Digest of United Kingdom Energy Statistics 2010

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Digest of United Kingdom Energy Statistics

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Monthly and quarterly data are also available for Energy, Solid fuels and derived gases, Petroleum, Gas and Electricity at:

www.decc.gov.uk/en/content/cms/statistics/source/source.aspx

Information on Energy Prices is available at:

www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx

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Chapter 7 Renewable sources of energy

Annex A Energy and commodity balances, conversion factors and calorific values

Introduction

I This issue of the Digest of United Kingdom Energy Statistics (DUKES) continues a series which commenced with the Ministry of Fuel and Power Statistical Digest for the years 1948 and 1949, published in 1950. The Ministry of Fuel and Power Statistical Digest was previously published as a Command Paper, the first being that for the years 1938 to 1943, published in July 1944 (Cmd. 6538). A publication tracing the history of energy production and use over the past 60 years was produced last year to mark the 60th anniversary of DUKES. The publication is available at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

II The current issue updates the figures given in the Department of Energy and Climate Change's (DECC) *Digest of United Kingdom Energy Statistics 2009*, published in July 2009.

III This printed and bound issue consists of seven chapters and four annexes. The first chapter deals with overall energy. The other chapters cover the specific fuels, combined heat and power and renewable sources of energy. The annexes cover conversion factors and calorific values, a glossary of terms, further sources of information and major events in the energy industries.

IV This Digest is also available on the internet. Some additional information appears on the internet only. The tables on the internet are provided in Microsoft Excel format. Most internet versions of the tables include data for earlier years, which are not provided in the printed copy publication. For example commodity and energy balances (see VII and VIII, below) for 1998 to 2006 are included on the internet, and tables that show five years in this printed version show twelve years in their internet form because page sizes are not a limiting factor. In addition, the following appear on the internet version only:

Long term trends text and tables
Major events from 1990 to 2010 - Annex D
(only Major events for 2008 to 2010 appear in the printed and bound version)
Energy and the environment – Annex E
UK oil and gas resources - Annex F
Foreign trade – Annex G
Flow charts – Annex H
Energy balance: net calorific values – Annex I
Heat reconciliation – Annex J

V Annual information on prices is included in the publication *Quarterly Energy Prices*. This is available together with *Energy Trends* on subscription from the Department of Energy and Climate Change. Further information on these publications can be found in Annex C.

VI Where necessary, data have been converted or adjusted to provide consistent series. However, in some cases changes in methods of data collection have affected the continuity of the series. The presence of remaining discontinuities is indicated in the chapter text or in footnotes to the tables.

VII Chapters 2, 3, 4, 5 and 7 contain production and consumption of individual fuels and are presented using *commodity balances*. A commodity balance illustrates the flows of an individual fuel through from production to final consumption, showing its use in transformation (including heat generation) and energy industry own use. Further details of commodity balances and their use are given in Annex A, paragraphs A.7 to A.42.

VIII The individual commodity balances are combined in an *energy balance,* presented in Chapter 1, *Energy*. The energy balance differs from a commodity balance in that it shows the interactions between different fuels in addition to illustrating their consumption. The energy balance thus gives a fuller picture of the production, transformation and use of energy showing all the flows. Expenditure on energy is also presented in energy balance format in Chapter 1. Further details of the energy balance and its use, including the methodology introduced in the 2003 Digest for heat, are given in Annex A, paragraphs A.43 to A.58.

IX Chapter 1 also covers general energy statistics and includes tables showing energy consumption by final users and an analysis of energy consumption by main industrial groups. Fuel production and consumption statistics are derived mainly from the records of fuel producers and suppliers.

X Chapters 6 and 7 summarise the results of surveys conducted by AEA Energy & Environment on behalf of DECC which complement work undertaken by DECC. These chapters estimate the contribution made by combined heat and power (CHP) and renewable energy sources to energy production and consumption in the United Kingdom.

XI Some of the data shown in this Digest may contain previously unpublished revisions and estimates of trade from HM Revenue and Customs and the Office for National Statistics. These data are included in Annex G.

Definitions

XII The text at the beginning of each chapter explains the main features of the tables. Technical notes and definitions, given at the end of this text, provide detailed explanations of the figures in the tables and how they are derived. Further information on methodologies are also provided on the DECC website for each fuel at www.decc.gov.uk/en/content/cms/statistics/source/source.aspx.

XIII Most chapters contain some information on 'oil' or 'petroleum'; these terms are used in a general sense and vary according to usage in the field examined. In their widest sense they are used to include all mineral oil and related hydrocarbons (except methane) and any derived products.

XIV An explanation of the terms used to describe electricity generating companies is given in Chapter 5, paragraphs 5.57 to 5.63.

XV Data in this issue have been prepared on the basis of the Standard Industrial Classification (SIC 2003) as far as is practicable. For further details of classification of consumers see Chapter 1, paragraphs 1.54 to 1.59.

XVI Where appropriate, further explanations and qualifications are given in footnotes to the tables.

Proposed change to use net calorific values when producing energy statistics

XVII A consultation was launched in the 2005 edition of the Digest seeking views of users as to whether Net Calorific Values (NCVs) should be used in place of Gross Calorific Values (GCVs). As a result of this consultation, DECC recognised that there are good arguments both for and against moving from GCV to NCV. However at present it has been concluded that there would be no demonstrable advantage to changing the method of presenting UK Energy statistics, and so GCVs continue to be used in this edition and will be used in future editions of the Digest. The fuel specific NCVs will continue to be published, and are shown in Annex A. The total energy balances on a net calorifc basis are now being produced as part of the internet version of the Digest, Annex I.

Geographical coverage

XVIII The geographical coverage of the statistics is the United Kingdom. Shipments to the Channel Islands and the Isle of Man from the United Kingdom are not classed as exports. Supplies of solid fuel and petroleum to these islands are therefore included as part of United Kingdom inland consumption or deliveries.

Periods

XIX Data in this Digest are for calendar years or periods of 52 weeks, depending on the reporting procedures within the fuel industry concerned. Actual periods covered are given in the notes to the individual fuel chapters

Revisions

XX The tables contain revisions to some of the previously published figures, and where practicable the revised data have been indicated by an 'r'. The 'r' marker is used whenever the figure has been revised from that published in the printed copy of the 2009 Digest, even though some figures

may have been amended on the internet version of the tables. Statistics on energy in this Digest are classified as National Statistics. This means that they are produced to high professional standards as set out in the UK Statistics Authority's Code of Practice for Official Statistics. The Code of Practice requires that all the public bodies that produce official statistics "Publish a revisions policy for those outputs that are subject to scheduled revisions. Provide a statement explaining the nature and extent of revisions at the same time that they are released". The following statement outlines the policy on revisions for energy statistics.

Revisions to data published in the *Digest of UK Energy Statistics*.
It is intended that any revisions should be made to previous years' data only at the time of the publication of the Digest (ie in July 2010 when this Digest is published, revisions can be made to 2008 and earlier years). In exceptional circumstances previous years' data can be amended between Digest publication dates, but this will only take place when quarterly *Energy Trends* is published. The reasons for substantial revisions will be explained in the 'Highlights' sheet of the internet version of the table concerned. Valid reasons for revisions of Digest data include:

- revised and validated data received from a data supplier;
- the figure in the Digest was wrong because of a typographical or similar error.

In addition, when provisional annual data for a new calendar year (eg 2010) are published in *Energy Trends* in March of the following year (eg March 2011), percentage growth rates are liable to be distorted if the prior year (ie 2009) data are constrained to the Digest total, when revisions are known to have been made. In these circumstances the prior year (ie 2009) data will be amended for all affected tables in *Energy Trends* and internet versions of all affected Digest tables will be clearly annotated to show that the data has been up-dated in *Energy Trends*.

Revisions to 2010 data published in *Energy Trends* prior to publication in the 2011 edition of the *Digest of UK Energy Statistics.*

- All validated amendments from data suppliers will be updated when received and published in the next statistical release.
- All errors will be amended as soon as identified and published in the next statistical release.
- Data in energy and commodity balances format will be revised on a quarterly basis, to coincide with the publication of *Energy Trends*.

Further details on the UK Statistics Authority's Code of Practice for Official Statistics can be found at: www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html. DECC's statements of compliance with the Code are available at:
www.decc.gov.uk/en/content/cms/statistics/governance/governance.aspx.
The UK Statistics Authority have undertaken as assessment of DECC's energy statistics and their report can be accessed at: www.statisticsauthority.gov.uk/assessment/assessment-reports/index.html. The authority's recommendations have been incorporated into this publication and other DECC energy statistical publications and outputs.

Energy data on the internet

XXI Energy data are held on the energy area of the DECC web site, under "statistics". The Digest is available at www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx.
Information on further DECC energy publications available both in printed copy format and on the Internet is given in Annex C.

XXII The Department of Energy and Climate Change was created on 3 October 2008. This Department took over energy policy from the former Department for Business, Enterprise and Regulatory Reform (BERR) and climate change policy from the Department for Environment, Food and Rural Affairs (Defra). Within this publication references to DECC's predecessor Departments refer to BERR or Defra.

XXIII Short term statistics are published:

- monthly, by DECC on the Internet at www.decc.gov.uk/en/content/cms/statistics/source/source.aspx
- quarterly, by DECC in paper and on the internet in *Energy Trends,* and *Quarterly Energy Prices*: www.decc.gov.uk/en/content/cms/statistics/publications/publications.aspx

- quarterly, by DECC in a Statistical Press Release which provides a summary of information published in *Energy Trends* and *Quarterly Energy Prices* publications: www.decc.gov.uk/en/content/cms/statistics/publications/publications.aspx
- monthly, by the Office for National Statistics in the Monthly Digest of Statistics (Palgrave Macmillan).

To subscribe to *Energy Trends* and *Quarterly Energy Prices,* please contact Clive Sarjantson at the address given at paragraph XXIX. Single copies are available from the Publications Orderline, as given in Annex C, priced £6 for Energy Trends and £8 for Quarterly Energy Prices.

Table numbering

XXIV Page 10 contains a list showing the tables in the order in which they appear in this issue, and their corresponding numbers in previous issues.

Symbols used

XXV The following symbols are used in this Digest:

..	not available
-	nil or negligible (less than half the final digit shown)
r	Revised since the previous edition

Rounding convention

XXVI Individual entries in the tables are rounded independently and this can result in totals, which are different from the sum of their constituent items.

Acknowledgements

XXVII Acknowledgement is made to the main coal producing companies, the electricity companies, the oil companies, the gas pipeline operators, the gas suppliers, National Grid, the Institute of Petroleum, the Coal Authority, the United Kingdom Iron and Steel Statistics Bureau, AEA Energy & Environment, the Department for Environment, Food and Rural Affairs, the Department for Transport, OFGEM, Building Research Establishment, HM Revenue and Customs, the Office for National Statistics, and other contributors to the enquiries used in producing this publication.

Cover photograph

XXVIII The cover illustration used for this Digest and other DECC energy statistics publications is from a photograph by Peter Askew. It was a winning entry in the DTI News Photographic Competition in 2002.

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Enquirers with hearing difficulties can contact the Department on 0300 060 4000.
Overseas callers can contact the Department on +44 (20) 7979 7777.

XXX For enquiries concerning particular data series or chapters contact those named on page 9 or at the end of the relevant chapter.

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July 2010

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Tables as they appear in this issue and their corresponding numbers in the previous three issues

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	-	-	-	1.4	**ELECTRICITY**	5.1	5.1	5.1	5.1
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	-	-	2.4	2.5		6.5	6.5	6.5	6.5
	-	2.4	2.5	2.6		6.6	6.6	6.6	6.6
	2.4	2.5	2.6	-		6.7	6.7	6.7	6.7
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	2.6	-	-	-		6.9	6.9	6.9	6.9
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Chapter 1
Energy

Introduction

1.1 This chapter presents figures on overall energy production and consumption. Figures showing the flow of energy from production, transformation and energy industry use through to final consumption are presented in the format of an energy balance based on the individual commodity balances presented in Chapters 2 to 5 and 7.

1.2 The chapter begins with aggregate energy balances covering the last three years (Tables 1.1 to 1.3) starting with the latest year, 2009. Energy value balances then follow this for the same years (Tables 1.4 to 1.6) and Table 1.7 shows sales of electricity and gas by sector in value terms. Table 1.8 covers final energy consumption by the main industrial sectors over the last five years, followed by Table 1.9, which shows the fuels used for electricity generation by these industrial sectors. The explanation of the principles behind the energy balance and commodity balance presentations, and how this links with the figures presented in other chapters, is set out in Annex A. Information on long term trends (Tables 1.1.1 to 1.1.8) for production, consumption, and expenditure on energy, as well as long term temperature data and analyses such as the relationship between energy consumption and the economy of the UK are available on DECC's energy statistics web site at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Calorific values when producing energy statistics

1.3 In this publication Gross Calorific Values (GCVs) are used to convert fuel from their original units to tonnes of oil equivalent (toe). An alternative is to use Net Calorific Values (NCVs) as detailed in paragraph XVII of the introduction. The fuel specific NCVs are shown at Annex A. However, as the EU renewables target is calculated on data converted using net calorific values, aggregate energy balances for the most recent years have been calculated using NCVs; these are used in table 7.7, and are available on the internet version, Annex I, of this publication at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx.

The energy industries

1.4 The energy industries in the UK play a central role in the economy by producing, transforming and supplying energy in its various forms to all sectors. They are also major contributors to the UK's Balance of Payments through the exports of crude oil and oil products. The box below summarises the energy industries' contribution to the economy in 2009:

- 3.7 per cent of GDP;
- 10.1 per cent of total investment;
- 49.6 per cent of industrial investment;
- 150,200 people directly employed (5 per cent of industrial employment);
- Many others indirectly employed (eg an estimated 239,000 in support of UK Continental Shelf activities).

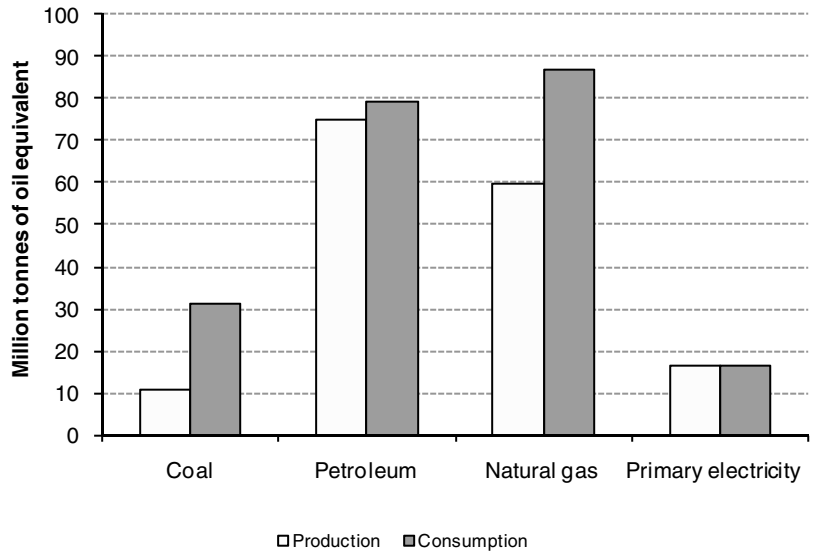
Aggregate energy balance (Tables 1.1, 1.2 and 1.3)

1.5 These tables show the flows of energy in the United Kingdom from production to final consumption through conversion into secondary fuels such as coke, petroleum products, secondary electricity and heat sold. The figures are presented on an energy supplied basis, in tonnes of oil equivalent (toe), a unit of energy where 1 toe = 41.868 GJ, see also paragraph 1.26.

1.6 In 2009, the primary supply of fuels was 220.0 million tonnes of oil equivalent, a 6.3 per cent decrease compared to 2008. Indigenous production in 2009 was 5.7 per cent lower than in 2008, with

output falling in each year since 1999. Chart 1.1 illustrates the figures for the production and consumption of individual primary fuels in 2009. In 2009, aggregate primary fuel consumption was not met by indigenous production; this continues the trend since 2004 when the UK became a net importer of fuel. However, as explained in subsequent chapters, the UK has traded fuels such as oil and gas regardless of whether it has been a net exporter or importer. In 2009 the UK imported more coal, manufactured fuels, crude oil, electricity and gas than it exported; however, we remained a net exporter of petroleum products.

Chart 1.1: Production and consumption of primary fuels 2009



Note: Includes non-energy use of petroleum and gas. Differences between consumption and production are made up by foreign trade, marine bunkers and stock changes.

1.7 Total primary energy demand was 6.3 per cent lower in 2009 than in 2008 at 220.0 million tonnes of oil equivalent. The very small difference between demand and supply is classed as the statistical difference, which is explained in paragraph 1.60. Demand has declined in each of the last four years, however the change in 2009 was much higher than that of the previous three years reflecting the impact of the recession. Chart 1.2 shows the composition of primary demand in 2009.

1.8 The transfers row in Tables 1.1 to 1.3 should ideally sum to zero with transfers from primary oils to petroleum products amounting to a net figure of zero. Similarly the manufactured gases and natural gas transfers should sum to zero. However differences in calorific values between the transferred fuels can result in non-zero values.

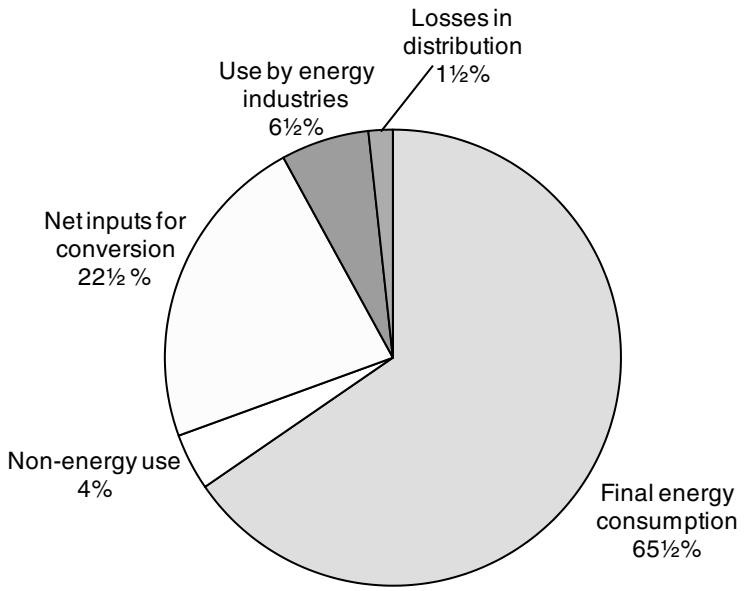
1.9 The transformation section of the energy balance shows, for each fuel, the net inputs for transformation uses. For example, Table 1.1 shows that 3,595 thousand tonnes of oil equivalent of coal feeds into the production of 3,446 thousand tonnes of oil equivalent of coke, representing a loss of 150 thousand tonnes of oil equivalent in the manufacture of coke in 2009. In 2009, energy losses during the production of electricity and other secondary fuels amounted to just under 50 million tonnes of oil equivalent, shown in the transformation row in Table 1.1.

1.10 In 2009, due to decreasing demand for electricity, generation by gas and coal plants both declined. Generation from coal-fired stations was 17 per cent lower in 2009 than in 2008, with generation from gas in 2009, 6 per cent lower than the record high seen in 2008. Generation from nuclear sources increased by 32 per cent as plants came back online following repair and maintenance in 2008. Generation from wind increased sharply, up 31 per cent on a year earlier.

1.11 The switch of some coal fired electricity generation to nuclear contributed to the fall in carbon dioxide emissions between 2008 and 2009. Provisional DECC estimates suggest that emissions fell by 52 million tonnes of carbon dioxide ($MtCO_2$) (9¾ per cent) to 483 $MtCO_2$ between 2008 and 2009. Other factors contributing to the fall included lower fossil fuel consumption by industry and in road transport as the economy contracted in 2009. More details of carbon dioxide emissions are available in an article in the March edition of Energy Trends, which is available on the DECC web site at:

www.decc.gov.uk/en/content/cms/statistics/publications/trends/articles_issue/articles_issue.aspx

Chart 1.2: Primary demand 2009



Primary demand: 220.0 million tonnes of oil equivalent

1.12 The energy industry use section of the table represents use of fuels by the energy industries themselves. This section also includes consumption by those parts of the iron and steel industry which behave like an energy industry i.e. they are involved in the transformation processes (see paragraph A.29 of Annex A). In 2009, energy industry use amounted to 13.7 million tonnes of oil equivalent of energy, a decrease of 4.5 per cent on 2008. The main reason for the decline was reduced production, driven by lower demand, combined with an increase in efficiency driven by a rise in costs.

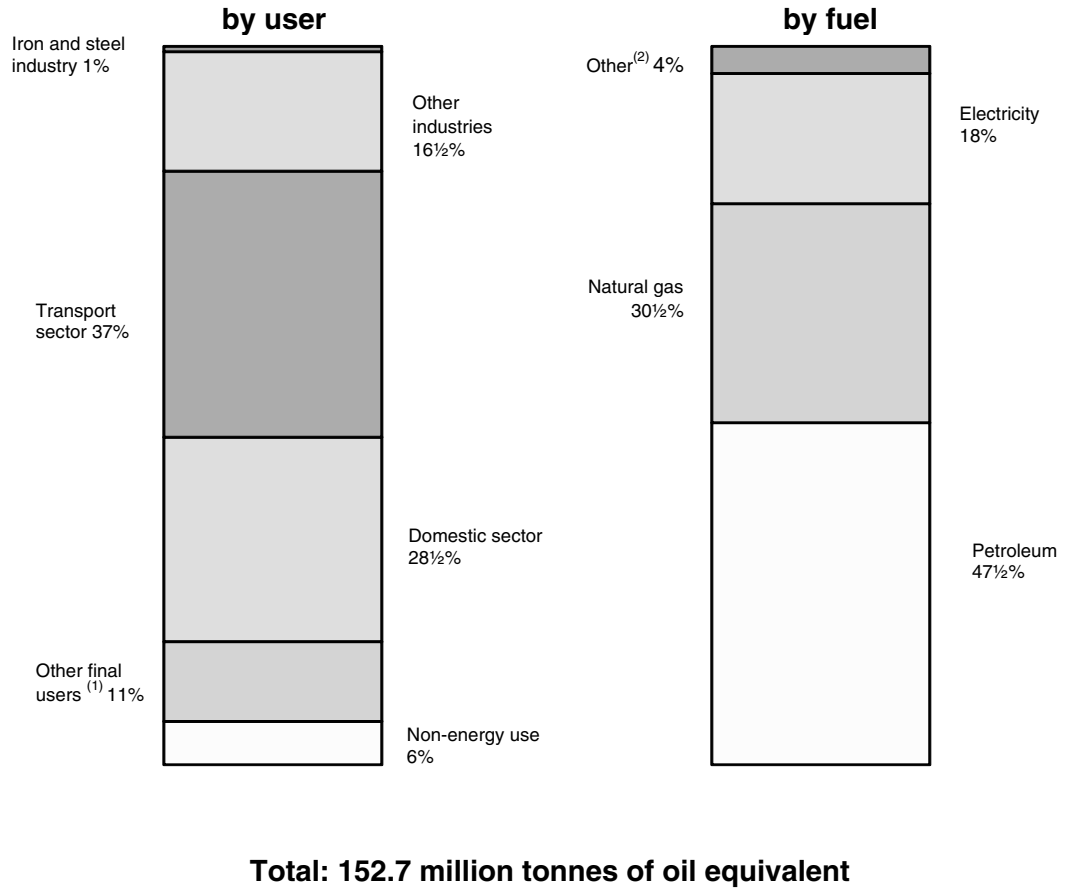
1.13 Losses presented in the energy balance include distribution and transmission losses in the supply of manufactured gases, natural gas, and electricity. Recorded losses increased marginally by 0.1 per cent between 2008 and 2009. Losses in North Sea gas production are no longer separately identified in the simplified Petroleum Product Reporting System, which was introduced in January 2001. This has improved the quality of production data and reduced reported losses. Further details can be found in paragraph 4.24 in Chapter 4.

1.14 Total final consumption, which includes non-energy use of fuels, in 2009 was 152.7 million tonnes of oil equivalent; this is an 11.0 million tonnes of oil equivalent reduction, 6.7 per cent, on the consumption in 2008. In 2009 the UK economy was in recession, with GDP falling by 4.9 per cent, within which manufacturing output was down by 10.5 per cent. Final energy consumption in 2009 was mainly accounted for by the transport sector (37 per cent), the domestic sector (28.5 per cent), the industrial sector (17.5 per cent), the commercial sector (5.9 per cent) and non-energy use (5.8 per cent). These figures are illustrated in Chart 1.3. Recent trends in industrial consumption are shown in Table 1.8 and are discussed in paragraphs 1.22 to 1.24.

1.15 The main fuels used by final consumers in 2009 were petroleum products (47.5 per cent), natural gas (30.5 per cent) and electricity (18 per cent). Of the petroleum products consumed by final users 11 per cent was for non-energy purposes; for natural gas 1.7 per cent was consumed for non-energy purposes. The amount of heat that was bought for final consumption accounted for 0.9 per cent of the total final energy consumption.

1.16 Non-energy use of fuels includes use as chemical feedstocks and other uses such as lubricants. Non-energy use of fuels for 2009 are shown in Table 1A. Further details of non-energy use are given in Chapter 3, paragraph 3.57 and Chapter 4, paragraph 4.46.

Chart 1.3: Final energy consumption 2009



Total: 152.7 million tonnes of oil equivalent

(1) Includes services and agricultural sectors.
(2) Includes coal, manufactured fuels, biomass etc.

