECTION 9: LIST OF ANNEXES

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

Table A: Carbon dioxide emissions by source

Table B: Greenhouse gas emissions by gas

Table C: Final energy demand

Table D: Electricity generation by source

Table E: Fossil fuel and retail price assumptions