Table 1A: Non-energy use of fuels 2009

Thousand tonnes of oil equivalent

	Petroleum	Natural gas
Petrochemical feedstocks	5,108	722
Other	2,986	-
Total	**8,094**	**772**

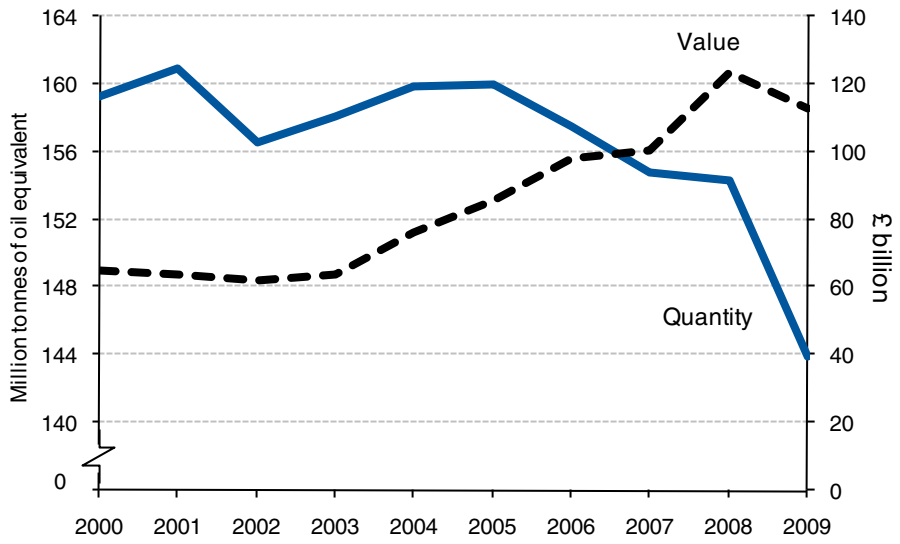
Value balance of traded energy (Tables 1.4, 1.5 and 1.6)

1.17 Tables 1.4 to 1.6 present the value of traded energy in a similar format to the energy balances. The balance shows how the value of inland energy supply is made up from the value of indigenous production, trade, tax and margins (profit and distribution costs). The lower half of the table shows how this value is generated from the final expenditure on energy through transformation processes and other energy sector users as well as from the industrial and domestic sectors. The balances only contain values of energy which is traded, ie where a transparent market price is applicable. Further

technical notes are given in paragraphs 1.26 to 1.60. In keeping with the energy balances, the value balances since 2000 have included data on heat generation and heat sold. Additionally, an estimate of the amount of Climate Change Levy paid is included in Tables 1.4, 1.5 and 1.6. This levy was introduced in April 2001 and is payable by non-domestic final consumers of gas, electricity, coal, coke and LPG.

1.18 Total expenditure by final consumers in 2009 is estimated at £112,970 million, (£112,200 million shown as actual final consumption and £770 million of coal consumed by the iron and steel sector in producing coke for their own consumption). This is down by 8 per cent on 2008, reflecting the reduced energy demand and a fall in energy prices. In 2009, crude oil prices fell back to average just over $60 per barrel, compared to an average price of nearly $100 per barrel in 2008. This fall in prices has fed through to the costs of other energy products, although the impact on electricity prices is more evident in late 2009 and 2010. Chart 1.4 below shows energy consumption and expenditure by final users.

Chart 1.4: Energy consumption and estimated expenditure on energy by final users



1.19 The value balance provides a guide on how the value chain works in the production and consumption of energy. For example, in 2009, £19,075 million of crude oil was indigenously produced, of which £12,205 million was exported, and £15,055 million of crude oil was imported. Allowing for stock changes, this provides a total value of UK inland crude oil supply of £22,040 million. This fuel was then completely consumed within the petroleum industry in the process of producing £28,855 million of petroleum products. Again some external trade and stock changes took place before arriving at a basic value of petroleum products of £26,310 million. In supplying the fuel to final consumers distribution costs were incurred and some profit was made amounting to £3,275 million, whilst duty and tax meant a further £34,340 million was added to the basic price to arrive at the final market value of £63,925 million. This was the value of petroleum products purchased, of which industry purchased £2,230 million, domestic consumers for heating purposes purchased £1,245 million, with the vast majority purchased within the transportation sectors, £57,150 million.

1.20 Of the total final expenditure on energy in 2009 (£112,970 million), the biggest share, 52 per cent, fell to the transport sector. Of the remaining 48 per cent, industry purchased around a quarter or £12,870 million, with the domestic sector purchasing around a half or £29,770 million.

Sales of electricity and gas by sector (Table 1.7)

1.21 Table 1.7 shows broad estimates for the total value of electricity and gas to final consumption. Net selling values provide some indication of typical prices paid in broad sectors and can be of use to supplement more detailed and accurate information contained in the rest of this chapter.

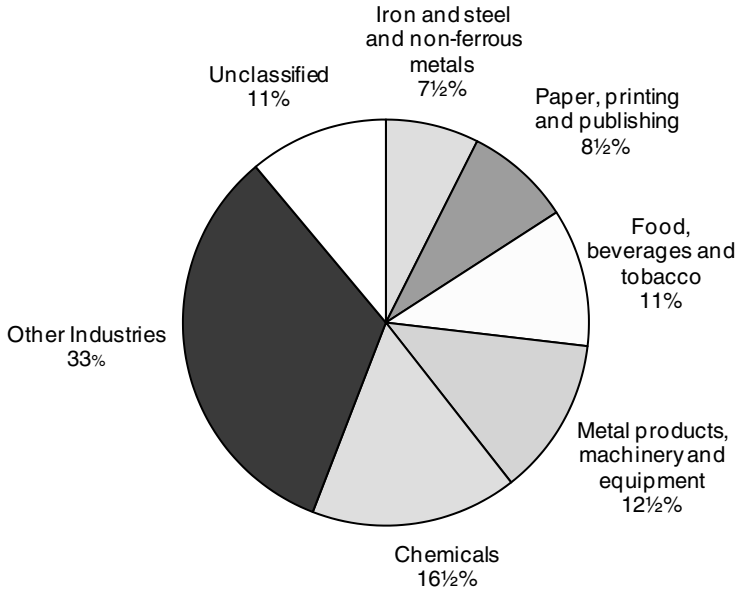
Energy consumption by main industrial groups (Table 1.8)

1.22 This table presents final energy consumption for the main industrial sub-sectors over the last five years.

1.23 So far as is practicable, the user categories have been grouped on the basis of the 2003 Standard Industrial Classification (see paragraphs 1.54 to 1.59). However, some data suppliers have difficulty in classifying consumers to this level of detail and the breakdown presented in these tables must therefore be treated with caution. The groupings used are consistent with those used in Table 1.9 which shows industrial sectors' use of fuels for generation of electricity (autogeneration).

1.24 In 2009, 26.7 million tonnes of oil equivalent were consumed by the main industrial groups. The largest consuming groups were chemicals (16.5 per cent), metal products, machinery and equipment (12.6 per cent), food, beverages and tobacco (11.0 per cent), iron and steel and non-ferrous metals (7.4 per cent), and paper, printing and publishing (8.5 per cent). The figures are illustrated in Chart 1.5.

Chart 1.5: Energy consumption by main industrial groups 2009



Total final energy consumption by industry
26.7 million tonnes of oil equivalent

Fuels consumed for electricity generation by main industrial groups (autogeneration) (Table 1.9)

1.25 This table gives details of the amount of each fuel consumed by industries in order to generate electricity for their own use. Fuel consumption is consistent with the figures given for "other generators" in Table 5.4 of Chapter 5. The term autogeneration is explained further in paragraphs 1.31 and 1.32. Electricity produced via autogeneration is included within the figures for electricity consumed by industrial sectors in Table 1.8. Table 1.9 has been produced using the information currently available and shows the same sector detail as Table 1.8, data cannot be given in as much detail as in the individual commodity balances and the energy balance because it could disclose information about individual companies. Table 1.9 allows users to allocate the fuel used for autogeneration to individual industry groups in place of the electricity consumed. Further information on the way Table 1.9 links with the other tables is given in paragraph 1.32.

Technical notes and definitions

I Units and measurement of energy

Units of measurement

1.26 The original units of measurement appropriate to each fuel are used in the individual fuel chapters. A common unit of measurement, the tonne of oil equivalent (toe), which enables different fuels to be compared and aggregated, is used in Chapter 1. In common with the International Energy Agency and with the Statistical Office of the European Communities, the tonne of oil equivalent is defined as follows:

1 tonne of oil equivalent = 10^7 kilocalories
= 396.83 therms
= 41.868 Gigajoules (GJ)
= 11,630 Kilowatt hours (kWh)

1.27 This unit should be regarded as a measure of energy content rather than a physical quantity. One tonne of oil is not equal to one tonne of oil equivalent.

Thermal content - energy supplied basis of measurement

1.28 Tables 1.1 to 1.3, 1.8 and 1.1.1 to 1.1.5 (available on DECC's energy statistics site at www.decc.gov.uk/en/content/cms/statistics/source/total/total.aspx) are compiled on an energy-supplied basis. Detailed data for individual fuels are converted from original units to tonnes of oil equivalent using gross calorific values and conversion factors appropriate to each category of fuel. The results are then aggregated according to the categories used in the tables. Gross calorific values represent the total energy content of the fuel, including the energy needed to evaporate the water present in the fuel (see also paragraph 1.52).

1.29 Estimated gross and net calorific values for 2009 are given on page 223. Calorific values are reviewed each year in collaboration with the fuel industries, and figures for earlier years can be found in Table A.2 and A.3 on pages 224 and 225. This year, some revisions have been made to the net calorific values for certain waste and biofuels. To construct energy balances on an energy supplied basis calorific values are required for production, trade, and stocks, as follows:

Coal The weighted average gross calorific value of all indigenous coal consumed is used to derive the thermal content of coal production and undistributed stocks. Thermal contents of imports and exports allow for the quality of coal. Thermal contents of changes in coal stocks at secondary fuel producers are the average calorific values of indigenous coal consumed.

Petroleum Work carried out in 1997 to revise calorific values for petroleum products did not find any recent work on the subject. In the absence of such work, the gross calorific values, included in Annex A, and used in the construction of these energy balances from 1990 onwards have been calculated using a formula derived by the US Bureau of Standards. This formula estimates the gross calorific value of products according to their density as follows:

$Gj = 51.83 - 8.78 \times d^2$, where d is the density of the product in terms of kilograms per litre.

For crude petroleum and refinery losses, the weighted average calorific value for all petroleum products from UK refineries is used. A notional figure of 42.9 GJ per tonne is used for non-energy petroleum products (industrial and white spirits, lubricants, bitumen, petroleum coke, waxes and miscellaneous products).

Gases Although the original unit for gases is the cubic metre, figures for gases are generally presented in the fuel sections of this Digest in gigawatt hours (GWh), having been converted from cubic metres using gross calorific values provided by the industries concerned. Conversion factors between units of energy are given on the flap inside the back cover and on page 221.

Electricity and heat Unlike other fuels, the original unit used to measure electricity and heat is a measure of energy. The figures for electricity and heat can therefore be converted directly to toe using the conversion factors on the flap inside the back cover and on page 221.

Primary electricity Hydro electricity and net imports of electricity are presented in terms of the energy content of the electricity produced (the energy supplied basis). This is consistent with international practice. Primary inputs for nuclear electricity assume the thermal efficiencies at nuclear stations given in Chapter 5, Table 5.10 (39.0 per cent in 2009). (See Chapter 5, paragraphs 5.65 and 5.72).

Non-energy uses of fuel

1.30 Energy use of fuel mainly comprises use for lighting, heating, motive power and power for appliances. Non-energy use includes use as chemical feedstocks, solvents, lubricants and road making material. It should be noted that the amounts of non-energy use of natural gas included in the Digest are approximate. Further discussion of non-energy uses of lubricating oils and petroleum coke appears in Chapter 3, paragraph 3.57.

Autogeneration of electricity

1.31 Autogeneration is defined as the generation of electricity by companies whose main business is not electricity generation, the electricity being produced mainly for that company's own use. Estimated amounts of fuel used for thermal generation of electricity by such companies, the output of electricity and the thermal losses incurred in generation are included within the Transformation sector in the energy balances shown in Tables 1.1 to 1.3. Electricity used in the power generation process by autogenerators is shown within the Energy Industry Use section. Electricity consumed by industry and commerce from its own generation is included as part of Final consumption. This treatment is in line with the practice in international energy statistics.

1.32 Figures on total amount of fuel used and electricity generated by autogenerators, and the amount of electricity for own consumption is shown in Tables 1.9, 5.1, 5.3 to 5.6. Table 1.9 summarises the figures by broad industrial groups. Much of the power generated is from combined heat and power (CHP) plants and data from Chapter 6 are included within Table 1.9. Differences will occur where CHP plants are classified to major power producers, and this mainly affects the chemicals sector. The method of allocating fuel used in CHP plants between electricity production and heat production is described in Chapter 6 paragraphs 6.35 to 6.37. This method can give rise to high implied conversion efficiencies in some sectors, most notably in the iron and steel sector.

Final consumption, deliveries, stock changes

1.33 Figures for final consumption relate to deliveries, if fuels can be stored by users and data on actual consumption are not available. Final consumption of petroleum and solid fuels is on a deliveries basis throughout, except for the use of solid fuels by the iron and steel industry. Figures for domestic use of coal are based on deliveries to merchants. Figures for stock changes in Tables 1.1 to 1.3 cover stocks held by primary and secondary fuel producers, major distributors of petroleum products, and stocks of coke and breeze held by the iron and steel industry; for coal they also include an estimate of volumes in transit. Figures for stock changes in natural gas represent the net amount put into storage by gas companies operating pipelines.

1.34 Figures for final consumption of electricity include sales by the public distribution system and consumption of electricity produced by generators other than the major electricity producing companies. Thus electricity consumption includes that produced by industry and figures for deliveries of other fuels to industry exclude amounts used to generate electricity (except for years prior to 1987, shown in tables giving long term trends).

Heat sold

1.35 Heat sold is defined as heat that is produced and sold under the provision of a contract. The heat sold figures have been derived from two sources covering CHP plants and community heating schemes without CHP plants. Data for heat sold were supplied by CHP plants to the Combined Heat and Power Quality Assurance Programme and were processed by AEA. Data for heat consumption from community heating schemes were derived from the Building Research Establishment's (BRE) 'Nationwide Survey of Community Heating' that was carried out in 1997, a database of community heating schemes in social housing in 2000, and Community Heating Sales Surveys undertaken

between 2003 and 2005. The estimates from these sources have been used to derive heat sold figures since 1999. When information about where the heat was generated was not available from the BRE sources, it was assumed that domestic sector heat consumption was provided by the commercial sector, public sector heat consumption was provided by the public administration and industrial sectors (using proportions derived from CHP statistics) and that industrial sector heat consumption was provided by the industrial sector. The introduction of heat sold into the energy balances has not affected the individual fuel totals, since the energy used to generate the heat has been deducted from the final consumption section of the energy balance and transferred to the transformation section. The figures that are included in the balances should be treated as indicative of the amount of heat sold. Annex J of the Digest, at www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx, shows the quantity of fuel by consuming sector used to produce heat that is subsequently sold.

II Energy balances (Tables 1.1, 1.2 and 1.3)

1.36 Tables 1.1, 1.2 and 1.3 show the energy flows as the primary fuels are processed (or used) and as the consequent secondary fuels are used. The net inputs to transformation are shown in the transformation rows and hence outputs from transformation processes into which primary fuels are input (such as electricity generation, heat generation or petroleum refining) appear as positive figures under the secondary product's heading in the tables. Similarly the net inputs are shown as negative figures under the primary fuel headings.

III Value balances (Tables 1.4, 1.5 and 1.6)

Valuation of energy purchases

1.37 In common with the rest of the chapter, these tables covering energy expenditure follow a balance format. While a user may derive data on a similar basis as that previously published, the balance table allows for more varied use and interpretation of traded energy value data. That said, the table continues to only show values for energy that has to be purchased and therefore does not include estimated values of a sector's internal consumption, such as coal used in the process of coal extraction.

The value balance

1.38 The table balances around **market value of inland consumption**, with the lower half of the table showing the total value of consumption by end users, sub divided into energy sector users and final users both for energy and non-energy use. The top half of the table shows the supply components that go to make up the final market value of inland consumption, namely upstream cost of production, imports, taxes and the margins and costs of delivering and packaging the fuel for the final consumer. The total final consumers' value of energy consumption is represented by the lines 'total non energy sector use' and iron and steel sectors purchases of coal for use in solid fuel manufacture.

1.39 All figures are estimates and have been rounded to the nearest £5 million.

Fuel definitions in value balances

1.40 **Crude oil** includes NGLs (Natural Gas Liquids) and refinery feedstocks. **Natural gas** does not include colliery methane. **Electricity** only includes electricity delivered via the public distribution system and therefore does not value electricity produced and consumed by autogenerators, however the fuels used by autogenerators are included under Transformation. **Manufactured solid fuels** includes coke, breeze and other solid manufactured fuels, mainly products from patent fuel and carbonisation plants. **Other fuels** includes all other fuels not separately listed, where they can be clearly considered as traded and some reasonable valuation can be made. Fuels mainly contributing to this year's values are wood, coke oven and colliery methane gases sold on to other industrial users and some use of waste products such as poultry litter.

Energy end use

1.41 Values represent the cost to the final user including transportation of the fuel. They are derived, except where actual values are available, from the traded element of the volumes presented in aggregate energy balance and end user prices collected from information supplied by users or energy

suppliers. The **energy sector** consists of those industries engaged in the production and sale of energy products, but values are not given for consumption of self-generated fuels eg coke oven gas used by coke producers. Many of the processes in the **iron and steel** industry are considered to be part of the energy sector in the energy balances, but for the purposes of this economic balance their genuine purchases are treated as those of final consumers, except for purchases of coal directly used in coke manufacture, which is shown separately as part of manufacture of solid fuel. Coal used directly in or to heat blast furnaces is shown as iron and steel final use. **Transformation** includes those fuels used directly in producing other fuels eg crude oil in petroleum products. **Electricity generators** keep and use significant stocks of coal, and the stocks used in consumption each year are shown separately. The value and margins for these being assumed to be the same as other coal purchased in the year. **Road transport** includes all motor spirit and DERV use. **Commercial and other users** includes public administration and miscellaneous uses not classified to the industrial sector.

Supply

1.42 The supply side money chain is derived using various methods. **Indigenous production** represents the estimated basic value of in-year sales by the upstream producers. This value is gross of any taxes or cost they must meet. The valuation problems in attributing network losses in gas and electricity between upstream and downstream within this value chain means any costs borne are included in the production value. **Imports and exports** are valued in accordance with data published by HM Revenue and Customs, contained in Annex G (which can be found on the Internet at www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx). However, crude oil is treated differently, where the value is formed from price data taken from a census survey of refiners and volume data taken from Table 3.1. These values are considered to reflect the complete money chain more accurately than Tables G.1 to G.4. **Stock changes** are those for undistributed stocks except for coal where coke oven and generators stocks are included. A stock increase takes money out of the money chain and is therefore represented as a negative. **Distribution costs** are arrived at by removing an estimate of producers' value along with any taxes from the end user values shown. For most fuels, the estimate of producer value is derived from the consumption used for end use and the producer price taken from survey of producers. No sector breakdown is given for gas and electricity margins because it is not possible to accurately measure delivery costs for each sector. **Taxes** include VAT where not refundable and duties paid on downstream sales. Excluded are the gas and fossil fuel levies, petroleum revenue tax and production royalties and licence fees. The proceeds from the fossil fuel levy are redistributed across the electricity industry, whilst the rest are treated as part of the production costs.

Sales of electricity and gas by sector (Table 1.7)

1.43 This table provides data on the total value of gas and electricity sold to final consumers. The data are collected from the energy supply companies. The data are useful in indicating relative total expenditure between sectors, but the quality of data provided in terms of industrial classification has been worsening in recent years. Net selling values provide an indication of typical prices paid in broad sectors.

IV Measurement of energy consumption

Primary fuel input basis

1.44 Energy consumption is usually measured in one of three different ways. The first, known as the primary fuel input basis, assesses the total input of primary fuels and their equivalents. This measure includes energy used or lost in the conversion of primary fuels to secondary fuels (for example in power stations and oil refineries), energy lost in the distribution of fuels (for example in transmission lines) and energy conversion losses by final users. Primary demands as in Table 1.1, 1.2 and 1.3 are on this basis.

Final consumption - energy supplied basis

1.45 The second method, known as the energy supplied basis, measures the energy content of the fuels, both primary and secondary, supplied to final users. Thus it is net of fuel industry own use and conversion, transmission and distribution losses, but it includes conversion losses by final users. Table 1B presents shares of final consumption on this basis. The final consumption figures are presented on this basis throughout Chapter 1.

1.46 Although this is the usual and most direct way to measure final energy consumption, it is also possible to present final consumption on a primary fuel input basis. This can be done by allocating the conversion losses, distribution losses and energy industry use to final users. This approach can be used to compare the total primary fuel use which each sector of the economy accounts for. Table 1C presents shares of final consumption on this basis.

Final consumption - useful energy basis

1.47 Thirdly, final consumption may be expressed in the form of useful energy available after deduction of the losses incurred when final users convert energy supplied into space or process heat, motive power or light. Such losses depend on the type and quality of fuel and the equipment used and on the purpose, conditions, duration and intensity of use. Statistics on useful energy are not sufficiently reliable to be given in this Digest; there is a lack of data on utilisation efficiencies and on the purposes for which fuels are used.

Shares of each fuel in energy supply and demand

1.48 The relative importance of the energy consumption of each sector of the economy depends on the method used to measure consumption. Shares of final consumption on an energy supplied basis (that is in terms of the primary and secondary fuels directly consumed) in 2009 are presented in Table 1B. For comparison, Table 1C presents shares of final consumption on a primary fuel input basis.

Table 1B: Primary and secondary fuels consumed by final users in 2009 – energy supplied basis

	Percentage of each fuel						Percentage of each sector					
	Industry	Transport	Domestic	Others	Total		Solid fuels	Petrol-eum	Gas	Secondary electricity	Bio-mass	Total
Solid fuels	68	-	30	2	100	Industry	7	21	38	33	2	100
Petroleum	8	85	5	2	100	Transport	-	97	-	1	2	100
Gas	21	-	63	16	100	Domestic	2	7	66	24	1	100
Electricity	30	3	38	29	100	Others	-	8	43	48	2	100
Biomass	18	48	22	12	100							
All fuels	**18**	**40**	**31**	**12**	**100**	**All users**	**2**	**45**	**32**	**19**	**1**	**100**

Table 1C: Total primary fuel consumption by final users in 2009 - primary input basis

	Percentage of each fuel						Percentage of each sector					
	Industry	Transport	Domestic	Others	Total		Coal	Petrol-eum	Gas	Primary electricity	Bio-mass	Total
Coal	33	3	37	27	100	Industry	23	14	49	11	3	100
Petroleum	9	83	5	3	100	Transport	1	95	1	1	2	100
Gas	26	1	52	21	100	Domestic	17	6	65	9	3	100
Primary electricity	30	3	38	29	100	Others	24	5	53	14	4	100
Biomass	26	18	32	23	100							
All fuels	**22**	**30**	**32**	**16**	**100**	**All users**	**15**	**34**	**41**	**8**	**3**	**100**

1.49 In 2009, every 1 toe of secondary electricity consumed by final users required, on average, 0.8 toe of coal, 1.0 toe of natural gas, 0.5 toe of primary electricity (nuclear, wind, natural flow hydro and imports) and 0.2 toe of oil and renewables combined. The extent of this primary consumption is hidden in Table 1B, which presents final consumption only in terms of the fuels directly consumed. When all such primary consumption is allocated to final users, as in Table 1C, the relative importance of fuels and sectors changes; the transport sector, which uses very little electricity, declines in importance, whilst the true cost of final consumption in terms of coal use can now be seen.

1.50 Another view comes from shares of users' expenditure on each fuel (Table 1D based on Table 1.4). In this case the importance of fuels which require most handling by the user (solids and liquid fuels) is slightly understated, and the importance of uses taxed at higher rates (transport) is overstated in the "All users" line.

Table 1D: Value of fuels purchased by final users in 2009

	Percentage of each sector						
	Solid fuels	Petroleum	Gas	Secondary electricity	Heat	Biofuels	Total
Industry	9	17	18	55	1	-	100
Transport	-	97	-	1	-	2	100
Domestic	1	4	43	52	-	-	100
Others	-	5	22	73	1	-	100
All users	**1**	**54**	**15**	**28**	**0**	**1**	**100**

Systems of measurement - international statistics

1.51 The systems of energy measurement used in various international statistics differ from the methods of the Digest as follows:

Net calorific values

1.52 Calorific values (thermal contents) used internationally are net rather than gross. The difference between the net and gross thermal content is the amount of energy necessary to evaporate the water present in the fuel or formed during the combustion process. The differences between gross and net values are generally taken to be 5 per cent for liquid and solid fuels (except for coke and coke breeze where there is no difference), 10 per cent for gases (except for blast furnace gas, 1 per cent), 15 per cent for straw, and 16 per cent for poultry litter. The calorific value of wood is highly dependent on its moisture content. In Annex A, the gross calorific value is given as 10 GJ per tonne at 50 per cent moisture content and this rises to 14.5 GJ at 25 per cent moisture content and 19 GJ for dry wood (equivalent to a net calorific value). Both gross and net calorific values are shown in Annex A. DECC and the Iron and Steel Statistics Bureau are currently reviewing the relationship between net and gross calorific values for fuels used by the Iron and Steel industry.

V Definitions of fuels

1.53 The following paragraphs explain what is covered under the terms "primary" and "secondary" fuels.

Primary fuels

Coal - Production comprises all grades of coal, including slurry.

Primary oils - This includes crude oil, natural gas liquids (NGLs) and feedstock.

Natural gas liquids - Natural gas liquids (NGLs) consist of condensates (C_5 or heavier) and petroleum gases other than methane C_1, that is ethane C_2, propane C_3 and butane C_4, obtained from the onshore processing of associated and non-associated gas. These are treated as primary fuels when looking at primary supply but in the consumption data presented in this chapter these fuels are treated as secondary fuels, being transferred from the primary oils column in Tables 1.1, 1.2 and 1.3.

Natural gas - Production relates to associated or non-associated methane C_1 from land and the United Kingdom sector of the Continental Shelf. It includes that used for drilling production and pumping operations, but excludes gas flared or re-injected. It also includes colliery methane piped to the surface and consumed by collieries or others.

Nuclear electricity - Electricity generated by nuclear power stations belonging to the major power producers. See Chapter 5, paragraphs 5.57 to 5.63.

Natural flow hydro-electricity - Electricity generated by natural flow hydroelectric power stations, whether they belong to major power producers or other generators. Pumped storage stations are not included (see under secondary electricity below).

Renewable energy sources - In this chapter figures are presented for renewables and waste in total. Further details, including a detailed breakdown of the commodities and technologies covered are in Chapter 7.

Secondary fuels

Manufactured fuel - This heading includes manufactured solid fuels such as coke and breeze, other manufactured solid fuels, liquids such as benzole and tars and gases such as coke oven gas and blast furnace gas. Further details are given in Chapter 2, Tables 2.4, 2.5 and 2.6.
Coke and breeze – Coke, oven coke and hard coke breeze. Further details are given in Chapter 2, Tables 2.4, 2.5 and 2.6.
Other manufactured solid fuels – Manufactured solid fuels produced at low temperature carbonisation plants and other manufactured fuel and briquetting plants. Further details are given in Chapter 2, Tables 2.4, 2.5 and 2.6.
Coke oven gas - Gas produced at coke ovens, excluding low temperature carbonisation plants. Gas bled or burnt to waste is included in production and losses. Further details are given in Chapter 2, Tables 2.4, 2.5 and 2.6.
Blast furnace gas - Blast furnace gas is mainly produced and consumed within the iron and steel industry. Further details are given in Chapter 2, Tables 2.4, 2.5 and 2.6.
Petroleum products - Petroleum products produced mainly at refineries, together with inland deliveries of natural gas liquids.
Secondary electricity - Secondary electricity is that generated by the combustion of another fuel, usually coal, natural gas, biofuels or oil. The figure for outputs from transformation in the electricity column of Tables 1.1, 1.2 and 1.3 is the total of primary and secondary electricity, and the subsequent analysis of consumption is based on this total.
Heat sold – Heat sold is heat that is produced and sold under the provision of a contract.

VI Classification of consumers

1.54 The Digest has been prepared, as far as is practicable, on the basis of the *Standard Industrial Classification (SIC)2003* (www.statistics.gov.uk/about/data/classifications/default.asp). SIC(2003) replaced SIC(1992) on 1 January 2003. SIC(1992) had been the basis of the industrial classification of energy statistics since 1995. Between 1986 and 1994 data in the Digest were prepared on the basis of the previous classification, SIC(1980). The changes in classification between SIC(1992) and SIC(2003) are mainly in the very detailed classifications at the four or five digit level. As such the classifications used for energy statistics are unaffected by these changes. However, not all consumption/disposals data are on this new basis, and where they are, there are sometimes constraints on the detail available. In particular the sectoral breakdown in the petroleum chapter is based on data that continue to be classified according to SIC (1968) by the oil industry. The main differences between the 1968 SIC (which was used as the basis for most data published for years prior to 1984) and the 1980 SIC were described in the 1986 and 1987 issues of the Digest. The differences between SIC 1980 and SIC 1992 are relatively minor. At the time of the change from the 1980 SIC to the 1992 SIC the main difference was that under the former showrooms belonging to the fuel supply industries were classified to the energy sector, whilst in the latter they are in the commercial sector. Since privatisation few gas, coal and electricity companies have retained showrooms and the difference is therefore minimal.

1.55 The 2011 edition of the Digest will be produced based upon the revised SIC (2007) classification system. In itself, this is unlikely to lead to major revisions, as most changes will be made at the more detailed levels of classification, rather than at the higher levels presented in the Digest.

1.56 Table 1E shows the categories of consumers together with their codes in SIC 2003. The coverage varies between tables (eg in some instances the 'other' category is split into major constituents, whereas elsewhere it may include transport). This is because the coverage is dictated by what data suppliers can provide. The table also shows the disaggregation available within industry. This disaggregation forms the basis of virtually all the tables that show a disaggregated industrial breakdown.

Table 1E: SIC 2003 classifications

Fuel producers	10-12, 23, 40
Final consumers:	
Industrial	
Unclassified	See paragraph 1.56
Iron and steel	27, *excluding 27.4*, 27.53, 27.54
Non-ferrous metals	27.4, 27.53, 27.54
Mineral products	14, 26
Chemicals	24
Mechanical engineering and metal products	28, 29
Electrical and instrument engineering	30-33
Vehicles	34, 35
Food, beverages & tobacco	15, 16
Textiles, clothing, leather, & footwear	17-19
Paper, printing & publishing	21, 22
Other industries	13, 20, 25, 36, 37, 41
Construction	45
Transport, storage and communications	60-63
Other final users	
Domestic	Not covered by SIC 2003.
Public administration	75, 80, 85
Commercial	50-52, 55, 64-67, 70-74
Agriculture	01, 02, 05
Miscellaneous	90-93, 99

1.57 There is also an 'unclassified' category in the industry sector (see Table 1E). In cases where the data supplier has been unable to allocate an amount between categories, but the Department of Energy and Climate Change has additional information, from other data sources, with which to allocate between categories, then this has been done. Where such additional information is not available the data are included in the 'unclassified' category, enabling the reader to decide whether to accept a residual, pro-rate, or otherwise adjust the figures. The 'miscellaneous' category also contains some unallocated figures for the services sector.

1.58 In Tables 6.8 and 6.9 of Chapter 6 the following abbreviated grouping of industries, based on SIC 2003, is used in order to prevent disclosure of information about individual companies.

Table 1F: Abbreviated grouping of Industry

Iron and steel and non-ferrous metal	27
Chemicals	24
Oil refineries	23.2
Paper, printing and publishing	21, 22
Food, beverages and tobacco	15, 16
Metal products, machinery and equipment	28, 29, 30, 31, 32, 34, 35
Mineral products, extraction, mining and agglomeration of solid fuels	10, 11, 14, 26
Sewage Treatment	(parts of 41 and 90)
Electricity supply	40.1
Other industrial branches	12, 13, 17, 18, 19, 20, 23.1, 23.3, 25, 33, 36, 37, 40.2, 41 (remainder) 45
Transport, commerce, and administration	1, 2, 5, 50 to 99 (except 90 and 92)
Other	40.3, 90 (remainder), 92

1.59 In Tables 1.8 and 1.9 the list above is further condensed and includes only manufacturing industry and construction as follows.

Table 1G: Abbreviated grouping of Industry for Tables 1.8 and 1.9

Iron and steel and non-ferrous metals	27
Chemicals	24
Paper, printing and publishing	21, 22
Food, beverages and tobacco	15, 16
Metal products, machinery and equipment	28, 29, 30, 31, 32, 34, 35
Other (including construction)	12, 13, 14, 17, 18, 19, 20, 23.1, 23.3, 25, 26, 33, 36, 37, 45

VII Monthly and quarterly data

1.60 Monthly and quarterly data on energy production and consumption (including on a seasonally adjusted and temperature corrected basis) split by fuel type are provided on the DECC website at www.decc.gov.uk/en/content/cms/statistics/source/total/total.aspx. Quarterly figures are also published in DECC's quarterly statistical bulletin *Energy Trends* and *Quarterly Energy Prices*. See Annex C for more information about these bulletins.

VIII Statistical differences

1.61 Tables 1.1 to 1.3 each contain a statistical difference term covering the difference between recorded supply and recorded demand. These statistical differences arise for a number of reasons. The data within each table are taken from varied sources, as described above and in later chapters, for example producers, intermediate consumers (such as electricity generators), final consumers and HM Revenue and Customs. Also, some of the figures are estimated either because data in the required detail are not readily available within the industry or because the methods of collecting the data do not cover the smallest members of the industry. Typically, the supply of fuels is easier to measure than demand, and thus greater reliance can be made of these numbers.

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1.1 Aggregate energy balance 2009

Thousand tonnes of oil equivalent

	Coal	Manufactured fuel *(1)*	Primary oils	Petroleum products	Natural gas *(2)*	Renewable & waste *(3)*	Primary electricity	Electricity	Heat	Total
Supply										
Indigenous production	11,026	-	74,739	-	59,720	4,928	16,484	-	-	166,895
Imports	24,682	127	59,351	24,502	39,191	1,203	-	568	-	149,625
Exports	-470	-122	-49,452	-28,029	-11,788	-	-	-322	-	-90,184
Marine bunkers	-	-	-	-2,621	-	-	-	-	-	-2,621
Stock change *(4)*	-4,234	-10	593	366	-419	-	-	-	-	-3,704
Primary supply	**31,004**	**-5**	**85,232**	**-5,782**	**86,703**	**6,131**	**16,484**	**246**	**-**	**220,012**
Statistical difference *(5)*	-120	-4	+59	+55	+27	-	-	-16	-	+1
Primary demand	**31,124**	**-1**	**85,173**	**-5,837**	**86,675**	**6,131**	**16,484**	**262**	**-**	**220,011**
Transfers	-	-63	-3,057	+3,090	-30	-	-1,254	+1,254	-	-61
Transformation	**-29,427**	**1,622**	**-82,116**	**80,081**	**-32,752**	**-4,016**	**-15,229**	**30,730**	**1,439**	**-49,668**
Electricity generation	-24,678	-772	-	-1,560	-30,626	-4,016	-15,229	30,730	-	-46,152
Major power producers	-23,807	-	-	-1,069	-28,011	-695	-15,229	28,081	-	-40,730
Autogenerators	-872	-772	-	-491	-2,615	-3,322	-	2,649	-	-5,422
Heat generation	-286	-51	-	-59	-2,125	-	-	-	1,439	-1,083
Petroleum refineries	-	-	-82,116	81,868	-	-	-	-	-	-248
Coke manufacture	-3,595	3,446	-	-	-	-	-	-	-	-150
Blast furnaces	-620	-1,236	-	-168	-	-	-	-	-	-2,024
Patent fuel manufacture	-247	236	-	-	-	-	-	-	-	-11
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**706**	**-**	**4,795**	**5,939**	**-**	**-**	**2,210**	**93**	**13,747**
Electricity generation	-	-	-	-	-	-	-	1,417	-	1,417
Oil and gas extraction	-	-	-	-	5,255	-	-	52	-	5,307
Petroleum refineries	-	-	-	4,795	337	-	-	374	93	5,599
Coal extraction	3	-	-	-	8	-	-	79	-	90
Coke manufacture	-	381	-	-	-	-	-	8	-	389
Blast furnaces	-	325	-	-	39	-	-	40	-	404
Patent fuel manufacture	-	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	100	-	100
Other	-	-	-	-	301	-	-	142	-	443
Losses	**-**	**70**	**-**	**-**	**1,406**	**-**	**-**	**2,314**	**-**	**3,790**
Final consumption	**1,694**	**782**	**-**	**72,538**	**46,548**	**2,115**	**-**	**27,723**	**1,346**	**152,746**
Industry	**1,113**	**565**	**-**	**5,434**	**9,841**	**387**	**-**	**8,433**	**898**	**26,671**
Unclassified	-	206	-	2,359	2	387	-	-	-	2,955
Iron and steel	1	359	-	54	433	-	-	310	-	1,157
Non-ferrous metals	17	-	-	45	213	-	-	548	-	822
Mineral products	710	-	-	184	1,293	-	-	601	-	2,789
Chemicals	59	-	-	156	2,213	-	-	1,478	482	4,388
Mechanical engineering etc	10	-	-	88	555	-	-	636	-	1,289
Electrical engineering etc	3	-	-	41	279	-	-	547	-	871
Vehicles	32	-	-	103	620	-	-	434	-	1,190
Food, beverages etc	26	-	-	260	1,725	-	-	917	1	2,929
Textiles, leather etc	49	-	-	92	444	-	-	248	-	832
Paper, printing etc	71	-	-	61	1,191	-	-	931	-	2,254
Other industries	130	-	-	1,852	691	-	-	1,656	415	4,744
Construction	3	-	-	139	180	-	-	127	-	450
Transport *(6)*	7	-	-	**54,743**	-	**1,009**	-	**754**	-	**56,512**
Air	-	-	-	12,730	-	-	-	-	-	12,730
Rail	7	-	-	747	-	-	-	754	-	1,507
Road	-	-	-	39,696	-	1,009	-	-	-	40,704
National navigation	-	-	-	1,570	-	-	-	-	-	1,570
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**574**	**217**	**-**	**4,267**	**35,935**	**719**	**-**	**18,536**	**449**	**60,697**
Domestic	521	217	-	3,013	28,790	460	-	10,537	52	43,590
Public administration	17	-	-	373	3,181	114	-	1,640	388	5,712
Commercial	35	-	-	361	2,513	9	-	6,035	9	8,962
Agriculture	-	-	-	291	158	136	-	324	-	909
Miscellaneous	2	-	-	228	1,292	-	-	-	-	1,522
Non energy use	**-**	**-**	**-**	**8,094**	**772**	**-**	**-**	**-**	**-**	**8,866**

(1) Includes all manufactured solid fuels, benzole, tars, coke oven gas and blast furnace gas.
(2) Includes colliery methane.
(3) Includes geothermal and solar heat.
(4) Stock fall (+), stock rise (-).
(5) Primary supply minus primary demand.
(6) See paragraphs 5.10 regarding electricity use in transport and 7.26 regarding renewables use in transport.

1.2 Aggregate energy balance 2008

Thousand tonnes of oil equivalent

	Coal	Manufactured fuel *(1)*	Primary oils	Petroleum products	Natural gas *(2)*	Renewable & waste *(3)*	Primary electricity	Electricity	Heat	Total
Supply										
Indigenous production	11,284r	-	78,580	-	69,665r	4,463r	12,965	-	-	176,958r
Imports	28,410r	500	65,575r	26,250r	35,000	948	-	1,057	-	157,740r
Exports	-457	-142	-52,984r	-31,310r	-10,548	-	-	-109	-	-95,550r
Marine bunkers	-	-	-	-2,733	-	-	-	-	-	-2,733
Stock change *(4)*	-1,972r	156	259r	163r	-265	-	-	-	-	-1,660r
Primary supply	**37,265r**	**514**	**91,430r**	**-7,631r**	**93,853r**	**5,411r**	**12,965**	**948**	**-**	**234,755r**
Statistical difference *(5)*	-162r	-8r	+196r	-179r	+12r	-	-	+26r	-	-115r
Primary demand	**37,426r**	**522r**	**91,235r**	**-7,452r**	**93,841r**	**5,411r**	**12,965**	**922r**	**-**	**234,870r**
Transfers	-	-126	-3,098r	+3,105r	-6	-	-1,056	+1,056	-	-125
Transformation	**-35,639r**	**1,671r**	**-88,136r**	**85,814r**	**-34,582r**	**-3,531r**	**-11,909**	**32,012r**	**1,529r**	**-52,773r**
Electricity generation	-29,944r	-858	-	-1,750r	-32,400r	-3,531r	-11,909	32,012r	-	-48,381r
Major power producers	-28,972r	-	-	-1,260r	-29,618r	-750	-11,909	29,374	-	-43,135r
Autogenerators	-971r	-858	-	-490r	-2,782r	-2,782r	-	2,638r	-	-5,246r
Heat generation	-312r	-51	-	-60	-2,182r	-	-	-	1,529r	-1,077r
Petroleum refineries	-	-	-88,136r	87,841r	-	-	-	-	-	-295r
Coke manufacture	-4,280	4,064r	-	-	-	-	-	-	-	-217r
Blast furnaces	-852	-1,718	-	-217	-	-	-	-	-	-2,787
Patent fuel manufacture	-251r	235	-	-	-	-	-	-	-	-16r
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**4**	**849r**	**-**	**5,036r**	**6,215r**	**-**	**-**	**2,221r**	**72r**	**14,396r**
Electricity generation	**-**	**-**	-	-	-	-	-	1,399r	-	1,399r
Oil and gas extraction	**-**	**-**	-	-	5,270	-	-	51	-	5,322
Petroleum refineries	**-**	**-**	-	5,036r	427r	-	-	374r	72r	5,909r
Coal extraction	4	**-**	-	**-**	8	-	-	84	-	96
Coke manufacture	-	429	-	**-**	-	-	-	7	-	436
Blast furnaces	-	420	-	**-**	62	-	-	39	-	521
Patent fuel manufacture	-	-	-	**-**	**-**	-	-	-	-	-
Pumped storage	-	-	-	**-**	**-**	-	-	110	-	110
Other	-	-	-	**-**	447	-	-	156r	-	604r
Losses	**-**	**236**	**-**	**-**	**1,173r**	**-**	**-**	**2,375r**	**-**	**3,784r**
Final consumption	**1,783r**	**982**	**-**	**76,432r**	**51,864r**	**1,880r**	**-**	**29,394r**	**1,457r**	**163,792r**
Industry	**1,239r**	**744r**	**-**	**5,984r**	**11,928r**	**391r**	**-**	**9,398r**	**1,011r**	**30,694r**
Unclassified	-	239r	-	2,426	3	391r	-	-	-	3,058r
Iron and steel	1	505r	-	62r	595r	-	-	401r	-	1,564r
Non-ferrous metals	20	-	-	47	257r	-	-	610r	-	934r
Mineral products	759	-	-	223r	1,579r	-	-	656r	-	3,217r
Chemicals	65r	-	-	176	2,681r	-	-	1,633r	592r	5,147r
Mechanical engineering etc	10	-	-	98	662r	-	-	698r	4r	1,472r
Electrical engineering etc	4	-	-	47	335	-	-	601r	-	987r
Vehicles	34	-	-	116	741r	-	-	474r	-	1,364r
Food, beverages etc	20r	-	-	293r	2,095r	-	-	1,002r	8r	3,417r
Textiles, leather etc	53	-	-	104	524r	-	-	274	-r	956
Paper, printing etc	105r	-	-	65	1,427r	-	-	1,028r	1	2,627r
Other industries	142r	-	-	2,168r	815r	-	-	1,874r	406r	5,404r
Construction	27r	-	-	159	213r	-	-	148r	**-**	547r
Transport *(6)*	5r	**-**	**-**	**57,268**	**-**	**821**	**-**	**779r**	**-**	**58,874r**
Air	**-**	**-**	**-**	13,426	-	-	**-**	**-**	**-**	13,426
Rail	5r	**-**	**-**	747	-	-	**-**	779r	**-**	1,531r
Road	**-**	**-**	**-**	41,331	-	821	**-**	**-**	**-**	42,152
National navigation	**-**	**-**	**-**	1,764	-	-	**-**	**-**	**-**	1,764
Pipelines	**-**	**-**	**-**	-	-	-	**-**	**-**	**-**	-
Other	**540r**	**238r**	**-**	**4,454**	**39,139r**	**668r**	**-**	**19,216r**	**446r**	**64,702r**
Domestic	515	238r	**-**	3,033	30,916r	430	**-**	10,818r	52	46,003r
Public administration	9r	-	-	472	3,660r	92r	**-**	1,724r	386r	6,344r
Commercial	7r	-	-	402	2,868r	11	**-**	6,325r	8r	9,620r
Agriculture	7r	-	-	305	186	134r	**-**	350	-	981r
Miscellaneous	1r	-	-	243	1,509r	-	-	-	-	1,753r
Non energy use				**8,725r**	**797**					**9,522r**

(1) Includes all manufactured solid fuels, benzole, tars, coke oven gas and blast furnace gas.
(2) Includes colliery methane.
(3) Includes geothermal and solar heat.
(4) Stock fall (+), stock rise (-).
(5) Primary supply minus primary demand.
(6) See paragraphs 5.10 regarding electricity use in transport and 7.26 regarding renewables use in transport.

1.3 Aggregate energy balance 2007

Thousand tonnes of oil equivalent

	Coal	Manufactured fuel *(1)*	Primary oils	Petroleum products	Natural gas *(2)*	Renewable & waste *(3)*	Primary electricity	Electricity	Heat	Total
Supply										
Indigenous production	10,696	-	83,912	-	72,125	4,371r	14,928	-	-	186,031r
Imports	28,195r	733	62,611	27,501	29,065	378	-	741	-	149,223r
Exports	-419	-170	-55,754	-32,710	-10,590	-34	-	-292	-	-99,969
Marine bunkers	-	-	-	-2,513	-	-	-	-	-	-2,513
Stock change *(4)*	1,947r	-22	856	1,175r	471	-	-	-	-	4,428r
Primary supply	**40,420r**	**541**	**91,625**	**-6,546r**	**91,071**	**4,715r**	**14,928**	**448**	**-**	**237,202r**
Statistical difference *(5)*	+12r	-13	+3r	-197r	+16r	-	-	+32r	-	-147r
Primary demand	**40,408r**	**554**	**91,622r**	**-6,350r**	**91,055r**	**4,715r**	**14,928**	**416r**	**-**	**237,348r**
Transfers	-	-126	-2,670r	+2,693r	-7	-	-892	+892	-	-109r
Transformation	**-38,617r**	**1,703r**	**-88,952r**	**87,351r**	**-32,633r**	**-3,483r**	**-14,036**	**32,897r**	**1,406r**	**-54,364r**
Electricity generation	-32,904r	-961r	-	-1,182r	-30,600r	-3,483r	-14,036	32,897r	-	-50,268r
Major power producers	-31,975	-	-	-719r	-27,501r	-625	-14,036	30,081	-	-44,775r
Autogenerators	-929r	-961r	-	-463r	-3,099r	-2,858r	-	2,817r	-	-5,493r
Heat generation	-304r	-51	-	-61r	-2,033r	-	-	-	1,406r	-1,043r
Petroleum refineries	-	-	-88,952r	88,803r	-	-	-	-	-	-149r
Coke manufacture	-4,319	4,171r	-	-	-	-	-	-	-	-147r
Blast furnaces	-904	-1,633	-	-210	-	-	-	-	-	-2,747
Patent fuel manufacture	-186r	176	-	-	-	-	-	-	-	-9r
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3r**	**881**	**-**	**4,922r**	**6,537r**	**-**	**-**	**2,467r**	**68r**	**14,879r**
Electricity generation	-	-	-	-	-	-	-	1,521r	-	1,521r
Oil and gas extraction	-	-	-	-	5,523	-	-	48	-	5,571
Petroleum refineries	-	-	-	4,922r	448r	-	-	484r	68r	5,922r
Coal extraction	3r	-	-	-	8	-	-	85	-	96
Coke manufacture	-	424	-	-	-	-	-	8	-	432
Blast furnaces	-	458	-	-	62	-	-	41	-	561
Patent fuel manufacture	-	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	104	-	104
Other	-	-	-	-	497	-	-	176r	-	673r
Losses	**-**	**216**	**-**	**-**	**1,038**	**-**	**-**	**2,276**	**-**	**3,531r**
Final consumption	**1,788r**	**1,032r**	**-**	**78,772r**	**50,840r**	**1,233r**	**-**	**29,462r**	**1,338r**	**164,465r**
Industry	**1,279r**	**839r**	**-**	**6,475r**	**11,466r**	**276**	**-**	**9,805r**	**896r**	**31,037r**
Unclassified	-	239r	-	2,641r	3	276	-	-	-	3,159r
Iron and steel	54r	600r	-	67r	630r	-	-	423	-	1,775r
Non-ferrous metals	22	-	-	48	246r	-	-	635r	-	952r
Mineral products	759	-	-	239r	1,451r	-	-	672r	-	3,121r
Chemicals	76r	-	-	192	2,592r	-	-	1,737r	480r	5,076r
Mechanical engineering etc	7	-	-	107	659r	-	-	727r	3r	1,504r
Electrical engineering etc	4	-	-	36	321r	-	-	627	-	987r
Vehicles	35	-	-	123	734r	-	-	492r	-	1,383r
Food, beverages etc	30r	-	-	283r	1,975r	-	-	1,039r	2r	3,329r
Textiles, leather etc	52	-	-	119	523r	-	-	288	-	981r
Paper, printing etc	101	-	-	65	1,334r	-	-	1,096r	1	2,596r
Other industries	139	-	-	2,386r	794r	-	-	1,916r	411	5,645r
Construction	-	-	-	169	204r	-	-	155r	-	528r
Transport *(6)*	**3r**	**-**	**-**	**59,071**	**-**	**362**	**-**	**740r**	**-**	**60,175r**
Air	-	-	-	13,906	-	-	-	-	-	13,906
Rail	3r	-	-	700	-	-	-	740r	-	1,443r
Road	-	-	-	42,846	-	362	-	-	-	43,208
National navigation	-	-	-	1,618	-	-	-	-	-	1,618
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**506r**	**193**	**-**	**4,377**	**38,495r**	**594r**	**-**	**18,917r**	**442r**	**63,524r**
Domestic	487	193	-	2,877	30,341r	400	-	10,555r	52	44,905r
Public administration	10r	-	-	487	3,650r	90r	-	1,727r	383r	6,347r
Commercial	4	-	-	409	2,846r	19	-	6,280r	7r	9,565r
Agriculture	3	-	-	294	172	85r	-	355	-	909
Miscellaneous	2r	-	-	310	1,486r	-	-	-	-	1,799
Non energy use	-	-	-	**8,849r**	**879**	-	-	-	-	**9,728r**

(1) Includes all manufactured solid fuels, benzole, tars, coke oven gas and blast furnace gas.
(2) Includes colliery methane.
(3) Includes geothermal and solar heat.
(4) Stock fall (+), stock rise (-).
(5) Primary supply minus primary demand.
(6) See paragraphs 5.10 regarding electricity use in transport and 7.26 regarding renewables use in transport.

1.4 Value balance of traded energy in 2009[(1)]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	545	200	19,075	28,855	7,570	13,210	250	245	69,950
Imports	2,710	35	15,055	9,470	4,775	260	-	340	32,640
Exports	-75	-30	-12,205	-11,350	-1,220	-160	-	-	-25,040
Marine bunkers	-	-	-	-750	-	-	-	-	-750
Stock change	-295	15	115	90	-5	-	-	-	-80
Basic value of inland consumption	**2,885**	**215**	**22,040**	**26,310**	**11,120**	**13,310**	**250**	**585**	**76,715**
Tax and margins									
Distribution costs and margins	**620**	**30**	**-**	**3,275**	**10,885**	**16,975**	**-**	**70**	**31,860**
Electricity generation	255	-	-	30	-	-	-	-	280
Solid fuel manufacture	200	-	-	-	-	-	-	-	200
of which iron & steel sector	175	-		-	-	-	-	-	175
Iron & steel final use	30	5		35	-	-	-	-	75
Other industry	-	10	-	500	-	-	-	-	510
Air transport	-	-	-	235	-	-	-	-	235
Rail and national navigation	-	-	-	80	-	-	-	-	80
Road transport	-	-	-	1,795	-	-	-	70	1,865
Domestic	135	10	-	225	-	-	-	-	370
Agriculture	-	-	-	15	-	-	-	-	15
Commercial and other services	-	-	-	50	-	-	-	-	50
Non energy use	-	-	-	315	170	-	-	-	485
VAT and duties	**10**	**5**	**-**	**34,340**	**605**	**735**	**-**	**900**	**36,595**
Electricity generation	-	-	-	75	-	-	-	-	75
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	330	-	-	-	-	330
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	250	-	-	-	-	250
Road transport	-	-	-	33,470	-	-	-	895	34,370
Domestic	10	5	-	75	605	735	-	-	1,435
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	105	-	-	-	-	105
Climate Change Levy	**5**	**-**			**170**	**530**			**705**
Total tax and margins	**635**	**35**	**-**	**37,615**	**11,660**	**18,240**	**-**	**970**	**69,155**
Market value of inland consumption	**3,525**	**250**	**22,040**	**63,925**	**22,780**	**31,550**	**160**	**1,555**	**145,780**
Energy end use									
Total energy sector	**3,030**	**-**	**22,040**	**345**	**5,130**	**390**	**-**	**80**	**31,020**
Transformation	3,030	-	22,040	345	5,025	-	-	80	30,525
Electricity generation	2,125	-	-	330	4,990	-	-	80	7,530
of which from stocks	45	-	-	-	-	-	-	-	45
Heat Generation	25	-	-	15	35	-	-	-	75
Petroleum refineries	-	-	22,040	-	-	-	-	-	22,040
Solid fuel manufacture	880	-	-	-	-	-	-	-	880
of which iron & steel sector	770	-	-	-	-	-	-	-	770
Other energy sector use	**-**	**-**	**-**	**-**	**105**	**390**	**-**	**-**	**495**
Oil & gas extraction	-	-	-	-	-	45	-	-	45
Petroleum refineries	-	-	-	-	55	275	-	-	330
Coal extraction	-	-	-	-	-	70	-	-	70
Other energy sector	-	-	-	-	50	-	-	-	50
Total non energy sector use	**495**	**250**	**-**	**61,190**	**17,480**	**31,155**	**160**	**1,475**	**112,200**
Industry	**250**	**140**	**-**	**2,230**	**2,340**	**7,035**	**85**	**25**	**12,100**
Iron & steel final use	140	120	-	80	95	135	-	-	575
Other industry	105	20	-	2,145	2,245	6,900	85	25	11,525
Transport	**-**	**-**	**-**	**57,150**	**-**	**635**	**-**	**1,400**	**59,185**
Air	-	-	-	4,420	-	-	-	-	4,420
Rail and national navigation	-	-	-	990	-	635	-	-	1,625
Road	-	-	-	51,745	-	-	-	1,400	53,145
Other final users	**245**	**105**	**-**	**1,810**	**15,140**	**23,485**	**75**	**50**	**40,915**
Domestic	240	105	-	1,245	12,720	15,395	10	50	29,770
Agriculture	-	-	-	125	65	430	-	-	620
Commercial and other services	5	-	-	440	2,355	7,655	65	-	10,525
Total value of energy end use	**3,525**	**250**	**22,040**	**61,535**	**22,610**	**31,550**	**160**	**1,555**	**143,220**
Value of non energy end use	**-**	**-**	**-**	**2,390**	**170**	**-**	**-**	**-**	**2,560**
Market value of inland consumption	**3,525**	**250**	**22,040**	**63,925**	**22,780**	**31,550**	**160**	**1,555**	**145,780**

(1) For further information see paragraphs 1.37 to 1.43.

1.5 Value balance of traded energy in 2008[(1)]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	915r	115r	26,630	39,855r	9,715r	10,090r	420r	310	88,045r
Imports	3,015	165	21,720	13,255r	6,425r	485	-	300	45,365r
Exports	-55	-30	-17,065r	-14,735r	-1,945r	-110	-	-	-33,945r
Marine bunkers	-	-	-	-900	-	-	-	-	-900
Stock change	-160r	-10	105	15r	-5	-	-	-	-55r
Basic value of inland consumption	**3,715r**	**235**	**31,385**	**37,490r**	**14,190r**	**10,465r**	**420r**	**610**	**98,510r**
Tax and margins									
Distribution costs and margins	**690r**	**30**	**-**	**3,520r**	**9,090r**	**19,955r**	**-**	**65**	**33,350r**
Electricity generation	360	-	-	30r	-	-	-	-	385
Solid fuel manufacture	190	-	-	-	-	-	-	-	190
of which iron & steel sector	170	-	-	-	-	-	-	-	170
Iron & steel final use	35	10	-	15r	-	-	-	-	60r
Other industry	5r	10	-	485r	-	-	-	-	495r
Air transport	-	-	-	120	-	-	-	-	120
Rail and national navigation	-	-	-	30	-	-	-	-	30
Road transport	-	-	-	2,095	-	-	-	65	2,155r
Domestic	100r	10	-	325	-	-	-	-	440r
Agriculture	-	-	-	15	-	-	-	-	15
Commercial and other services	-	-	-	65	-	-	-	-	65
Non energy use	-	-	-	340r	195	-	-	-	535r
VAT and duties	**10**	**5**	**-**	**33,610r**	**580r**	**710r**	**-**	**740**	**35,655r**
Electricity generation	-	-	-	90r	-	-	-	-	90r
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	360r	-	-	-	-	360r
Air transport	-	-	-	15	-	-	-	-	15
Rail and national navigation	-	-	-	250	-	-	-	-	250
Road transport	-	-	-	32,665	-	-	-	740	33,405r
Domestic	10	5	-	100	580r	710r	-	-	1,405r
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	115	-	-	-	-	115
Climate Change Levy	**5**	**-**	-	-	**180**	**540**	-	-	**730**
Total tax and margins	**705r**	**35r**	**-**	**37,130r**	**9,850r**	**21,205r**	**-**	**805**	**69,730r**
Market value of inland consumption	**4,420r**	**270r**	**31,385**	**74,625r**	**24,040r**	**31,670r**	**285r**	**1,415**	**168,105r**
Energy end use									
Total energy sector	**3,950r**	**-**	**31,385**	**420r**	**6,395r**	**360**	**-**	**70**	**42,580r**
Transformation	3,950r	-	31,385	420r	6,230r	-	-	70	42,055r
Electricity generation	3,080	-	-	405r	6,190r	-	-	70	9,745r
of which from stocks	70	-	-	-	-	-	-	-	70
Heat Generation	35r	-	-	20	40r	-	-	-	90r
Petroleum refineries	-	-	31,385	-	-	-	-	-	31,385
Solid fuel manufacture	835r	-	-	-	-	-	-	-	835r
of which iron & steel sector	740	-	-	-	-	-	-	-	740
Other energy sector use	**-**	**-**	**-**	**-**	**165r**	**360**	**-**	**-**	**525r**
Oil & gas extraction	-	-	-	-	-	45	-	-	45
Petroleum refineries	-	-	-	-	80r	240	-	-	320r
Coal extraction	-	-	-	-	-	75	-	-	75
Other energy sector	-	-	-	-	85r	-	-	-	85r
Total non energy sector use	**475r**	**270r**	**-**	**71,395r**	**17,450r**	**31,310r**	**285r**	**1,345**	**122,525r**
Industry	**275r**	**170r**	**-**	**2,960r**	**2,945r**	**8,305r**	**160r**	**30**	**14,845r**
Iron & steel final use	155	145r	-	95r	155r	185r	-	-	730
Other industry	115	25	-	2,865r	2,790r	8,125r	160r	30	14,115r
Transport	**-**	**-**	**-**	**65,965r**	**-**	**585**	**-**	**1,260**	**67,810r**
Air	-	-	-	7,595	-	-	-	-	7,595
Rail and national navigation	-	-	-	1,255	-	585	-	-	1,840
Road	-	-	-	57,115r	-	-	-	1,260	58,375r
Other final users	**200r**	**100**	**-**	**2,470**	**14,505r**	**22,420r**	**120**	**50**	**39,870r**
Domestic	200r	100	-	1,695	12,220r	14,885r	15	50	29,165r
Agriculture	-	-	-	145	65	415	-	-	625
Commercial and other services	-	-	-	630	2,225r	7,120r	105	-	10,080r
Total value of energy end use	**4,420r**	**270r**	**31,385**	**71,815r**	**23,845r**	**31,670r**	**285r**	**1,415**	**165,105r**
Value of non energy end use	**-**	**-**	**-**	**2,805r**	**195**	**-**	**-**	**-**	**3,000r**
Market value of inland consumption	**4,420r**	**270r**	**31,385**	**74,625r**	**24,040r**	**31,670r**	**285r**	**1,415**	**168,105r**

(1) For further information see paragraphs 1.37 to 1.43.

1.6 Value balance of traded energy in 2007[(1)]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	585	55	21,735r	26,645r	7,745r	8,420r	270r	255	65,705r
Imports	1,960	140	13,290	9,205	2,885	240	-	-	27,720
Exports	-40	-25	-13,740r	-9,900	-995	-110	-	-	-24,815r
Marine bunkers	-	-	-	-555	-	-	-	-	-555
Stock change	105r	-10	175	335r	5	-	-	-	610r
Basic value of inland consumption	**2,605**	**160**	**21,455**	**25,725r**	**9,635r**	**8,550r**	**270r**	**255**	**68,665r**
Tax and margins									
Distribution costs and margins	**360**	**50**	**-**	**3,010r**	**8,335r**	**17,225r**	**-**	**25**	**29,000r**
Electricity generation	115	-	-	5	-	-	-	-	120
Solid fuel manufacture	110	-	-	-	-	-	-	-	110
of which iron & steel sector	100	-	-	-	-	-	-	-	100
Iron & steel final use	20	35	-	20	-	-	-	-	80r
Other industry	10	10	-	380r	-	-	-	-	400r
Air transport	-	-	-	110	-	-	-	-	110
Rail and national navigation	-	-	-	10	-	-	-	-	10
Road transport	-	-	-	2,100	-	-	-	25	2,125
Domestic	105r	10	-	80	-	-	-	-	190
Agriculture	-	-	-	10	-	-	-	-	10
Commercial and other services	-	-	-	35	-	-	-	-	35
Non energy use	-	-	-	260r	150	-	-	-	410r
VAT and duties	**10**	**5**	**-**	**32,050r**	**475**	**595r**	**-**	**320**	**33,450r**
Electricity generation	-	-	-	55r	-	-	-	-	55r
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	320r	-	-	-	-	320r
Air transport	-	-	-	15	-	-	-	-	15
Rail and national navigation	-	-	-	195	-	-	-	-	195
Road transport	-	-	-	31,280r	-	-	-	315	31,595r
Domestic	10	5	-	70	475	595r	-	-	1,155r
Agriculture	-	-	-	15	-	-	-	-	15
Commercial and other services	-	-	-	105	-	-	-	-	105
Climate Change Levy	**5**	**-**	**-**	**-**	**165**	**515**	**-**	**-**	**685**
Total tax and margins	**370**	**55**	**-**	**35,060r**	**8,975r**	**18,335r**	**-**	**340**	**63,140r**
Market value of inland consumption	**2,975r**	**215**	**21,455**	**60,790r**	**18,610r**	**26,890r**	**175r**	**595**	**131,705r**
Energy end use									
Total energy sector	**2,630**	**-**	**21,455**	**270r**	**4,555r**	**325**	**-**	**50**	**29,290r**
Transformation	2,630	-	21,455	270r	4,420r	-	-	50	28,830r
Electricity generation	2,130	-	-	260r	4,390r	-	-	50	6,830r
of which from stocks	60	-	-	-	-	-	-	-	60
Heat Generation	20	-	-	15	30r	-	-	-	65r
Petroleum refineries	-	-	21,455	-	-	-	-	-	21,455
Solid fuel manufacture	480	-	-	-	-	-	-	-	480
of which iron & steel sector	435	-	-	-	-	-	-	-	435
Other energy sector use	**-**	**-**	**-**	**-**	**135r**	**325**	**-**	**-**	**460r**
Oil & gas extraction	-	-	-	-	-	40	-	-	40
Petroleum refineries	-	-	-	-	65r	220	-	-	285r
Coal extraction	-	-	-	-	-	65	-	-	65
Other energy sector	-	-	-	-	70	-	-	-	70
Total non energy sector use	**345**	**215**	**-**	**58,360r**	**13,905r**	**26,565r**	**175r**	**545**	**100,110r**
Industry	**185**	**145**	**-**	**2,275r**	**1,975r**	**6,970**	**90r**	**20**	**11,660r**
Iron & steel final use	95	125	-	70r	110	170r	-	-	575r
Other industry	90r	20	-	2,205r	1,865r	6,795r	90r	20	11,085r
Transport	**-**	**-**	**-**	**54,385r**	**-**	**495**	**-**	**480**	**55,360r**
Air	-	-	-	4,475	-	-	-	-	4,475
Rail and national navigation	-	-	-	790	-	495	-	-	1,280
Road	-	-	-	49,120r	-	-	-	480	49,600r
Other final users	**160**	**70**	**-**	**1,700**	**11,930r**	**19,100r**	**85r**	**45**	**33,090r**
Domestic	160	70	-	1,130	9,950	12,540r	10	45	23,905r
Agriculture	-	-	-	105	50	370	-	-	520
Commercial and other services	-	-	-	465	1,930r	6,195r	75r	-	8,665r
Total value of energy end use	**2,975r**	**215**	**21,455**	**58,630r**	**18,460r**	**26,890r**	**175r**	**595**	**129,395r**
Value of non energy end use	**-**	**-**	**-**	**2,160r**	**150**	**-**	**-**	**-**	**2,310r**
Market value of inland consumption	**2,975r**	**215**	**21,455**	**60,790r**	**18,610r**	**26,890r**	**175r**	**595**	**131,705r**

(1) For further information see paragraphs 1.37 to 1.43.

1.7 Sales of electricity and gas by sector

United Kingdom

	2005	2006	2007	2008	2009
Total selling value (£ million)[1]					
Electricity generation - Gas	3,333	3,966	4,391r	6,188r	4,991
Industrial - Gas	2,223	2,735	2,020r	3,166r	2,249
- Electricity	5,292	7,071	7,292	7,639r	7,427
of which:					
Fuel industries	232	296	323	364r	392
Industrial sector	5,060	6,775	6,969	7,275r	7,035
Domestic sector - Gas	7,822	9,618	9,475r	11,638r	12,114
- Electricity	9,205	10,799	11,943r	14,176r	14,664
Other - Gas	1,797	2,336	2,145r	2,304r	2,132
- Electricity	5,408	6,720	7,056r	8,055r	8,724
of which:					
Agricultural sector	276	340	369	412r	432
Commercial sector	3,857	4,776	5,033r	5,743r	6,209
Transport sector	346	459	494	593r	635
Public lighting	106	134	151	168r	189
Public admin. and other services	823	1,011	1,009r	1,139r	1,259
Total, all consumers	**35,080**	**43,246**	**44,321r**	**53,166r**	**52,301**
of which gas	**15,176**	**18,656**	**18,030r**	**23,295r**	**21,486**
of which electricity	**19,905**	**24,590**	**26,290r**	**29,871r**	**30,815**
Average net selling value per kWh sold (pence)[1]					
Electricity generation - Gas	1.015	1.284	1.236	1.644r	1.403
Industrial - Gas	1.469	1.877	1.515r	2.283r	1.966
- Electricity	4.998	6.707	6.895	7.450r	8.052
of which:					
Fuel industries	4.791	6.305	6.778	7.679r	8.701
Industrial sector	5.008	6.726	6.901	7.439r	8.019
Domestic sector - Gas	2.037	2.629	2.685	3.237	3.618
- Electricity	7.880	9.274	9.729	11.268	11.966
Other - Gas	1.672	2.264	2.262	2.409r	2.565
- Electricity	5.084	6.314	6.856	7.779r	8.808
of which:					
Agricultural sector	6.648	8.224	8.944	10.133r	11.481
Commercial sector	5.122	6.336	6.891	7.807r	8.846
Transport sector	4.642	6.109	6.567	7.441r	8.430
Public lighting	5.052	6.249	6.797	7.701r	8.725
Public admin. and other services	4.737	5.860	6.373	7.221r	8.181
Average, all consumers	**2.698**	**3.454**	**3.497r**	**4.083r**	**4.352**
of which gas	**1.563**	**2.020**	**1.926r**	**2.401r**	**2.419**
of which electricity	**6.049**	**7.490**	**7.937r**	**9.000r**	**9.819**

(1) Excludes VAT where payable - see paragraph 1.43 for a definition of average net selling value.

1.8 Final energy consumption by main industrial groups[1]

Thousand tonnes of oil equivalent

	2005	2006	2007	2008	2009
Iron and steel and non-ferrous metals					
Coal	24	36	76r	21	18
Manufactured solid fuels *(2)*	479	434	451	378	277
Blast furnace gas	28	78	48r	40r	36
Coke oven gas	79	106	101r	87	45
Natural gas	999r	989r	876r	852r	646
Petroleum	68	73	115r	109r	99
Electricity	1,093	1,151	1,058r	1,011r	858
Total iron and steel and non-ferrous metals	**2,770r**	**2,866r**	**2,726r**	**2,498r**	**1,980**
Chemicals					
Coal	84	84r	76r	65r	59
Natural gas	3,102r	2,952r	2,592r	2,681r	2,213
Petroleum	194	188r	192	176	156
Electricity	1,816r	1,753r	1,737r	1,633r	1,478
Heat purchased from other sectors *(3)*	392	371	480r	592r	482
Total chemicals	**5,588r**	**5,348r**	**5,076r**	**5,147r**	**4,388**
Metal products, machinery and equipment					
Coal	51	50	45	47r	45
Natural gas	1,949r	1,855r	1,714r	1,738r	1,454
Petroleum	292	315	266	261	232
Electricity	1,883	1,856r	1,846r	1,773r	1,618
Heat purchased from other sectors *(3)*	3	2	3r	4r	-
Total metal products, machinery and equipment	**4,177r**	**4,077r**	**3,874r**	**3,823r**	**3,350**
Food, beverages and tobacco					
Coal	19	17	30r	20r	26
Natural gas	2,143r	2,039r	1,975r	2,095r	1,725
Petroleum	323	282r	283r	293r	260
Electricity	1,055r	1,042r	1,039r	1,002r	917
Heat purchased from other sectors *(3)*	1	1	2r	8r	1
Total food, beverages and tobacco	**3,540r**	**3,381r**	**3,329r**	**3,417r**	**2,929**

(1) Industrial categories used are described in Table 1G. Data excludes energy used to generate heat for all fuels except manufactured solid fuels and electricity.

(2) Includes tars, benzole, coke and breeze and other manufactured solid fuels.

(3) Data equates to heat sold information in the energy balances.

1.8 Final energy consumption by main industrial groups[1] (continued)

Thousand tonnes of oil equivalent

	2005	2006	2007	2008	2009
Paper, printing and publishing					
Coal	98	99	101	105r	71
Natural gas	1,521r	1,420r	1,334r	1,427r	1,191
Petroleum	86	59	65	65	61
Electricity	1,137r	1,110r	1,096r	1,028r	931
Heat purchased from other sectors *(3)*	31	22	1	1	-
Total paper, printing and publishing	**2,873r**	**2,711r**	**2,596r**	**2,627r**	**2,254**
Other industries					
Coal	905	874	950	981r	892
Natural gas	3,303r	3,169r	2,972r	3,132r	2,609
Petroleum	2,953r	2,710r	2,913r	2,654r	2,266
Electricity	2,992r	2,970r	3,030r	2,951r	2,632
Heat purchased from other sectors *(3)*	405	414	411	406r	415
Total other industries	**10,557r**	**10,136r**	**10,276r**	**10,123r**	**8,815**
Unclassified					
Manufactured solid fuels *(2)*	226	231	239r	239r	206
Coke oven gas	-	-	-	-	-
Natural gas	5	4	3	3	2
Petroleum	2,665	2,853r	2,641r	2,426	2,359
Renewables & waste	201r	213	276	391r	387
Total unclassified	**3,097r**	**3,302r**	**3,159r**	**3,058r**	**2,955**
Total					
Coal	1,180	1,160r	1,279r	1,239r	1,113
Manufactured solid fuels *(2)*	705	665	690r	617r	483
Blast furnace gas	28	78	48r	40r	36
Coke oven gas	79	106	101r	87	45
Natural gas	13,022r	12,428r	11,466r	11,928r	9,841
Petroleum	6,581r	6,480r	6,475r	5,984r	5,434
Renewables & waste	201r	213	276	391r	387
Electricity	9,976r	9,881r	9,805r	9,398r	8,433
Heat purchased from other sectors *(3)*	831	809	896r	1,011r	898
Total	**32,602r**	**31,822r**	**31,037r**	**30,694r**	**26,671**

1.9 Fuels consumed for electricity generation (autogeneration) by main industrial groups[1]

Thousand tonnes of oil equivalent
(except where shown otherwise)

	2005	2006	2007	2008	2009
Iron and steel and non-ferrous metals					
Coal	767	768	767	801	708
Blast furnace gas	801	780	767	664	546
Coke oven gas	162	161	169	168	200
Natural gas	44	39	37	57	43
Petroleum	19	20	28	44	54
Other (including renewables) *(2)*	70	55	56	54	55
Total fuel input *(3)*	**1,863**	**1,823**	**1,824**	**1,789**	**1,607**
Electricity generated by iron & steel and non-ferrous	**488**	**481**	**476**	**485**	**459**
metals *(4)* *(in GWh)*	5,670	5,592	5,536	5,637	5,337
Electricity consumed by iron and steel and non-ferrous	**427**	**404**	**399**	**388**	**326**
metals from own generation *(5)* *(in GWh)*	4,969	4,703	4,639	4,509	3,795
Chemicals					
Coal	109	111	110	110	109
Natural gas	900	718	759	719	690
Petroleum	20	15	8	7	6
Other (including renewables) *(2)*	138	147	103	89	94
Total fuel input *(3)*	**1,167**	**990**	**979**	**925**	**898**
Electricity generated by chemicals *(4)*	**875**	**866**	**426**	**402**	**379**
(in GWh)	10,177	10,067	4,957	4,669	4,407
Electricity consumed by chemicals from own generation *(5)*	**768**	**627**	**273**	**243**	**226**
(in GWh)	8,935	7,289	3,179	2,821	2,627
Metal products, machinery and equipment					
Coal	-	-	-	-	
Natural gas	57	33	77	81	73
Petroleum	6	6	6	6	6
Other (including renewables) *(2)*	-	-	-	-	
Total fuel input *(3)*	**63**	**38**	**83**	**87**	**79**
Electricity generated by metal products, machinery	**18**	**16**	**44**	**49**	**46**
and equipment *(4)* *(in GWh)*	213	189	514	573	535
Electricity consumed by metal products, machinery	**18**	**16**	**37**	**47**	**39**
and equipment from own generation *(5)* *(in GWh)*	205	182	433	550	447
Food, beverages and tobacco					
Coal	11	7	5	3	4
Natural gas	351	335	371	350	349
Petroleum	9	8	5	3	5
Other (including renewables) *(2)*	-	-	-	-	
Total fuel input *(3)*	**371**	**351**	**380**	**356**	**358**
Electricity generated by food, beverages and tobacco *(4)*	**182**	**170**	**184**	**172**	**173**
(in GWh)	2,115	1,982	2,141	2,006	2,016
Electricity consumed by food, beverages and tobacco	**162**	**129**	**117**	**113**	**111**
from own generation *(5)* *(in GWh)*	1,886	1,497	1,364	1,316r	1,295

(1) Industrial categories used are described in Table 1G.
(2) Includes hydro electricity, solid and gaseous renewables and waste.
(3) Total fuels used for generation of electricity. Consistent with figures for fuels used by other generators in Table 5.4.

1.9 Fuels consumed for electricity generation (autogeneration) by main industrial groups[1] (continued)

Thousand tonnes of oil equivalent
(except where shown otherwise)

	2005	2006	2007	2008	2009
Paper, printing and publishing					
Coal	25	54	41	52	46
Natural gas	827	781	827	561	498
Petroleum	11	7	2	1	1
Other (including renewables) *(2)*	7	8	7	5	5
Total fuel input *(3)*	**869**	**850**	**877**	**619**	**550**
Electricity generated by paper, printing and publishing *(4)*	**408**	**378**	**386**	**286**	**248**
(in GWh)	4,749	4,395	4,492	3,320	2,881
Electricity consumed by paper, printing and publishing	**300**	**279**	**281**	**186**	**162**
from own generation *(5)* *(in GWh)*	3,490	3,245	3,266	2,168	1,884
Other industries					
Coal	-	-	-	-	
Coke oven gas	28	26	24	26	25
Natural gas	84	110	147	159	136
Petroleum	5	3	4	5	5
Other (including renewables) *(2)*	1,556	1,601	1,698	1,740	1,834
Total fuel input *(3)*	**1,673**	**1,739**	**1,874**	**1,929**	**1,999**
Electricity generated by other industries *(4)*	**93**	**107**	**134**	**138**	**131**
(in GWh)	1,085	1,240	1,555	1,610	1,522
Electricity consumed by other industries from own	**73**	**92**	**90**	**71**	**87**
generation *(5)* *(in GWh)*	851	1,075	1,047	827	1,013
Total					
Coal	911	940	922	966	867
Blast furnace gas	801	780	767	664	546
Coke oven gas	190	187	194	195	226
Natural gas	2,263	2,016	2,217	1,927	1,790
Petroleum	69	59	52	66	76
Other (including renewables) *(2)*	1,770	1,810	1,864	1,888	1,986
Total fuel input *(3)*	**6,005**	**5,791**	**6,015**	**5,705**	**5,491**
Electricity generated *(4)*	**2,064**	**2,018**	**1,651**	**1,532**	**1,436**
(in GWh)	24,009	23,465	19,196	17,815	16,698
Electricity consumed from own generation *(5)*	**1,749**	**1,547**	**1,198**	**1,048**	**951**
(in GWh)	20,335	17,991	13,926	12,191	11,060

(4) Combined heat and power (CHP) generation (ie electrical output from Table 6.8) plus non-chp generation, so that the total electricity generated is consistent with the "other generators" figures in Table 5.6.

(5) This is the electricity consumed by the industrial sector from its own generation and is consistent with the other generators final users figures used within the electricity balances (Tables 5.1 and 5.2). These figures are less than the total generated because some of the electricity is sold to the public distribution system and other users.

(6) The figures presented here are consistent with other figures presented elsewhere in this publication as detailed at (3), (4), and (5) above but are further dissaggregated. Overall totals covering all autogenerators can be derived by adding in figures for transport, services and the fuel industries. These can be summarised as follows:

Thousand tonnes of oil equivalent

Fuel input	**2005**	**2006**	**2007**	**2008**	**2009**
All industry	6,005	5,791	6,015	5,705	5,491
Fuel industries	1,465	1,455	1,588	1,255	1,077
Transport, Commerce and Administration	275	240	244	237	232
Services	1,172	1,253	986	1,166	1,623
Total fuel input	**8,917**	**8,739**	**8,833**	**8,363**	**8,432**
Electricity generated	**3,104**	**3,101**	**3,046**	**2,871**	**2,940**
Electricity consumed	**2,232**	**2,120**	**1,823**	**1,569**	**1,436**
					GWh
Electricity generated	**36,101**	**36,060**	**35,422**	**33,384**	**34,197**
Electricity consumed	**25,958**	**24,659**	**21,206**	**18,243**	**16,696**

Chapter 2
Solid fuels and derived gases

Introduction

2.1 This chapter presents figures on the supply and demand for coal and solid fuels derived from coal, and on the production and consumption of gases derived from the processing of solid fuels. An energy flow chart for 2009, showing the flows of coal from production and imports through to consumption, is included overleaf. This is a way of simplifying the figures that can be found in the commodity balance for coal in Table 2.1. It illustrates the flow of coal from the point at which it become available from home production or imports (on the left) to the eventual final use of coal (on the right).

2.2 Balances for coal and manufactured fuels, covering each of the last three years, form the first six tables of this chapter (Tables 2.1 to 2.6). From 2008, consumption of anthracite is shown separately to steam coal. Prior to 2008 anthracite figures were suppressed due to the small number of anthracite producers. From 2008, we have obtained written consent from the relevant companies to publish their figures. DECC have not been able to obtain the same written consent from data providers prior to 2008. These are followed by a five year table showing the supply and consumption of coal as a time series (Table 2.7). Comparable five year tables bring together data for coke oven coke, coke breeze and manufactured solid fuels (Table 2.8) and coke oven gas, blast furnace gas, benzole and tars (Table 2.9). As in previous years, tables showing deep mines in production (Table 2.10) and opencast sites in production (Table 2.11) complete the chapter. The long term trends commentary and tables on coal production and stocks, and on coal consumption are on the DECC energy statistics web site at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

2.3 Detailed statistics of imports and exports of solid fuels are in Annex G, also available on the DECC energy statistics web site at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

2.4 Figures for actual consumption of coal are available for all fuel and power producers and for final use by the iron and steel industry. The remaining final users consumption figures are based on information on disposals to consumers by producers and on imports. For further details see the technical notes and definitions section which begins at paragraph 2.32 of this chapter.

Commodity balances for coal (Tables 2.1, 2.2 and 2.3)

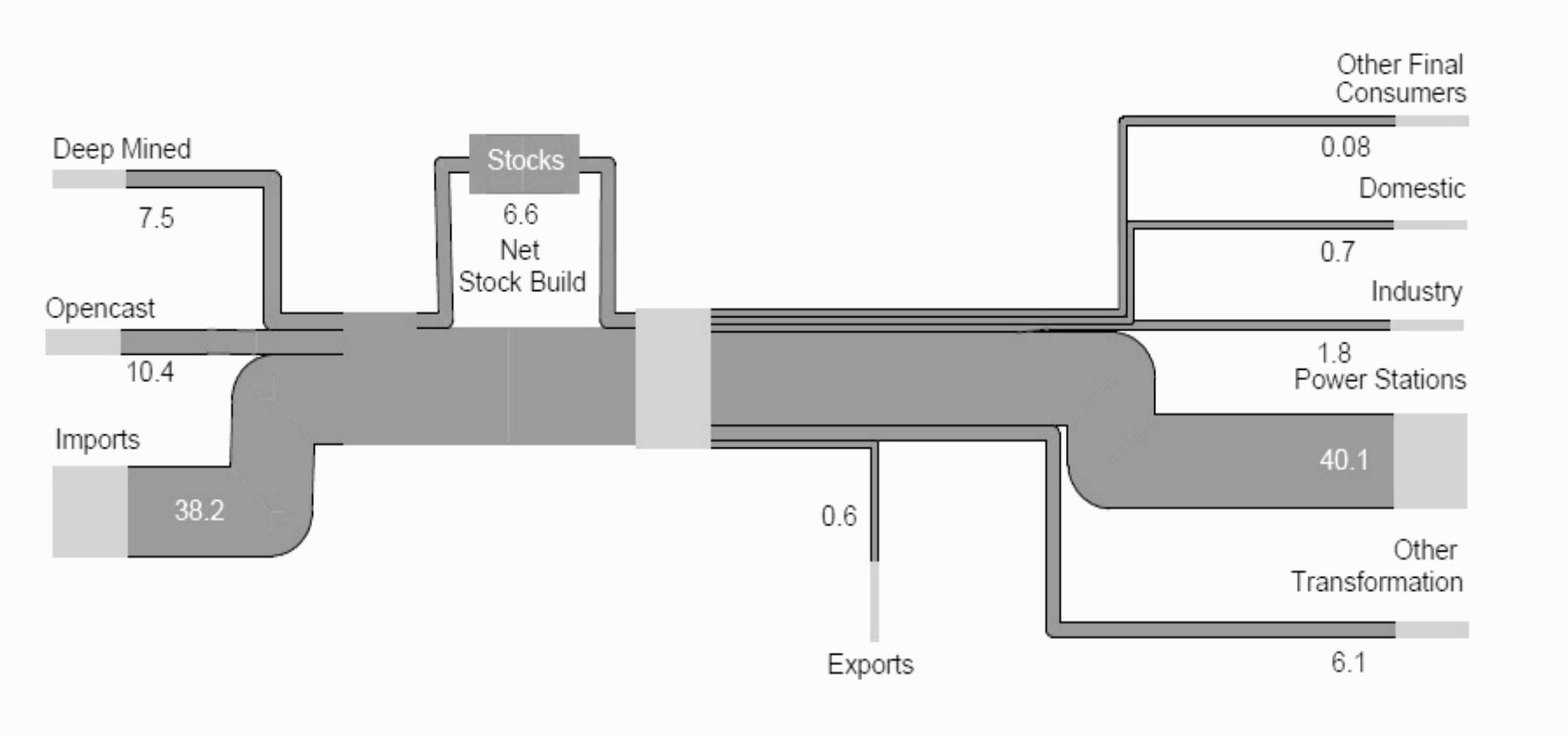
2.5 These balance tables separately identify the three main types of coal: steam coal, coking coal and anthracite. They show the variation both in the sources of supply and where the various types of coal are mainly used. A full breakdown of coal production figures is not available for disclosure control reasons.

2.6 In 2009, 86 per cent of coal demand was for steam coal, 12 per cent was for coking coal and 2 per cent was for anthracite. Electricity generation accounted for 94 per cent of demand for steam coal and 47 per cent of demand for anthracite. Coking coal was mainly used in coke ovens (85 per cent) but 15 per cent was directly injected into blast furnaces.

2.7 Only 5.5 per cent of the total demand for coal was for final consumption, where it was used for steam raising, space or hot water heating, or heat for processing. Steam coal accounted for 86 per cent of this final consumption. Seventy-four per cent of this was consumed by industry, with mineral products (e.g. cement, glass and bricks) and paper and printing were the largest users. The domestic sector accounted for 27 per cent of the final demand for coal, with 69 per cent of this demand being for steam coal and the remainder for anthracite.

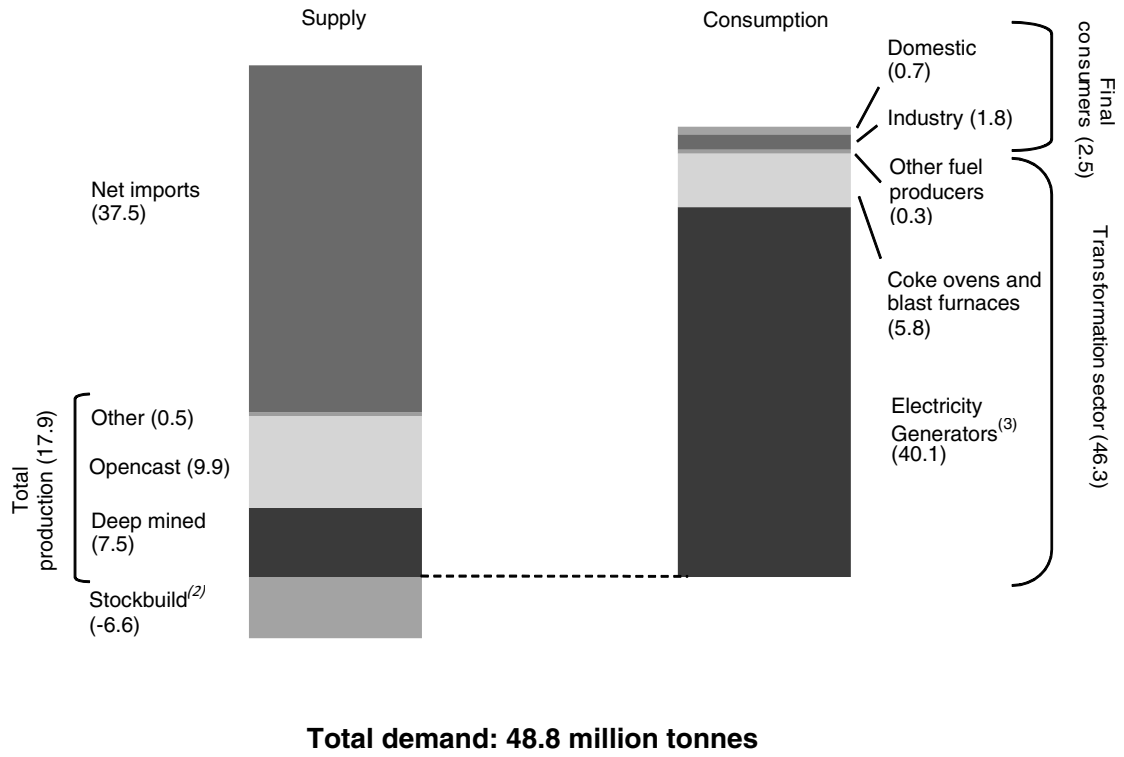
2.8 Chart 2.1, compares the sources of coal supplies in the UK in 2009, along with a breakdown of consumption by user, and serves to illustrate some of the features brought out below.

Coal flow chart 2009 (million tonnes of coal)



Notes:
This flow chart is based on the data that appear in Tables 2.1 and 2.7.
Opencast includes slurry and recovered coal.

Chart 2.1: Coal supply and consumption in the UK in 2009 (1)



(1) Figures shown are in million tonnes.
(2) A negative stock change (stockbuild) indicates a rise in stock levels, therefore, decreases total UK coal supply.
(3) Includes coal consumed in the generation of heat that is sold to third parties.

2.9 In 2009, 15 per cent of supply was from deep-mined production, 20 per cent from opencast operations, 77 per cent from net imports and 1 per cent from other sources such as slurry. Between the end of 2008 and the end of 2009, total stock levels rose by 40 per cent to 24.1 million tonnes.

2.10 Recent trends in coal production and consumption are described in paragraphs 2.18 to 2.24.

Commodity balances for manufactured fuels (Table 2.4, 2.5 and 2.6)

2.11 These tables cover fuels manufactured from coal and gases produced when coal is used in coke ovens and blast furnaces. Definitions of terms associated with coke, breeze, other manufactured solid fuels and manufactured gases are set out in paragraphs 2.44 to 2.48.

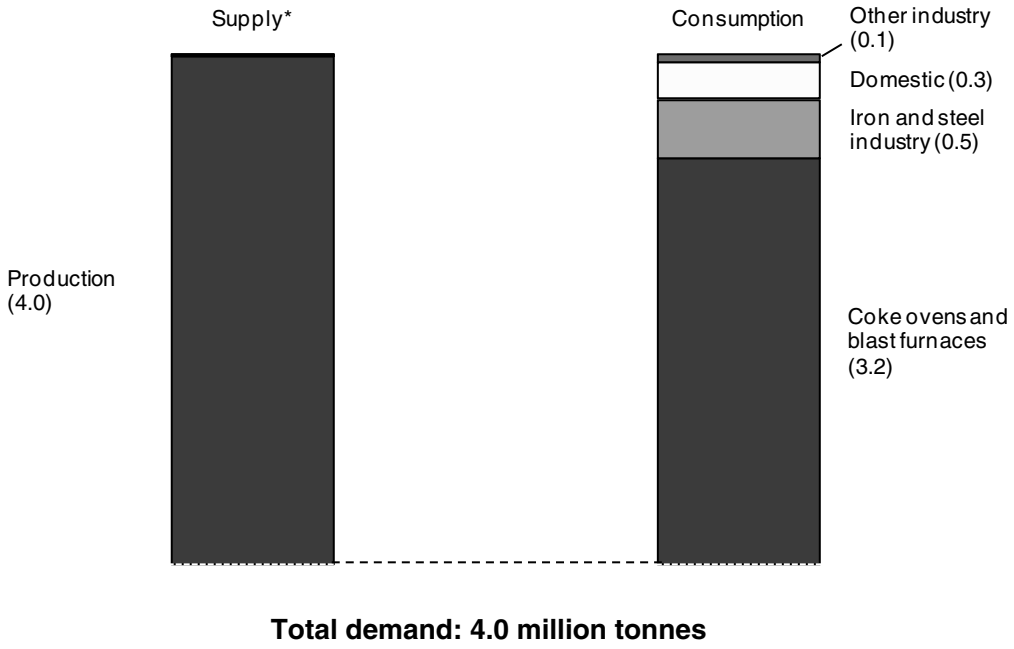
2.12 Around 95 per cent of coke oven coke and coke breeze is home produced with the rest imported. In 2009 the volume of imports was down 75 per cent from 2008. About 4.0 per cent of home production was exported. The coke screened out by producers as breeze and fines amounted to about a fifth of production plus imports in 2009; this appears as transfers in the coke breeze column of the balances. Transfers out of coke oven coke have not always been equal to transfers into coke oven breeze. This was due to differences arising from the timing, location of measurement and the practice adopted by the Iron and Steel works. Since 2000, however, the Iron and Steel Statistics Bureau have been able to reconcile these data. In 2009, 97 per cent of the demand for coke oven coke was at blast furnaces (part of the transformation sector) with most of the remainder going into final consumption.

2.13 Most of the supply of **coke breeze** is from re-screened coke oven coke, with direct production accounting for only 3.3 per cent of total supply. Some breeze is re-used in coke manufacture or in blast furnaces, but the majority is boiler fuel. Since 2007, most of the supply of coke breeze was reclassified to coke oven coke following better information received by the Iron and Steel Statistics Bureau.

2.14 **Other manufactured solid fuels** (patent fuels) are manufactured smokeless fuels, produced mainly for the domestic market, as the balances show. A small amount of these fuels (only 2.2 per cent of total supply in 2009) is imported, but exports generally exceed this. Imports and exports of manufactured smokeless fuels can contain small quantities of non-smokeless fuels.

2.15 Chart 2.2 shows the sources of coke, breeze and other manufactured solid fuels, and a breakdown of their consumption.

Chart 2.2: Supply and consumption of coke oven coke, coke breeze and other manufactured solid fuels in 2009 (1)

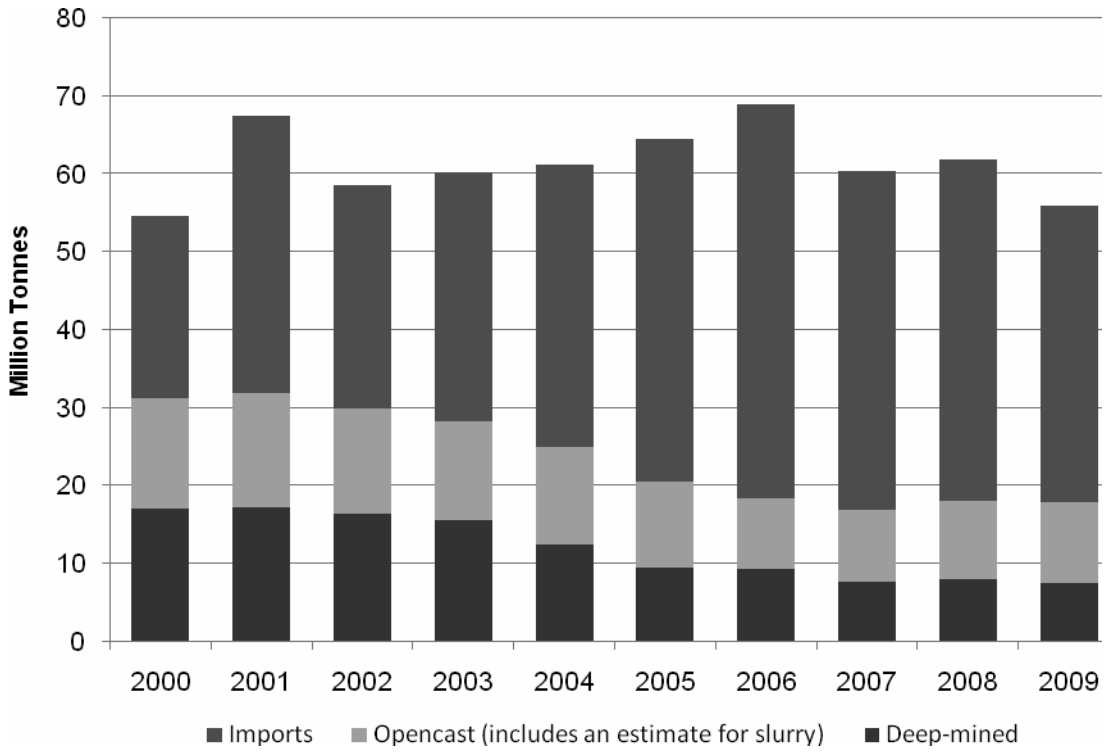


(1) Figures shown are in million tonnes.
** Net imports and stocks have a combined total of less than 0.5% of the total supply of coke oven coke, coke breeze and other manufactured solid fuels, therefore it is not visible under the supply bar chart.*

2.16 The carbonisation and gasification of solid fuels at coke ovens produces **coke oven gas** as a by-product. Some of this (47 per cent in 2009) is used to fuel the coke ovens themselves, while some is used in blast furnaces (7.0 per cent in 2009). Elsewhere, the gas is used for electricity generation (31 per cent), or for heat production, iron and steel and other industrial processes (14 per cent). The remaining 0.9 per cent is lost.

2.17 **Blast furnace gas** is a by-product of iron smelting in a blast furnace. A similar product is obtained when steel is made in basic oxygen steel (BOS) converters and "BOS" gas is included in this category. Most of these gases are used in other parts of integrated steel works. The generation of electricity in 2009 used 56 per cent of blast furnace gas and BOS gas, while 33 per cent was used in coke ovens and blast furnaces themselves, 1.6 per cent used in general heat production, 6.4 per cent was lost or burned as waste and a further 3.7 per cent was used in the iron and steel industry.

Chart 2.3: Coal production and imports 2000 to 2009



Supply and consumption of coal (Table 2.7)

2.18 **Production** - Figures for 2009 show that coal production (including slurry) fell by 1.0 per cent compared to production in 2008. Deep-mined production fell by 1.3 per cent and opencast production also fell but by 7.1 per cent. For the first time since 2002, imports decreased by 13 per cent in 2009 to 38 million tonnes. Overall demand for coal fell by 16 per cent in 2009, driven largely by lower consumption by major power producers reflecting lower coal fuel generation. Longer-term trends in production are illustrated in Chart 2.3.

2.19 Table 2A shows how production of coal is divided between England, Wales and Scotland. In 2009, 55 per cent of coal output was in England, 35 per cent in Scotland and 10 per cent in Wales. There has been no deep mining of coal in Scotland since Longannet mine closed in 2002.

Table 2A: Output from UK coal mines and employment in UK coal mines [(1)(2)(3)]

		Million tonnes			Number		
		Output			Employment		
		2007	2008	2009	end 2007	end 2008	end 2009
Deep-mined	England	7.3	7.8	7.4	3,334	3,516	3,436
	Wales	0.2	0.1	0.1	224	344	311
	Total	7.5	7.9	7.5	3,558	3,860	3,747
Opencast	England	1.8	2.1	2.1	425	539	458
	Scotland	5.9	5.7	6.0	965	1,166	1,242
	Wales	1.1	1.6	1.6	454	496	465
	Total	8.8	9.4	9.8	1,844	2,201	2,165
Total	England	9.1	10.0	9.5	3,759	4,055	3,894
	Scotland	5.9	5.7	6.0	965	1,166	1,242
	Wales	1.3	1.7	1.7	678	840	776
	Total	16.3	17.4	17.3	5,402	6,061	5,912

Source: The Coal Authority

(1) Output is the tonnage declared by operators to the Coal Authority, including estimated tonnages. It excludes estimates of slurry recovered from dumps, ponds, rivers, etc.

(2) Employment includes contractors and is as declared by licensees to the Coal Authority at 31 December each year.

(3) Table 2A is now published on a calendar year basis to be consistent with the rest of the DUKES publication.

2.20 Table 2A also shows how numbers employed in the production of coal have changed over the last three years. During 2009 total employment, including contractors, was 2.6 per cent lower than in 2008. At 31 December 2009, 66 per cent of the 5,912 people employed in UK coal mining worked in England, while 21 per cent were employed in Scotland and 13 per cent in Wales.

2.21 **Foreign trade –** Imports of coal and other solid fuel in 2009 decreased by 14 per cent from 2008 levels to 38 million tonnes. In 2009, steam coal accounted for 86 per cent of the total imports, 13 per cent was coking coal, with anthracite and other solid fuels accounting for final 1 per cent. As Table 2B shows, in 2009, Russia accounted for more than 50 per cent (18 million tonnes) of total steam coal imports, with a further 35 per cent (11 million tonnes) from a combination of Colombia, South Africa, the USA and Indonesia. The United Kingdom imported 48 per cent (2.5 million tonnes) of coking coal from Australia with a further 34 per cent (1.8 million tonnes) from the USA and Canada. Ninety-three per cent (0.2 million tonnes) of other solid fuels are imported from the European Union and Russia with 69 per cent (0.1 million tonnes) of anthracite also being imported from the European Union and Russia. For all coal, 49 per cent (19 million tonnes) of the United Kingdom's total imports comes from Russia and 42 per cent (16 million tonnes) from Colombia, South Africa, the USA and Australia. For more details of imports and exports of solid fuels by country of origin, see Annex G on the DECC energy statistics web site at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

2.22 The proportion of coal consumed by major power producers from imports has risen, from 20 per cent (8.1 million tonnes) in 1999 to a peak of 73.5 per cent (41 million tonnes) in 2006. In 2009, 77 per cent (29 million tonnes) of coal consumed by major power producers was from imports.

Table 2B: Imports of coal and other solid fuel in 2009[(1)]

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Other solid fuel	Total
Russia	18,472	304	34	36	18,847
Colombia	5,250	-	-	-	5,250
United States of America	3,122	1,578	-	-	4,700
Republic of South Africa	3,043	-	20	-	3,063
Australia	444	2,487	-	-	2,932
European Union (2)	1,136	-	41	135	1,312
Indonesia	721	-	-	-	721
People's Republic of China	602	-	14	-	615
Canada	-	201	-	-	201
Other countries	104	594	-	13	710
Total all countries	**32,894**	**5,164**	**109**	**184**	**38,351**

Source: H M Revenue and Customs, ISSB

(1) Country of origin basis.

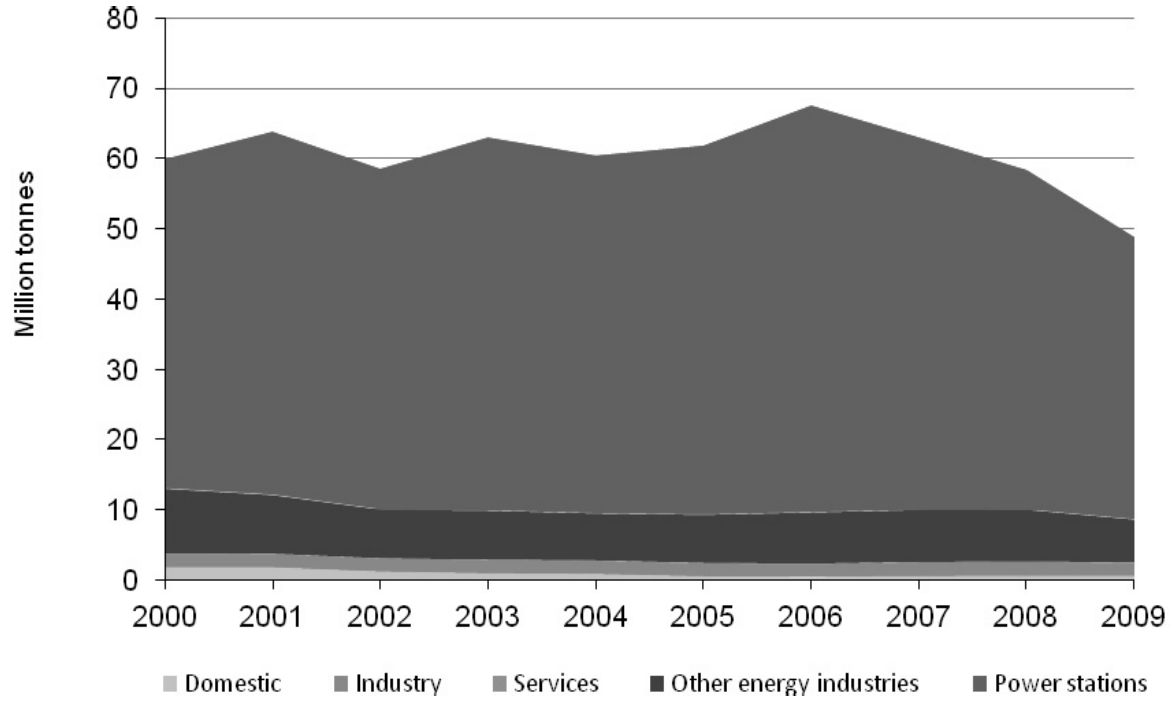
(2) Includes extra-EU coal routed through the Netherlands.

2.23 **Transformation** – The 16.0 per cent decline in total coal consumption between 2008 and 2009 reflected a decrease in coal-fired electricity generation by major power producers of 8.0 million tonnes. This fall was due to increased coal prices relative to gas, making coal-fired generation less competitive and lower demand for electricity. However, in UK steel production, coal use for coke making and for injection into blast furnaces fell by 18 per cent in 2009. Longer-term trends in consumption are illustrated in Chart 2.4.

2.24 **Final Consumption** – Overall consumption by final consumers in 2009 fell by 5.1 per cent from 2008. Industry sector consumption fell by 9.3 per cent. However, domestic demand increased marginally by less than 1.0 per cent on 2008, to 686 thousand tonnes and demand by the transport sector increased by 34 per cent to 9 million tonnes. The largest percentage increase was seen in the public admin and commercial sectors where demand in 2009 (73 thousand tonnes) increased by around 3 times the levels in 2008. This was because the quality of coal was too poor to blend with coal sold to coal-fired power stations and therefore it was sold to the public admin and commercial sectors.

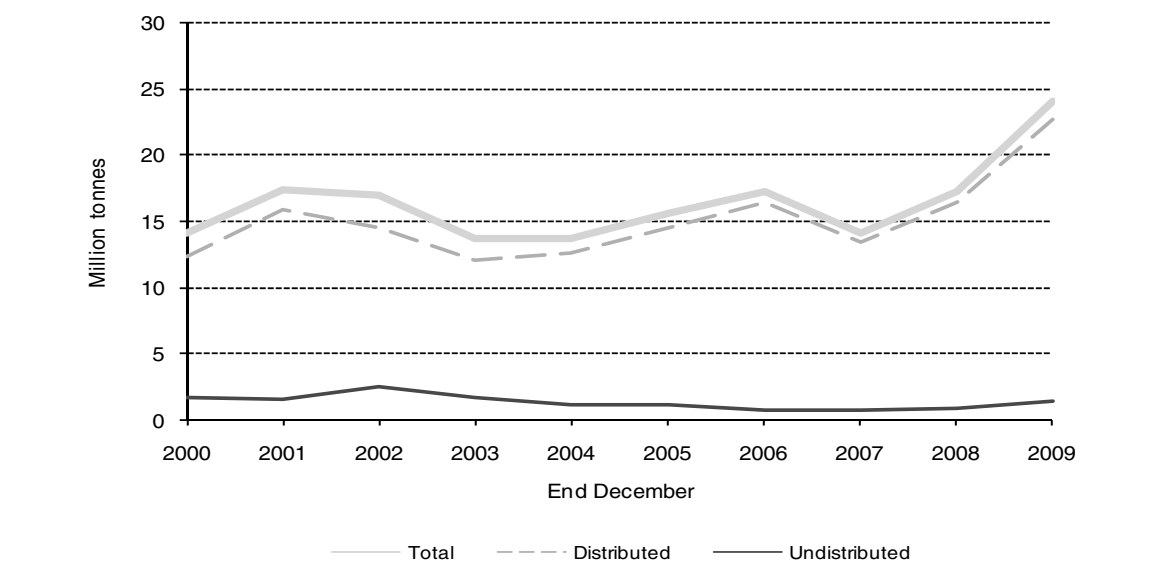
2.25 Longer-term trends in consumption are illustrated in Chart 2.4. Long term trends commentary on the consumption of coal in the UK since 1970 onwards can be found on the DECC energy statistics web site:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Chart 2.4: Coal consumption, 2000 to 2009



2.26 **Stocks** – Production and net imports together in 2009 were higher than the demand for coal. Consequently total stock levels were just under 7.0 million tonnes higher at the end of 2009 (24.1 million tonnes) compared to a year earlier. The 2009 stock levels are similar to the levels last since in 1994 (26.6 million tonnes). Total stocks at the end of 2009 were equivalent to around half of the year's coal consumption. Stocks held at collieries and opencast sites at the end of 2009 were 0.6 million tonnes higher than a year earlier and stocks at major power stations and coke ovens, as a whole rose by 6.6 million tonnes and accounted for 94 per cent of total stocks in 2009. The recent changes in coal stocks are illustrated in Chart 2.5.

Chart 2.5: Coal stocks in the UK 2000 to 2009



Supply and consumption of coke oven coke, coke breeze and other manufactured fuels (Table 2.8)

2.27 This table presents figures for the most recent five years on the same basis as the balance tables. Figures for stocks are also included. Coal used to produce these manufactured fuels is shown in Table 2.7. For **coke oven coke,** demand fell by 27 per cent in 2009 and production fell by 15 per cent. In 2009 both imports and exports fell by 72 per cent and 13 per cent from 2008. Stock levels fell by 11 per cent in 2009.

2.28 In 2009, the demand for **coke breeze** fell by 26 per cent compared to 2008 while transfers (re-screening, see paragraph 2.45) fell by 29 per cent and imports also falling by 83 per cent. Production of coke breeze fell by 16 per cent (due to the reclassification of the majority of coke breeze production to coke oven coke production). There was a 8.4 per cent decrease in the demand for **other manufactured solid fuels**, mainly for domestic use. UK production was up 0.3 per cent on 2008 levels.

Supply and consumption of coke oven gas, blast furnace gas, benzole and tars (Table 2.9)

2.29 This table presents figures for the most recent five years on the same basis as the other balance tables. In 2009, production of **coke oven gas** fell by 15 per cent and demand fell by 11 per cent. Use of coke oven gas in blast furnaces, and for final consumption as a whole, fell, but demand rose for use in electricity generation. Production of **blast furnace gas** fell 26 per cent and demand fell by 2.6 per cent in 2009 compared to 2008. Demand for benzole and tars fell by 15 per cent in 2009.

Structure of the coal industry (Tables 2.10 and 2.11)

2.30 As at 31 December 2009 there were six major deep mines in production in England. These were Daw Mill, Kellingley, Thoresby and Welbeck (which was due to close owing to reserve exhaustion in March 2010), all operated by UK Coal plc; Hatfield, operated by Powerfuel Mining plc; and Maltby, operated by Hargreaves Services. There were also two medium-sized mines in development (Aberpergwm, operated by Energybuild Ltd, and Unity, both in South Wales), two small mines (Eckington and Hayroyds) and several micro-mines. UK Coal is also continuing to keep Harworth colliery on “care and maintenance” to retain shaft facilities needed to access reserves in a new area. Deep mine production in 2009 was 7.5 million tonnes, down from 7.9 million tonnes in 2009. Surface mine output was 9.8 million tonnes in 2009, up from 9.4 million tonnes in 2008, with most of the increase attributable to Scotland. Nine applications for planning consent for new surface mines were approved covering 9.16 million tonnes of recoverable coal, all in England and Scotland; this represents nearly 94 per cent replacement of UK production in the year.

2.31 The deep mines that were in operation at the end of December 2009 are listed in Table 2.10. Opencast coal producers are similarly listed in Table 2.11, as well as those that are in development and not yet in operation. Further coal and slurry are supplied from recovery operations shown in the tables under “Other sources”.

Technical notes and definitions

2.32 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy as a whole in Chapter 1, paragraphs 1.26 to 1.60. Additional guidance on the compilation of the solid fuels and derived gases statistics can be found in the document 'Data Sources and Methodologies', this document is available on the DECC energy statistics web site at: www.decc.gov.uk/en/content/cms/statistics/source/coal/coal.aspx. For notes on the commodity balances and definitions of the terms used in the row headings see Annex A, paragraphs A.7 to A.42. While the data in the printed and bound copy of this Digest cover only the most recent 5 years, these notes also cover data for earlier years that are available on the DECC web site.

Steam coal, coking coal and anthracite

2.33 **Steam coal** is coal classified as such by UK coal producers and by importers of coal. It tends to have calorific values at the lower end of the range.

2.34 **Coking coal** is coal sold by producers for use in coke ovens and similar carbonising processes. The definition is not therefore determined by the calorific value or caking qualities of each batch of coal sold, although calorific values tend to be higher than for steam coal.

2.35 **Anthracite** is coal classified as such by UK coal producers and importers of coal. Typically it has a high heat content making it particularly suitable for certain industrial processes and for use as a domestic fuel. Some UK anthracite producers have found a market for their lower calorific value output at power stations.

Coal production

2.36 **Deep-mined** - The statistics cover saleable output from deep mines including coal obtained from working on both revenue and capital accounts. All licensed collieries (and British Coal collieries prior to 1995) are included, even where coal is only a subsidiary product.

2.37 **Opencast** - The figures cover saleable output and include the output of sites worked by operators under agency agreements and licences, as well as the output of sites licensed for the production of coal as a subsidiary to the production of other minerals.

2.38 **Other** - Estimates of slurry etc recovered and disposed of from dumps, ponds, rivers, etc.

Imports and exports of coal and other solid fuels

2.39 Figures are derived from returns made to HM Revenue and Customs and are broken down in greater detail in Annex G on the DECC energy statistics web site at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

2.40 However, in Tables 2.4, 2.5, 2.6 and 2.8, the export figures used for hard coke, coke breeze and other manufactured solid fuels for the years before 1998 (as reported on the DECC web site) are quantities of fuel exported as reported to DECC or its predecessor Departments by the companies concerned, rather than quantities recorded by HM Revenue and Customs in their Trade Statistics. A long term trend commentary and tables on exports are on the DECC energy statistics web site at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Allocation of imported coal

2.41 Although data are available on consumption of home produced coal, and also on consumption of imported coal by secondary fuel producers, there is only very limited direct information on consumption of imported coal by final users. Guidance on how DECC allocate imports to final users is outlined in paragraph 3.2.5 of the 'Data Sources and Methodologies' document. This guidance can be found on the DECC web site at: www.decc.gov.uk/en/content/cms/statistics/source/coal/coal.aspx.

Stocks of coal

2.42 Undistributed stocks are those held at collieries and opencast sites. It is not possible to distinguish these two locations in the stock figures. Distributed stocks are those held at power stations and stocking grounds of the major power producing companies (as defined in Chapter 5, paragraphs 5.57 and 5.58), coke ovens, low temperature carbonisation plants and patent fuel plants.

Transformation, energy industry use and consumption of solid fuels

2.43 Annex A of this Digest outlines the principles of energy and commodity balances and defines the activities that fall within these parts of the balances. However, the following additional notes relevant to solid fuels are given below:

Transformation: Blast furnaces - Coking coal injected into blast furnaces is shown separately within the balance tables.

Transformation: Low temperature carbonisation plants and patent fuel plants - Coal used at these plants for the manufacture of domestic coke such as Coalite and of briquetted fuels such as Phurnacite and Homefire.

Consumption: Industry - The statistics comprise sales of coal by the six main coal producers and a few small producers to the iron and steel industry (excluding that used at coke ovens and blast furnaces) and to other industrial sectors, estimated proportions of anthracite and steam coal imports, and submission made to the EU Emissions Trading Scheme. The figures exclude coal used for industries' own generation of electricity, which appear separately under transformation.

Consumption: Domestic – Some coal is supplied free of charge to retired miners and other retired eligible employees through the National Concessionary Fuel Scheme (NCFS). The concessionary fuel provided in 2009 is estimated at 71.6 thousand tonnes. This estimate is included in the domestic steam coal and domestic anthracite figures.

Consumption of coke and other manufactured solid fuels - These are disposals from coke ovens to merchants. The figures also include estimated proportions of coke imports.

Coke oven coke (hard coke) and hard coke breeze

2.44 The statistics cover coke produced at coke ovens owned by Corus plc, Coal Products Ltd and other producers. Low temperature carbonisation plants are not included (see paragraph 2.47, below). Breeze (as defined in paragraph 2.45) is excluded from the figures for coke oven coke.

2.45 Breeze can generally be described as coke screened below 19 mm (¾ inch) with no fines removed, but the screen size may vary in different areas and to meet the requirements of particular markets. Coke that has been transported from one location to another is usually re-screened before use to remove smaller sizes, giving rise to further breeze.

2.46 In 1998, an assessment using industry data showed that on average over the previous five years 91 per cent of imports had been coke and 9 per cent breeze and it is these proportions that have been used for 1998 and subsequent years in Tables 2.4, 2.5, 2.6 and 2.8.

2.47 Other manufactured solid fuels are mainly solid smokeless fuels for the domestic market for use in both open fires and in boilers. A smaller quantity is exported (although exports are largely offset by similar quantities of imports in most years). Manufacture takes place in patented fuel plants and low temperature carbonisation plants. The brand names used for these fuels include Homefire, Phurnacite, Ancit and Coalite.

Blast furnace gas, coke oven gas, benzole and tars

2.48 The following definitions are used in the tables that include these fuels:

Blast furnace gas - includes basic oxygen steel furnace (BOS) gas. Blast furnace gas is the gas produced during iron ore smelting when hot air passes over coke within the blast ovens. It contains carbon monoxide, carbon dioxide, hydrogen and nitrogen. In a basic oxygen steel furnace the aim is not to introduce nitrogen or hydrogen into the steel making process, so pure oxygen gas and suitable fluxes are used to remove the carbon and phosphorous from the molten pig iron and steel scrap. A similar fuel gas is thus produced.

Coke oven gas - is a gas produced during the carbonisation of coal to form coke at coke ovens. In 2009, some coke oven gas was produced using a combination of gases other than natural gas and blast furnace gas. This total has been added to the production of coke oven gas rather than transfers because it is specifically defined as the mixture of natural gas, blast furnace gas and BOS gas. The paragraph below on synthetic coke oven gas for a complete definition of this.

Synthetic coke oven gas - is mainly natural gas that is mixed with smaller amounts of blast furnace and BOS gas to produce a gas with almost the same qualities as coke oven gas. The transfers row of Tables 2.4, 2.5, 2.6 and 2.8 show the quantities of blast furnace gas used for this purpose and the total input of gases to the synthetic coke oven gas process. There is a corresponding outward transfer from natural gas in Chapter 4, Table 4.1.

Benzole - a colourless, liquid, flammable, aromatic hydrocarbon by-product of the iron and steel making process. It is used as a solvent in the manufacture of styrenes and phenols but can also be used as a motor fuel.

Tars - viscous materials usually derived from the destructive distillation of coal, which are by-products of the coke and iron making processes.

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2.1 Commodity balances 2009

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	15,862	246	1,266	17,374
Other sources	430	-	70	500
Imports	32,894	5,164	109	38,167
Exports	-526	-6	-115	-646
Marine bunkers	-	-	-	-
Stock change *(1)*	-6,797	+259	-70	-6,608
Transfers	-	-	-	-
Total supply	**41,863**	**5,663**	**1,260**	**48,786**
Statistical difference *(2)*	130	-124	-25	-19
Total demand	**41,733**	**5,787**	**1,285**	**48,805**
Transformation	**39,554**	**5,787**	**930**	**46,271**
Electricity generation	39,079	-	600	39,678
Major power producers	37,663	-	600	38,262
Autogenerators	1,416	-	-	1,416
Heat generation	465	-	-	465
Petroleum refineries	-	-	-	-
Coke manufacture	-	4,936	-	4,936
Blast furnaces	-	852	-	852
Patent fuel manufacture and low temperature carbonisation	11	-	330	340
Energy industry use	**5**	**-**	**-**	**5**
Electricity generation	-	-	-	-
Oil and gas extraction	-	-	-	-
Petroleum refineries	-	-	-	-
Coal extraction	5	-	-	5
Coke manufacture	-	-	-	-
Blast furnaces	-	-	-	-
Patent fuel manufacture	-	-	-	-
Pumped storage	-	-	-	-
Other	-	-	-	-
Losses	**-**	**-**	**-**	**-**
Final consumption	**2,174**	**-**	**356**	**2,530**
Industry	**1,618**	**-**	**142**	**1,760**
Unclassified	-	-	-	-
Iron and steel	2	-	58	60
Non-ferrous metals	28	-	-	28
Mineral products	1,076	-	1	1,077
Chemicals	93	-	-	93
Mechanical engineering etc	14	-	-	14
Electrical engineering etc	5	-	-	5
Vehicles	46	-	-	46
Food, beverages etc	37	-	11	48
Textiles, leather, etc	69	-	-	69
Paper, printing etc	124	-	-	124
Other industries	119	-	72	191
Construction	4	-	-	4
Transport	**9**	**-**	**-**	**9**
Air	-	-	-	-
Rail	9	-	-	9
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**547**	**-**	**214**	**761**
Domestic	472	-	214	686
Public administration	24	-	-	24
Commercial	49	-	-	49
Agriculture	-	-	-	-
Miscellaneous	3	-	-	3
Non energy use	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).

(2) Total supply minus total demand.

2.2 Commodity balances 2008

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	16,010r	307	1,287r	17,604
Other sources	368r	-	81r	449
Imports	37,382	6,349	144	43,875
Exports	-357	-139	-104	-599
Marine bunkers	-	-	-	-
Stock change *(1)*	-3,473	+414	-51	-3,110r
Transfers	-	-	-	-
Total supply	**49,930**	**6,931**	**1,358**	**58,219r**
Statistical difference *(2)*	91	-114	-104	-127
Total demand	**49,840r**	**7,045**	**1,461r**	**58,346r**
Transformation	**47,496r**	**7,045**	**1,134**	**55,675r**
Electricity generation	46,991r	-	817	47,808r
Major power producers	45,436r	-	817	46,252r
Autogenerators	1,556r	-	-	1,556r
Heat generation	500r	-	-	500r
Petroleum refineries	-	-	-	-
Coke manufacture	-	5,875	-	5,875
Blast furnaces	-	1,170	-	1,170
Patent fuel manufacture and low temperature carbonisation	5	-	317	322r
Energy industry use	**5**	**-**	**-**	**5**
Electricity generation	-	-	-	-
Oil and gas extraction	-	-	-	-
Petroleum refineries	-	-	-	-
Coal extraction	5	-	-	5
Coke manufacture	-	-	-	-
Blast furnaces	-	-	-	-
Patent fuel manufacture	-	-	-	-
Pumped storage	-	-	-	-
Other	-	-	-	-
Losses	**-**	**-**	**-**	**-**
Final consumption	**2,339**	**-**	**327r**	**2,665r**
Industry	**1,777r**	**-**	**162r**	**1,939r**
Unclassified	-	-	-	-
Iron and steel	2	-	67	69r
Non-ferrous metals	33	-	-	33
Mineral products	1,149	-	1	1,150
Chemicals	102	-	-	102r
Mechanical engineering etc	14	-	-	14
Electrical engineering etc	6	-	-	6
Vehicles	48	-	-	48
Food, beverages etc	27	-	11	39
Textiles, leather, etc	76	-	-	76
Paper, printing etc	149	-	-	149
Other industries	129	-	82	212
Construction	43	-	-	43r
Transport	**7**	**-**	**-**	**7**
Air	-	-	-	-
Rail	7	-	-	7
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**554**	**-**	**165**	**719r**
Domestic	521	-	164	684
Public administration	14	-	-	14
Commercial	10	-	-	10
Agriculture	10	-	-	10r
Miscellaneous	0	-	1	1
Non energy use	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).

(2) Total supply minus total demand.

2.3 Commodity balances 2007

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	..	266	..	16,540
Other sources	..	-	..	467
Imports	35,746	7,481r	137	43,364r
Exports	-428	-13	-103	-544
Marine bunkers	-	-	-	-
Stock change *(1)*	..	-533r	..	+3,076r
Transfers	-	-	-	-
Total supply	**..**	**7,202r**	**..**	**62,904r**
Statistical difference *(2)*	..	28r	..	-125r
Total demand	**54,609r**	**7,174r**	**1,246r**	**63,029r**
Transformation	**52,279r**	**7,174r**	**981r**	**60,434r**
Electricity generation	51,798	-	716	52,515
Major power producers	50,315	-	716	51,031
Autogenerators	1,480r	-	-	1,480r
Heat generation	485r	-	-	485
Petroleum refineries	-	-	-	-
Coke manufacture	-	5,932r	-	5,932r
Blast furnaces	-	1,242	-	1,242
Patent fuel manufacture and low temperature carbonisation	-	-	265r	265r
Energy industry use	**5**	**-**	**1**	**5**
Electricity generation	-	-	-	-
Oil and gas extraction	-	-	-	-
Petroleum refineries	-	-	-	-
Coal extraction	5	-	1	5
Coke manufacture	-	-	-	-
Blast furnaces	-	-	-	-
Patent fuel manufacture	-	-	-	-
Pumped storage	-	-	-	-
Other	-	-	-	-
Losses	**-**	**-**	**-**	**-**
Final consumption	**2,302r**	**-**	**262**	**2,590r**
Industry	**1,836r**	**-**	**76**	**1,912r**
Unclassified	-	-	-	-
Iron and steel	-	-	-	75r
Non-ferrous metals	..	-	..	36
Mineral products	..	-	..	1,150
Chemicals	..	-	..	119r
Mechanical engineering etc	..	-	..	10
Electrical engineering etc	..	-	..	6
Vehicles	..	-	..	49
Food, beverages etc	..	-	..	41
Textiles, leather, etc	..	-	..	74
Paper, printing etc	..	-	..	144
Other industries	..	-	..	208
Construction	-	-	-	-
Transport	**4**	**-**	**-**	**4**
Air	-	-	-	-
Rail	4	-	-	4
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	..	**-**	..	**675r**
Domestic	462	-	186	648
Public administration	..	-	..	14
Commercial	..	-	..	6
Agriculture	..	-	..	4
Miscellaneous	..	-	..	2
Non energy use	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).

(2) Total supply minus total demand.

2.4 Commodity balances 2009

Manufactured fuels

	Thousand tonnes				GWh		
	Coke oven coke	Coke breeze	Other manuf. solid fuel	Total manuf. solid fuel	Benzole and tars *(5)*	Coke oven gas	Blast furnace gas
Supply							
Production *(1)*	3,663	29	303	3,996	1,536	8,010	11,366
Other sources	-	-	-	-	-	-	-
Imports	140	38	6	184	-	-	-
Exports	-97	-49	-31	-177	-	-	-
Marine bunkers	-	-	-	-	-	-	-
Stock change *(2)*	-79	+91	-10	2	-	-	-
Transfers *(3)*	-784	+784	-	-	-	+369	-15
Total supply	**2,843**	**893**	**268**	**4,004**	**1,536**	**8,379**	**11,351**
Statistical difference *(4)*	-	+1	-	-	-	-	-46
Total demand	**2,843**	**892**	**269**	**4,004**	**1,536**	**8,379**	**11,397**
Transformation	**2,755**	**426**	**-**	**3,180**	**-**	**3,044**	**6,531**
Electricity generation	-	-	-	-	-	2,626	6,352
Major power producers	-	-	-	-	-	-	-
Autogenerators	-	-	-	-	-	2,626	6,352
Heat generation	-	-	-	-	-	418	179
Petroleum refineries	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-
Blast furnaces	2,755	426	-	3,180	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-
Low temperature carbonisation	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**4,501**	**3,712**
Electricity generation	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	3,916	514
Blast furnaces	-	-	-	-	-	585	3,199
Patent fuel manufacture	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Losses	-	-	-	-	-	**76**	**733**
Final consumption	**88**	**466**	**269**	**824**	**1,536**	**758**	**421**
Industry	**78**	**466**	**-**	**544**	**1,536**	**758**	**421**
Unclassified	71	7	-	78	1,536	230	-
Iron and steel	7	460	-	466	-	528	421
Non-ferrous metals	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Other	**10**	**-**	**269**	**280**	-	-	-
Domestic	10	-	269	280	-	-	-
Public administration	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-
Non energy use	-	-	-	-	-	-	-

(1) See paragraph 2.44 - 2.48
(2) Stock fall (+), stock rise (-).
(3) Coke oven gas and blast furnace gas transfers are for synthetic coke oven gas, see paragraph 2.48.
(4) Total supply minus total demand.
(5) Because of the small number of benzole suppliers, figures for benzole and tars cannot be given separately.

2.5 Commodity balances 2008

Manufactured fuels

	Thousand tonnes				GWh		
	Coke oven coke	Coke breeze	Other manuf. solid fuel	Total manuf. solid fuel	Benzole and tars *(5)*	Coke oven gas	Blast furnace gas
Supply							
Production *(1)*	4,324	35	302	4,661	1,816r	9,410	15,345
Other sources	-	-	-	-	-	-	-
Imports	503	219	16	738	-	-	-
Exports	-111	-74	-25	-210	-	-	-
Marine bunkers	-	-	-	-	-	-	-
Stock change *(2)*	+285	-80	-	+206	-	-	-
Transfers *(3)*	-1,104	+1,104	-	-	-	+71	-3
Total supply	**3,897**	**1,205**	**293**	**5,395**	**1,816r**	**9,481**	**15,342**
Statistical difference *(4)*	-2	-	-	-3	-	+53r	-119r
Total demand	**3,900**	**1,204**	**294**	**5,398**	**1,816r**	**9,428r**	**15,461r**
Transformation	**3,796**	**567**	**-**	**4,363**	**-**	**2,681**	**7,900**
Electricity generation	-	-	-	-	-	2,263	7,721
Major power producers	-	-	-	-	-	-	-
Autogenerators	-	-	-	-	-	2,263	7,721
Heat generation	-	-	-	-	-	418	179
Petroleum refineries	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-
Blast furnaces	3,796	567	-	4,363	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-
Low temperature carbonisation	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**5,117r**	**4,759**
Electricity generation	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	4,349r	639
Blast furnaces	-	-	-	-	-	768	4,121
Patent fuel manufacture	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Losses	-	-	-	-	-	**413**	**2,332**
Final consumption	**104**	**638**	**294**	**1,036**	**1,816r**	**1,217r**	**470r**
Industry	**91r**	**638**	**-**	**729r**	**1,816r**	**1,217r**	**470r**
Unclassified	78r	16	-	94r	1,816r	207	-
Iron and steel	13	621	-	635	-	1,010r	470r
Non-ferrous metals	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Other	**12r**	**-**	**294**	**307r**	-	-	-
Domestic	12r	-	294	307r	-	-	-
Public administration	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-
Non energy use	-	-	-	-	-	-	-

(1) See paragraph 2.44 - 2.48

(2) Stock fall (+), stock rise (-).

(3) Coke oven gas and blast furnace gas transfers are for synthetic coke oven gas, see paragraph 2.48.

(4) Total supply minus total demand.

(5) Because of the small number of benzole suppliers, figures for benzole and tars cannot be given separately.

2.6 Commodity balances 2007

Manufactured fuels

	Thousand tonnes				GWh		
	Coke oven coke	Coke breeze	Other manuf. solid fuel	Total manuf. solid fuel	Benzole and tars *(5)*	Coke oven gas	Blast furnace gas
Supply							
Production *(1)*	4,451	25	227	4,703	1,838r	9,651	16,701
Other sources	-	-	-	-	-	-	-
Imports	745	325	13	1,083	-	-	-
Exports	-105	-152	-7	-264	-	-	-
Marine bunkers	-	-	-	-	-	-	-
Stock change *(2)*	+34	-80	+2	-44	-	-	-
Transfers *(3)*	-1,115	+1,115	-	-	-	+81	-3
Total supply	**4,010**	**1,233**	**235**	**5,478**	**1,838r**	**9,732**	**16,698**
Statistical difference *(4)*	-14	+3	-	-10	-	+47	-113
Total demand	**4,024**	**1,229**	**235**	**5,488r**	**1,838r**	**9,685**	**16,811**
Transformation	**3,910**	**483**	**-**	**4,392**	**-**	**2,671r**	**9,102r**
Electricity generation	-	-	-	-	-	2,253r	8,922r
Major power producers	-	-	-	-	-	-	-
Autogenerators	-	-	-	-	-	2,253r	8,922r
Heat generation	-	-	-	-	-	418	179
Petroleum refineries	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-
Blast furnaces	3,910	483	-	4,392	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-
Low temperature carbonisation	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**5,170**	**5,082**
Electricity generation	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	4,228	703
Blast furnaces	-	-	-	-	-	942	4,379
Patent fuel manufacture	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Losses	-	-	-	-	-	**445**	**2,071**
Final consumption	**114**	**747**	**235**	**1,096r**	**1,838r**	**1,399r**	**557r**
Industry	**99**	**747**	**-**	**846**	**1,838r**	**1,399r**	**557r**
Unclassified	76	13	-	89	1,838r	221	-
Iron and steel	23	734	-	757	-	1,178r	557r
Non-ferrous metals	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Other	**15**	**-**	**235**	**249**	-	-	-
Domestic	15	-	235	249	-	-	-
Public administration	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-
Non energy use	-	-	-	-	-	-	-

(1) See paragraph 2.44 - 2.48

(2) Stock fall (+), stock rise (-).

(3) Coke oven gas and blast furnace gas transfers are for synthetic coke oven gas, see paragraph 2.48.

(4) Total supply minus total demand.

(5) Because of the small number of benzole suppliers, figures for benzole and tars cannot be given separately.

2.7 Supply and consumption of coal

Thousand tonnes

	2005	2006	2007	2008	2009
Supply					
Production	20,008	18,079	16,540	17,604	17,374
Deep-mined	9,563	9,444	7,674	8,096	7,520
Opencast	10,445	8,635	8,866	9,509	9,854
Other sources *(1)*	490	438	467	449	500
Imports	43,968	50,528r	43,364r	43,875	38,167
Exports	-536	-443	-544	-599	-646
Stock change *(2)*	-2,151	-1,262	+3,076r	-3,110r	-6,608
Total supply	**61,780**	**67,340r**	**62,904r**	**58,219r**	**48,786**
Statistical difference *(3)*	-72r	-232r	-125r	-127r	-19
Total demand	**61,852r**	**67,572r**	**63,029r**	**58,346r**	**48,805**
Transformation	**59,392**	**65,220r**	**60,434r**	**55,675r**	**46,271**
Electricity generation	52,058	57,438	52,511r	47,808r	39,678
Major power producers	50,582	55,926r	51,031	46,252r	38,262
Autogenerators	1,476	1,511	1,480r	1,556r	1,416
Heat generation	459	457	485r	500r	465
Coke manufacture	5,570	5,929	5,932r	5,875	4,936
Blast furnaces	1,039	1,121	1,242	1,170	852
Patent fuel manufacture and low temperature carbonisation	266	276	265r	322r	340
Energy industry use	**6**	**4**	**5**	**5**	**5**
Coal extraction	6	4	5	5	5
Final consumption	**2,455r**	**2,349r**	**2,590r**	**2,665r**	**2,530**
Industry	**1,781**	**1,750r**	**1,912r**	**1,939r**	**1,760**
Unclassified	-	-	-	-	-
Iron and steel	-	1	75r	69r	60
Non-ferrous metals	41	60	36	33	28
Mineral products	1,120	1,047	1,150	1,150	1,077
Chemicals	132	131r	119r	102r	93
Mechanical engineering etc	12	12	10	14	14
Electrical engineering etc	5	6	6	6	5
Vehicles	55	53	49	48	46
Food, beverages etc	26	25	41	39	48
Textiles, clothing, leather, etc	71	70	74	76	69
Pulp, paper, printing etc	142	141	144	149	124
Other industries	178	205	208	212	191
Construction	-	-	-	43	4
Transport	**4**	**4**	**4**	**7**	**9**
Other	**669r**	**595**	**675r**	**719r**	**761**
Domestic	614	559	648	684	686
Public administration	38r	20	14	14	24
Commercial	6	6	6	10	49
Agriculture	9	5	4	10r	-
Miscellaneous	2	5	2	1	3
Non energy use	-	-	-	-	-
Stocks at end of year *(4)*					
Distributed stocks	14,527	16,442	13,420r	16,408r	22,640
Of which:					
Major power producers	12,696	14,813	11,179	14,863	21,770
Coke ovens	1,317	962	1,479r	1,065r	806
Undistributed stocks	1,101	783	734r	854r	1,450
Total stocks *(5)*	**15,628**	**17,226**	**14,155r**	**17,262r**	**24,090**

(1) Estimates of slurry etc. recovered from ponds, dumps, rivers, etc.
(2) Stock fall (+), stock rise (-).
(3) Total supply minus total demand.
(4) Excludes distributed stocks held in merchants' yards, etc., mainly for the domestic market, and stocks held by the industrial sector.
(5) For some years, closing stocks may not be consistent with stock changes, due to additional stock adjustments

2.8 Supply and consumption of coke oven coke, coke breeze and other manufactured solid fuels

Thousand tonnes

	2005	2006	2007	2008	2009
Coke oven coke					
Supply					
Production	4,105	4,384	4,451	4,324	3,663
Imports	674	748	745	503	140
Exports	-64	-94	-105	-111	-97
Stock change *(1)*	-94	-237	+34	+285	-79
Transfers	-983	-955	-1,115	-1,104	-784
Total supply	**3,638**	**3,846**	**4,010**	**3,897**	**2,843**
Statistical difference *(2)*	-2	-1	-14	-2	-
Total demand	**3,639**	**3,847**	**4,024**	**3,900**	**2,843**
Transformation	**3,516**	**3,745**	**3,910**	**3,796**	**2,755**
Blast furnaces	3,516	3,745	3,910	3,796	2,755
Energy industry use	**-**	**-**	**-**	**-**	**-**
Final consumption	**123**	**102**	**114**	**104**	**88**
Industry	**89**	**80**	**99**	**91r**	**78**
Unclassified	67	53	76	78r	71
Iron and steel	22	26	23	13	7
Non-ferrous metals	**-**	**-**	**-**	**-**	**-**
Other	**34**	**22**	**15**	**12r**	**10**
Domestic	34	22	15	12r	10
Stocks at end of year *(3)*	**413**	**650**	**616**	**331**	**296**
Coke breeze					
Supply					
Production *(4)*	259	245	25	35	29
Imports	235	261	325	219	38
Exports	-55	-74	-152	-74	-49
Stock change *(1)*	-59	+25	-80	-80	+91
Transfers	+983	955	1,115	1,104	784
Total supply	**1,363r**	**1,411**	**1,233**	**1,205**	**893**
Statistical difference *(2)*	-1r	-4	+3	**-**	+1
Total demand	**1,364r**	**1,415**	**1,229**	**1,204**	**892**
Transformation	**568r**	**688**	**483**	**567**	**426**
Coke manufacture	**-**	**-**	**-**	**-**	**-**
Blast furnaces	568r	688	483	567	426
Energy industry use	**-**	**-**	**-**	**-**	**-**
Final consumption	**796**	**727**	**747**	**638**	**466**
Industry	**796**	**727**	**747**	**638**	**466**
Unclassified	14	26	13	16	7
Iron and steel	782	701	734	621	460
Stocks at end of year *(3)*	**418**	**394**	**473**	**553**	**196**
Other manufactured solid fuels					
Supply					
Production	258	260	227	302	303
Imports	6	10	13	16	6
Exports	-15	-12	-7	-25	-31
Stock change *(1)*	+6	+2	+2	**-**	-10
Total supply	**254**	**260**	**235**	**293**	**268**
Statistical difference *(2)*	-2	+3	+0	-1	-1
Total demand	**256**	**257**	**235**	**294**	**269**
Transformation	**-**	**-**	**-**	**-**	**-**
Energy industry use	**-**	**-**	**-**	**-**	**-**
Patent fuel manufacture	**-**	**-**	**-**	**-**	**-**
Final consumption	**256**	**257**	**235**	**294**	**269**
Industry	**-**	**-**	**-**	**-**	**-**
Unclassified	**-**	-	-	-	-
Other	**256**	**257**	**235**	**294**	**269**
Domestic	256	257	235	294	269
Stocks at end of year *(3)*	**24**	**25**	**27**	**26**	35

(1) Stock fall (+), stock rise (-).
(2) Total supply minus total demand.
(3) Producers stocks and distributed stocks.
(4) See paragraph 2.13

2.9 Supply and consumption of coke oven gas, blast furnace gas, benzole and tars

GWh

	2005	2006	2007	2008	2009
Coke oven gas					
Supply					
Production	9,290	9,825r	9,651	9,410	8,010
Imports	-	-	-	-	
Exports	-	-	-	-	
Transfers *(1)*	+53	+57r	+81	+71	+369
Total supply	**9,343**	**9,882**	**9,732**	**9,481**	**8,379**
Statistical difference *(2)*	+64	+76	+47	+53r	-
Total demand	**9,279**	**9,806**	**9,685**	**9,428r**	**8,379**
Transformation	**2,625**	**2,593**	**2,671r**	**2,681**	**3,044**
Electricity generation	2,207	2,175	2,253r	2,263	2,626
Heat generation	418	418	418	418	418
Other	-	-	-	-	-
Energy industry use	**5,064**	**5,300**	**5,170**	**5,117r**	**4,501**
Coke manufacture	4,321	4,282	4,228	4,349r	3,916
Blast furnaces	743	1,019	942	768	585
Other	-	-	-	-	-
Losses	**441**	**483**	**445**	**413**	**76**
Final consumption	**1,149**	**1,430**	**1,399r**	**1,217r**	**758**
Industry	**1,149**	**1,430**	**1,399r**	**1,217r**	**758**
Unclassified	236	194	221	207	230
Iron and steel	913	1,236	1,178r	1,010r	528
Blast furnace gas					
Supply					
Production	16,199	16,443	16,701	15,345	11,366
Imports	-	-	-	-	-
Exports	-	-	-	-	-
Transfers *(1)*	-2	-2	-3	-3	-15
Total supply	**16,197**	**16,441**	**16,698**	**15,342**	**11,351**
Statistical difference *(2)*	-107	-119	-113	-119r	-46
Total demand	**16,304**	**16,560**	**16,811**	**15,461r**	**11,397**
Transformation	**9,490**	**9,249**	**9,102r**	**7,900**	**6,531**
Electricity generation	9,310	9,070	8,922r	7,721	6,352
Heat generation	179	179	179	179	179
Other	-	-	-	-	-
Energy industry use	**4,474**	**4,831**	**5,082**	**4,759**	**3,712**
Coke manufacture	285	536	703	639	514
Blast furnaces	4,189	4,294	4,379	4,121	3,199
Other	-	-	-	-	-
Losses	**2,014**	**1,578**	**2,071**	**2,332**	**733**
Final consumption	**326**	**902**	**557r**	**470r**	**421**
Industry	**326**	**902**	**557r**	**470r**	**421**
Unclassified	-	-	-	-	-
Iron and steel	326	902	557r	470r	421
Benzole and tars *(3)*					
Supply					
Production	1,749r	1,873	1,838r	1,816r	1,536
Final consumption *(4)*	**1,749r**	**1,873**	**1,838r**	**1,816r**	**1,536**
Unclassified	1,749r	1,873	1,838r	1,816r	1,536
Iron and steel	-	-	-	-	-

(1) To and from synthetic coke oven gas, see paragraph 2.48.
(2) Total supply minus total demand.
(3) Because of the small number of benzole suppliers, figures for benzole and tars cannot be given separately.
(4) From 2000 Iron and steel under final consumption has been reclassified due to additional information being received.

2.10 Deep mines in production at 31 December 2009[(1)]

Licensee	Site	Location
Blanentillery Mining Partnership	Blanentillery No.2 Colliery	Torfaen
Eckington Colliery Partnerships	Eckington Colliery	Derbyshire
Energybuild Mining Ltd	Aberpergwm Colliery	Neath Port Talbot
J Flack Ltd	Hay Royds Colliery	Kirklees
Maltby Colliery Ltd	Maltby Colliery	Rotherham
NH Colliery Ltd	Nant Hir No.2 Colliery	Neath Port Talbot
Powerfuel Mining Ltd	Hatfield Colliery	Doncaster
Ray Ashly, Richard Daniels and Neil Jones	Monument Colliery	Gloucestershire
S Harding & R Harding	Cannop Drift Mine	Gloucestershire
UK Coal Mining Ltd	Daw Mill Colliery	Warwickshire
	Kellingley Colliery	North Yorkshire
	Thoresby Colliery	Nottinghamshire
	Welbeck Colliery	Nottinghamshire

(1) In addition, at 31 December 2009, there were:

4 mines developing -
Ayle Colliery, owned by Ayle Colliery Company Ltd, in Northumberland
Gleison Colliery, owned by Coal Direct Ltd, in Neath Port Talbot
Johnson Mine, owned by Riche UK Mining Ltd, in Torfaen
Unity Mine, owned by Unity Mine Ltd, in Neath Port Talbot

Source: The Coal Authority

2.11 Opencast sites in production at 31 December 2009[1]

Licensee	Site Name	Location
Aardvaark TMC Ltd	Glenmuckloch	Dumfries & Galloway
(trading as ATH Resources)	Muir Dean	Fife
	Skares Road	East Ayrshire
Bryn Bach Coal Ltd	Cwm Yr Onen Colliery Reclamation	Neath Port Talbot
Celtic Energy Ltd	East Pit	Neath Port Talbot
	Nant Helen	Powys
Energybuild Ltd	Nant-y-Mynydd Site	Neath Port Talbot
H J Banks (Mining) Ltd	Shotton	Northumberland
Hall Construction Services Ltd	Wilsontown	South Lanarkshire
Kier Minerals Ltd	Greenburn Project	East Ayrshire
Miller Argent (South Wales) Ltd	Ffos-y-Fran Land Reclamation Scheme	Merthyr Tydfil
Provectus Remediation Ltd	Former Biwater Works	Derbyshire
Shires Developments (Engine) Ltd	Engine	Derbyshire
The Scottish Coal Company Ltd	Borken Cross	South Lanarkshire
	Chalmerston	East Ayrshire
	Chapelhill Site	South Lanarkshire
	Glentaggart	South Lanarkshire
	Greenbank (St Ninians)	Fife
	House of Water	East Ayrshire
	Powharnal	East Ayrshire
	Shewington	Midlothian
	Spireslack Revised	East Ayrshire
UK Coal Mining Ltd	Cutacre	Bolton
	Lodge House	Derbyshire
	Long Moor	Leicestershire
	Steadsburn	Northumberland

(1) In addition, at 31 December 2009, there were:

9 mines developing -
Mossband Farm Quarry, owned by Benhar Developments Ltd, in North Lanarkshire
Selar, owned by Celtic Energy Ltd, in Neath Port Talbot
Temple Quarry, owned by Holgate Aggregates Ltd, in Kirklees
Methley Quarry, owned by Lafarge Aggregates Ltd, in Leeds
Caughley Quarry, owned by Parkhill Estates Ltd, in Shropshire

Bwich Ffos, owned by Tarmac Ltd, in Neath Port Talbot
House of Water Tappet Hill Extension, owned by The Scottish Coal Company Ltd, in East Ayrshire
Grasshill/Spireslack, owned by The Scottish Coal Company Ltd, in East Ayrshire
Potland Burn, owned by UK Coal Mining Ltd, in Northumberland

Source: The Coal Authority

Chapter 3
Petroleum

Introduction

3.1 This chapter contains commodity balances covering the supply and disposal of primary oils (crude oil and natural gas liquids), feedstocks (including partly processed oils) and petroleum products in the UK during the period 2007 to 2009. These balances are given in Tables 3.1 to 3.4. Additional data have been included in supplementary tables on areas not covered by the format of the balances. This extra information includes details on refinery capacities and aggregates for refinery operations, as well as additional detail on deliveries into consumption, including breakdowns by sector and industry.

3.2 Statistics of imports and exports of crude oil, other refinery feedstocks and petroleum products, refinery receipts, refinery throughput and output and deliveries of petroleum products are obtained from the United Kingdom oil industry and the Department of Energy and Climate Change's (DECC) Petroleum Production Reporting System.

3.3 The annual figures relate to calendar years or the end of calendar years. Unless otherwise stated, the data in the tables cover the United Kingdom.

3.4 Information on long-term trends (Tables 3.1.1 and 3.1.2) and the annex on the oil and gas resources in the UK (Annex F) provide a more complete picture of the UK oil and gas production sector and are only available in the internet version of this publication which can be found on the DECC web site at www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

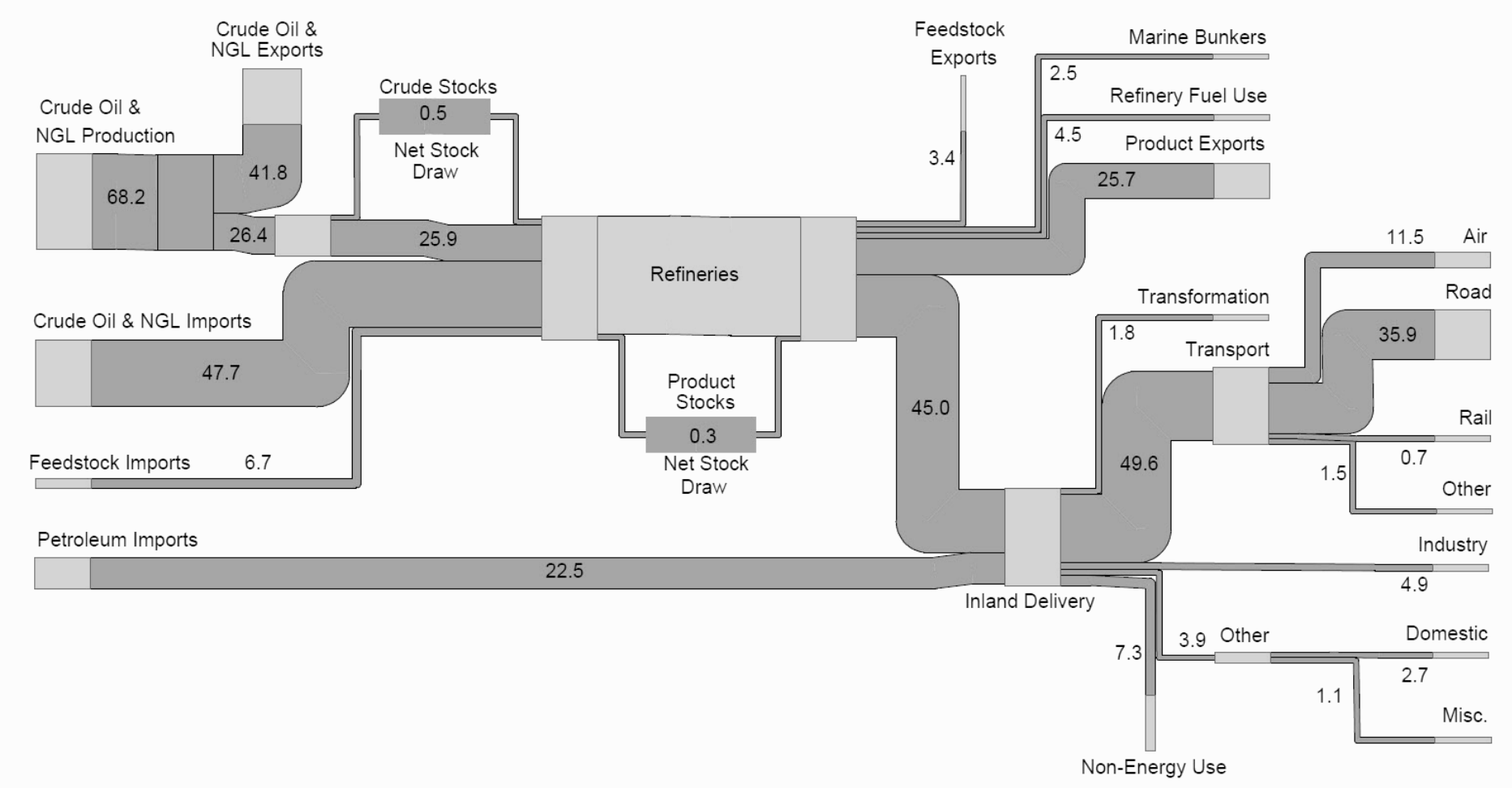
3.5 A flow chart of the movement of crude oil, other refinery feedstocks and petroleum products for 2009 has been provided, showing the flow from indigenous production and imports to eventual uses. The flows are measured in million tonnes and the width of the bands are approximately proportional to the size of the flow they represent.

Commodity balances for primary oil (Table 3.1)

3.6 This table shows details of the production, supply and disposals of primary oils (crude oil and natural gas liquids (NGLs)) and feedstocks in 2007, 2008 and 2009. The table examines the supply chain from the production of oil and NGLs, recorded by individual oil terminals and oil fields, to their disposal to export or to UK refineries (see Annex F, Table F.2 on DECC's energy statistics web site). It also covers the use of these primary oils as recorded by the refineries. Therefore the statistical difference in the tables represents the differences between data reported by these different sources and the sites of production and consumption.

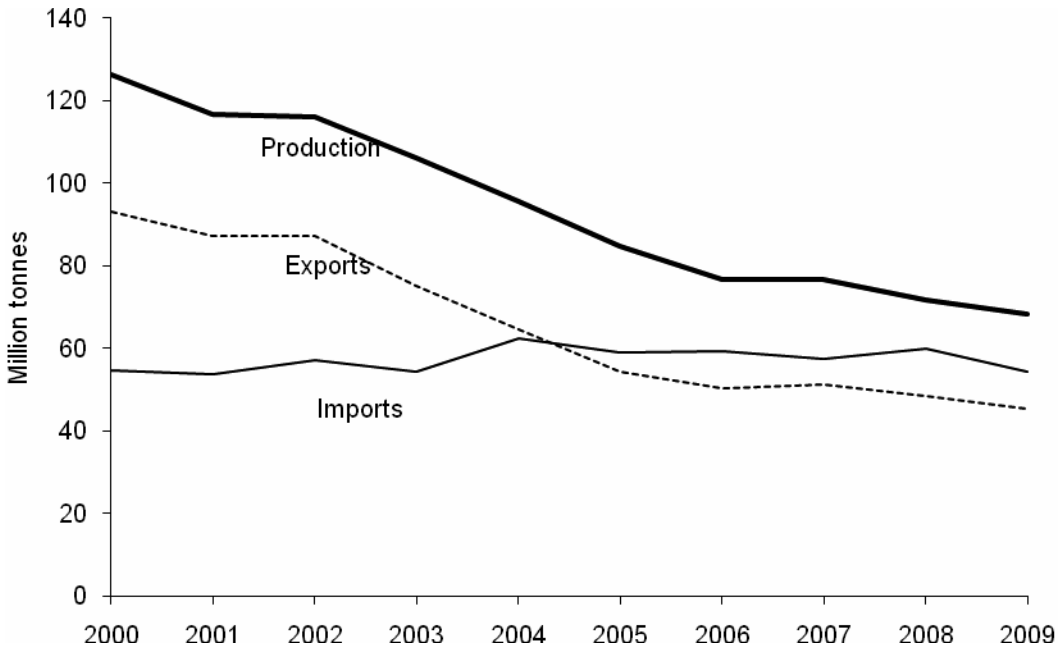
3.7 Production from the United Kingdom Continental Shelf (UKCS) peaked in 1999 but has been in general decline since. Chart 3.1 illustrates recent trends in production, imports and exports of crude oil, NGLs and feedstocks. It shows that crude oil exports have fallen in line with the decline in production whilst imports have risen gradually. Gross production of crude oil and NGLs in 2009 was 68 million tonnes, 3 million tonnes lower than 2008 and half the peak production level of 137 million tonnes in 1999. In 2009 about two-thirds of the United Kingdom's primary oil production was exported, with imported crude oil accounting for about three quarters of refinery intake. Crude oil imports are down significantly on 2008, with both the suspension of refinery production at North Tees and the global economic downturn contributing to this reduction. Feedstocks (including partly processed oils) made up 12 per cent of total imports of oil in 2009. Total primary oil imports in 2009 decreased 9 per cent in comparison to 2008, while exports fell by 7 per cent to 45 million tonnes. Since 2005, the UK has returned to being a net-importer of primary oils, by 9 million tonnes in 2009. Exports in 2009 were 17 per cent lower than imports. In 2008, exports were 19 per cent lower than imports. Further declines in exports and increases in imports will be seen as indigenous production continues to decline. Even so, primary oil exports will continue to make a significant contribution to the UK economy (see Annex G on DECC's energy statistics web site).

Petroleum Flow Chart 2009 (million tonnes)



Note:
This flow chart is based on the data that appear in Tables 3.1 and 3.2.
The numbers on either side of the flow chart will not match due to losses in transformation.

Chart 3.1: Production, imports and exports of primary oils 2000 to 2009



3.8 The UK imports crude oil for various commercial reasons. Primarily, refineries consider the type of crude oil rather than its source origin. Most UK refineries use North Sea 'type' crude and do not differentiate between the UK and Norwegian sectors of the North Sea. Indeed, some UK refiners have production interests in both UK and Norwegian waters, so the company may own the imported crude at the point of production. The close proximity of some UK and Norwegian oil fields mean that they may use the same pipeline infrastructure, for example the Norpipe oil terminal in Teesside receives both UK and Norwegian crude from the North Sea. Some crude oils are specifically imported for the heavier hydrocarbons which they contain as these are needed for the manufacture of various petroleum products such as bitumen and lubricating oils. This is in contrast to most North Sea type crude which contains a higher proportion of the lighter hydrocarbon fuels resulting in higher yields of products such as motor spirit and other transport fuels. In recent years, UKCS receipts have averaged around 30 per cent of the oil received at the UK's refineries.

3.9 The 2009 energy balance in Table 3.1 shows that the overall statistical difference in the primary oil balance is plus 89 thousand tonnes. This means that the total quantities of crude oil and NGLs reported as being produced by the individual UK production fields are 89 thousand tonnes (0.1 per cent) less than the totals reported by UK oil companies as being received by refineries or going for export. The reasons for this are discussed later in paragraphs 3.76 to 3.86.

Commodity balances - Petroleum products (Tables 3.2 to 3.4)

3.10 These tables show details of the production, supply and disposals of petroleum products into the UK market in 2009, 2008 and 2007. The upper half of the table represents the supply side and calculates overall availability of the various products in the UK by combining production at refineries with trade (imports and exports), stock changes, product transfers and deliveries to international marine bunkers. The lower half of the table reports the demand side and covers the uses made of the different products, including the uses made within refineries as fuels in the refining process, and details of the amounts reported by oil companies within the UK as delivered for final consumption.

Supply of petroleum products

3.11 Total petroleum products (gross) output from UK refineries in 2009 was 75 million tonnes, which was 7 per cent (6 million tonnes) lower than the level in 2008 and 8 per cent lower than the 2007 level. This is the largest contraction in refinery output for more than a decade. Whilst fluctuations in refinery output can result from maintenance work, the economic slowdown and refinery shutdown contributed to this significantly lower output in 2009.

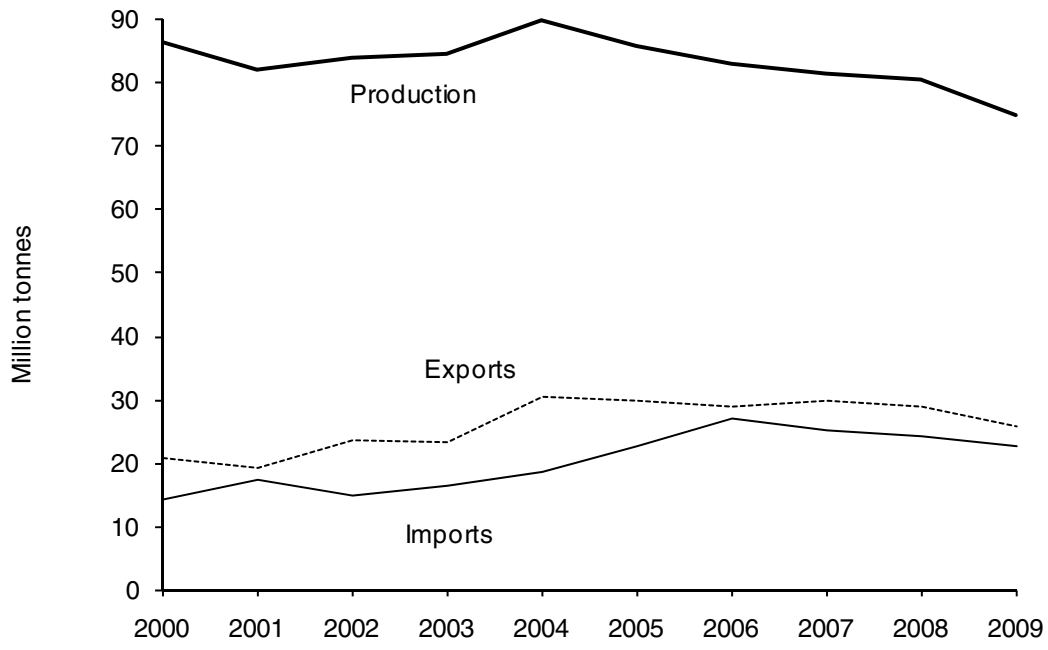
3.12 Individual products generally followed the overall decrease, but fuel oil and lubricants showed more significant downturns, registering decreases in output of 24 per cent and 32 per cent respectively. The production of motor spirit was against the general trend, and was very slightly up on the 2008 figures.

3.13 UK domestic production of individual petroleum products is increasingly no longer aligned with the domestic market demand. While UK has surplus production of motor spirit and fuel oil, it produces insufficient aviation turbine fuel. Aviation turbine fuel and gas/diesel oil are extracted from the same fraction of crude oil (middle distillates), though to different quality criteria. Therefore, as the production of one increases there is less of this fraction of crude oil available for production of the other. More information on refinery capacity in the UK and refinery capacity utilisation is given in paragraphs 3.61 and 3.62.

Production, imports and exports of petroleum products

3.14 Chart 3.2 shows imports and exports of petroleum products along with production. Imports of products increased to 2006, but have tailed off in recent years. The UK is still a net exporter of petroleum products by 3 million tonnes in 2009 and refinery infrastructure suggests that exports will continue to be significant for sometime.

Chart 3.2: Production, imports and exports of petroleum products 2000 to 2009



3.15 The UK has been a net exporter of oil products every year since 1974, with the exception of 1984 due to the effects of the industrial action in the coal-mining sector. Exports of petroleum products were 26 million tonnes in 2009, 11 per cent lower than in 2008 and 14 per cent lower than in 2007. Imports of oil products into the UK were 22 million tonnes in 2009, which were 7 per cent lower than in 2008 and 11 per cent lower than in 2007. Overall, the UK net exports were 3 million tonnes in 2009, down from 5 million tonnes reported in 2008 and 2007. Additional analysis of the exports and imports of oil products is given in the long term trends internet section (paragraphs 3.1.2-3.1.9) and additional details about trends in UK oil production are given in Annex F on DECC's energy statistics web site.

3.16 Differences in product types explain why the UK imports petroleum products when there is an overall surplus available for export. Exports in 2009 were mainly made up of motor spirit (8 million tonnes), gas/diesel oil (6 million tonnes) and fuel oil (6 million tonnes), whereas imports consisted of aviation turbine fuel (8 million tonnes), motor spirit (3 million tonnes) and gas/diesel oil (7 million

seasonally high demand or to cover production shortfalls in refinery shutdowns for maintenance.

3.17 For gas/diesel oil, exports from the UK tend to be of lower grades for use as heating fuels, while imports tend to be of higher-grade gas/diesel oil with a low sulphur content. With the introduction of low sulphur Diesel Engined Road Vehicle (DERV) fuel and motor spirit into the UK market and the required increased production capacity at UK refineries for these fuels, UK imports of these products increased to meet the shortfall. As noted above, aviation turbine fuel is imported simply because the UK cannot make enough of it to meet demand, since it is derived from the same sort of hydrocarbons as gas/diesel oil, and as such there is a physical limit to how much can be made from the amount of oil processed in the UK.

3.18 More information on the structure of refineries in the UK and trends in imports and exports of crude oil and oil products is given in the long-term trends section on DECC's energy statistics web site (Table 3.1.1).

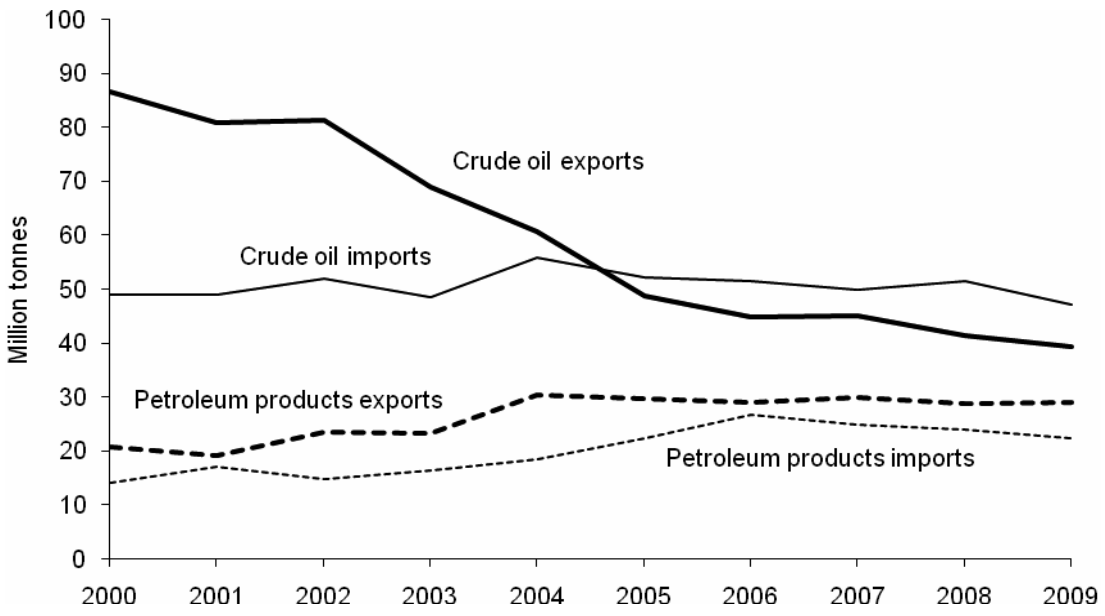
3.19 The United States remains one of the key markets for UK exports of oil products, with 21 per cent of total UK product exports destined to the US in 2009. Of the 5.4 million tonnes exported to the US in 2009, motor spirit comprised 92 per cent. The majority of UK product exports are however intra-EU, with the principal recipients in 2009 being the Netherlands, Ireland, Belgium, France and Spain. In 2009, the UK supplied 7 per cent of total US imports of all petroleum products and 10, 12 and 8 per cent respectively of total product imports into the Netherlands, Spain and France (mostly as gas oil for heating, motor spirit and fuel oil). In 2009, the UK supplied 89 per cent of total oil products imported into Ireland (principally motor spirit, jet kerosene and DERV fuel for transport, along with gas oil for heating). The main sources of the UK's imports of petroleum products in 2009 were the Netherlands, Belgium, France, Singapore and Sweden (source: HM Revenue and Customs; HMRC).

3.20 In 2009, 21 per cent of UK production of fuel oil and 3 per cent of gas oil/diesel production went into international marine bunkers, totalling 2 million tonnes of products; 3 per cent of the total UK refinery production in the year. These are fuel sales destined for consumption on ocean going vessels and therefore cannot be classified as being consumed within the UK. Correspondingly, these quantities are treated in a similar way to exports in the commodity balances. It should be noted that these quantities do not include deliveries of fuels for use in UK coastal waters, which are counted as UK consumption and are given in the figures of the transport section of the commodity balances.

Overall oil net imports/exports

3.21 Chart 3.3 compares the level of imports and exports of crude oil with those for petroleum products over the period 2000 to 2009. The chart shows that in 2005 the UK became a net importer of crude oil, and has remained so since that date. For petroleum products in 2009, the UK was a net exporter but overall for oil and oil products combined, the UK was a net importer in 2009, influenced mainly by the scale of crude oil imports.

Chart 3.3: Imports and exports of crude oil and petroleum products 2000 to 2009



Supply and disposal of products (Table 3.5)

3.22 Table 3.5 brings together the commodity balances for primary oils and for petroleum products into a single overall balance table. Bringing these data together highlights some of the issues faced when compiling these data and the need for a statistical difference, which is covered in paragraphs 3.76 to 3.86. When looking at the transfers from upstream to downstream, a loss in the refining process is expected.

Consumption of petroleum products

3.23 Tables 3.2 to 3.4 show the consumption of oil products during the period 2007 to 2009, by consumers (going down the tables) and for individual products (going across the tables). The tables show a reduction in consumption of 5 per cent, the largest single contraction since 1985. The economic slowdown would appear to be the largest driver of this contraction, and the final consumption of petroleum products in 2009 is broadly similar to that reported in 1983. Whilst consumption of petroleum products is down, biofuels consumption for transport purposes has shown increases that are not reflected here and would offset the drop in overall consumption to 4 per cent.

Consumption of petroleum products by product

3.24 Final consumption is dominated by three individual products; aviation turbine fuel, motor spirit and gas/diesel oil that between them made up 80 per cent of total final energy consumption in 2009. These three products are predominantly used as transport fuels although 10 per cent of gas/diesel oil is used by industry. More detail on transport fuels is given in paragraph 3.34 to 3.53.

3.25 Amongst the major fuels, fuel oil shows the largest decrease in 2009, down 20 per cent on 2008. Changes in fuel specification and price drivers are believed to be the major contributors to this decrease. Further detail on the consumption of fuel oil broken down by grade is given in Table 3.6.

Consumption of petroleum products by sector

3.26 Deliveries of petroleum products into consumption in the UK in 2009 (shown in Tables 3.2 to 3.4), including those used by the UK refining industry as fuels within the refining process and all other uses, totalled 72 million tonnes. This was 5 per cent lower than 2008 and 7 per cent lower than in 2007. Deliveries have declined in recent years from a 2005 peak, with the biggest drop between 2008 and 2009.

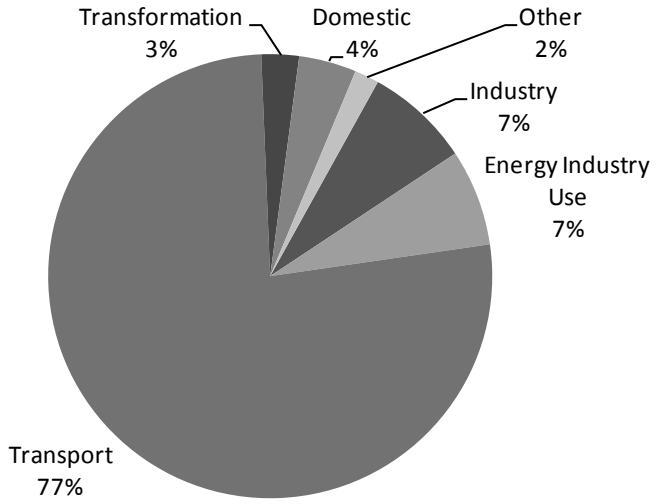
3.27 One of the most significant longer term non-transport changes in deliveries of products in the last twenty years has been the decline in use for electricity generation. Major electricity producers are using natural gas as their fuel of choice for electricity generation rather than oil-based fuels. There has also been a significant decline over the last ten years in heat generation by oil. From this edition of the Digest, data in Chapter 3 (Table 3.2 to 3.4) has been fully aligned with Chapter 5 (Electricity). The data on oil used for electricity generation collected from major power producers and autogenerators is judged to be more accurate than data from oil refiners about the destination of their deliveries. This has been revised back to 2005 so, when looking at the long term trends table (Table 3.1.2 on DECC's energy statistics website), there is a break in the time series at this point.

3.28 The data included under the blast furnaces heading of the Transformation sector represents fuel oil used in the manufacture of iron and steel which is directly injected into blast furnaces, as opposed to being used as a fuel to heat the blast furnaces. The fuel used for the latter (mostly gas oil) is included under the blast furnaces heading of the Energy Industry Use sector.

3.29 Other figures in the Energy Industry Use sector relate to uses within the UK refining industry in the manufacture of oil products. These are products either used as fuels during refining processes or products used by the refineries themselves as opposed to being sold to other consumers. It excludes any fuels used for the generation of electricity since these amounts are included in the Transformation sector totals. Given the interest in the total amounts of fuels used within refineries, Table 3.5 includes data on total refinery fuel usage (i.e. including that used in the generation of electricity) over the period 2005 to 2009.

3.30 Final consumption of oil products in 2009, i.e. excluding any uses by the energy industries themselves or for transformation purposes, amounted to 66 million tonnes, 4 million tonnes less than 2008 and 6 million tonnes less than 2007. Chart 3.4 shows the breakdown of consumption for energy uses by each sector in 2009, including energy industry use and transformation, but excluding non energy use.

Chart 3.4: Petroleum products used for energy (share by main sector) 2009



3.31 Consumption of products for non energy use decreased to just over 7 million tonnes in 2009, down by 8 per cent when compared to 2008, with non-energy products making up 11 per cent of final consumption of oil products. Additional detail on the non-energy uses of oil products, by product and by type of use where such information is available, is given in Table 3D and paragraphs 3.54 to 3.60 later in this text.

3.32 The total amount of oil products used by industry was in decline in the middle-1990s as industry moved away from using oil as an energy source. Since 1998, oil use by industry has been fairly constant at around 8 per cent of consumption.

3.33 Transport sector consumption in 2009 decreased by 4 per cent compared with 2008, and 7 per cent compared with 2007. This is largely due to a decline in commercial sales because of the recession but also due to biofuels taking an increased share relative to the hydrocarbon motor spirit and diesel. Final energy consumption by sectors other than transport and industry decreased by 4 per cent in 2009 compared with 2008. Changes in the consumption of fuels in transport are discussed in more detail below.

Transport fuels - information on inland deliveries of motor spirit and DERV (Table 3.6)

3.34 Table 3.6 provides details of the consumption of motor spirit, gas oil/diesel and fuel oils for the period 2005 to 2009. It includes information on retail and commercial deliveries of motor spirit and DERV fuel that cannot be accommodated within the structure of the commodity balances, but which are of interest. The table also includes additional details of the quantities of motor spirit and DERV fuel sold collectively by super/hypermarket companies in the UK.

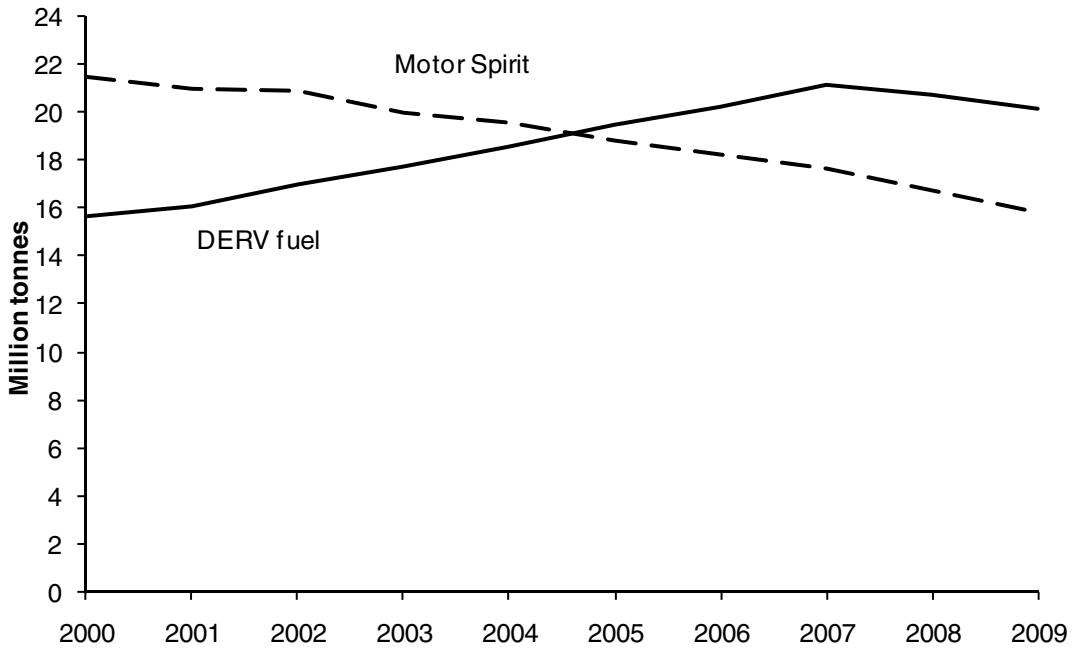
3.35 Table 3.6 no longer provides separate breakdowns for lead replacement and super premium unleaded petrol. The demand for lead replacement petrol has fallen sharply over the last ten years with people switching to premium unleaded. Additionally, the remaining demand for petrol with a higher octane rating has moved away from lead replacement to super premium unleaded. Demand for lead replacement petrol fell to less than 10 thousand tonnes in 2007 so, for simplicity, lead replacement and super premium unleaded have been combined. Biofuels are now covered in paragraphs 3.46 to 3.48 and Table 3B.

3.36 Hydrocarbon motor spirit deliveries in 2009 were 5 per cent down compared to 2008 and 10 per cent lower than in 2007. Deliveries of hydrocarbon DERV fuel were 3 per cent lower in 2009 compared to 2008, and 5 per cent lower than in 2007. With the inclusion of biodiesel, total DERV decreased by 2 per cent in 2009. Whilst DERV deliveries decreased, motor spirit deliveries again decreased at a higher rate.

3.37 Chart 3.5 shows how consumption of DERV fuel has steadily increased from 2000 to surpass deliveries of motor spirit in 2005 in weight terms. This is a result of a long-term shift to diesel engine vehicles. DERV is denser than motor spirit so the total weight of deliveries surpassed the weight of motor spirit deliveries before the volume did. The chart also shows the reduction in the consumption of motor spirit in the UK, which has been on a downward trend since 1990. Consumption of motor spirit in 2009 was a third lower than the peak of 24 million tonnes in 1990.

3.38 One feature of Chart 3.5 is the reduction in diesel deliveries in 2008 and 2009. There are a number of reasons for this, including the reduction in commercial use (see Table 3.6), largely brought about by lower performance of the UK economy; the use of biofuels; and higher prices. The Department for Transport's provisional Road Traffic Statistics show a decrease in car and heavy goods vehicle traffic between 2008 and 2009.

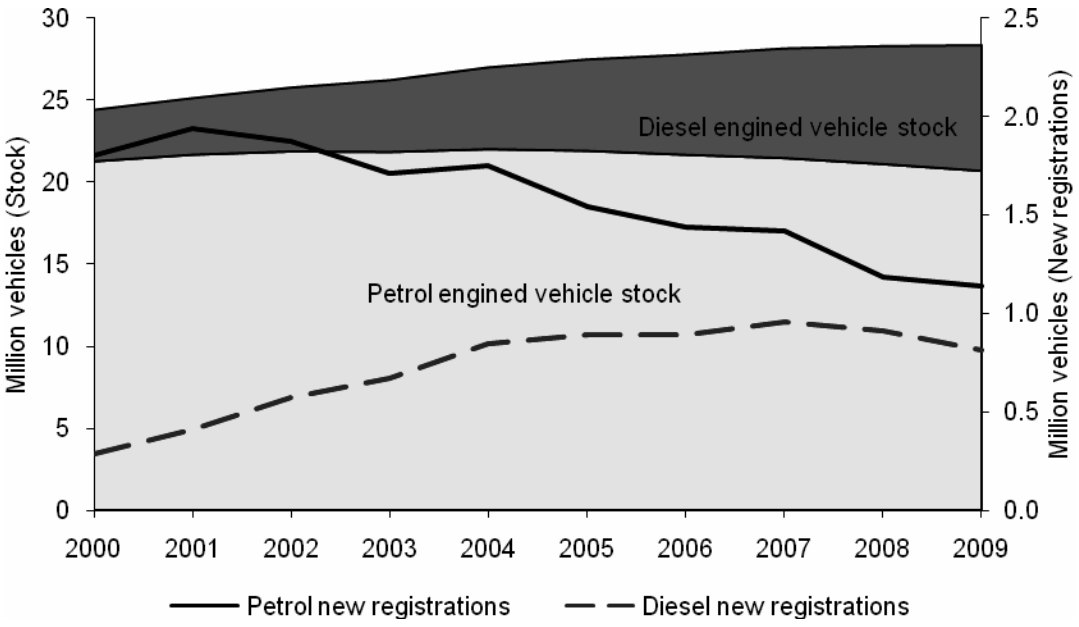
Chart 3.5: Deliveries of Motor Spirit and DERV fuel 2000 to 2009



3.39 Several factors are behind the differing trends seen for motor spirit and DERV fuel. For a number of years, the number of diesel-engined vehicles in use in the UK has been increasing. Diesel vehicles are more fuel-efficient than their petrol equivalents. In the National Travel Survey carried out by the Department for Transport, diesel-engined cars averaged 39 miles per gallon of fuel, compared with 31 miles per gallon for petrol-engined cars. Traditionally, the greater fuel-efficiency of diesel vehicles had been at the expense of higher purchase prices and a performance deficit when compared to petrol-engined equivalents. More recently, the purchase prices for diesel and petrol engined vehicles have become more alike, while improved technology has substantially reduced the performance deficit.

3.40 Chart 3.6 illustrates the switch from petrol to diesel engines in terms of vehicle licence registrations based on Driver and Vehicle Licensing Agency (DVLA) data. It contains details of vehicle licence registrations for private cars during each year for the period 2000 to 2009, broken down by type of engine. Whilst the number of petrol engined vehicles licensed fell by 3 per cent, the number of diesel engined vehicles licensed has increased 144 per cent in the same ten year period. The petrol engined vehicle stock remains greater than diesel; however its share has decreased from 87 per cent in 2000 to 73 per cent in 2009.

Chart 3.6: Private car registrations by type of engine 2000 to 2009



Source: Department for Transport

3.41 The chart also shows new registrations for petrol and diesel cars. Although more new petrol cars are registered each year than diesel, registrations for new petrol cars peaked in 2001 and have declined since, in contrast to registrations for new diesel cars that increased each year from 1999 to 2008 with a small decline in 2009. As the actual number of petrol engined vehicles on the road is relatively flat, new registrations are simply replacing losses. This turnover in the vehicle stock would suggest that the average fuel efficiency of the UK petrol vehicle stock would improve as newer vehicles tend to be more fuel efficient due to improved technology. This is supported by a comparison of the static petrol car population in chart 3.6 with the steady decline of motor spirit consumption illustrated in chart 3.5.

3.42 As part of their work to compile the UK National Atmospheric Emissions Inventory, AEA Energy and Environment has constructed estimates for the consumption of road transport fuels by different vehicle classes, and these are shown in Table 3A. The table shows the increasing share of DERV used by cars and light goods vehicles (vans).

Table 3A Estimated consumption of road transport fuels by vehicle class

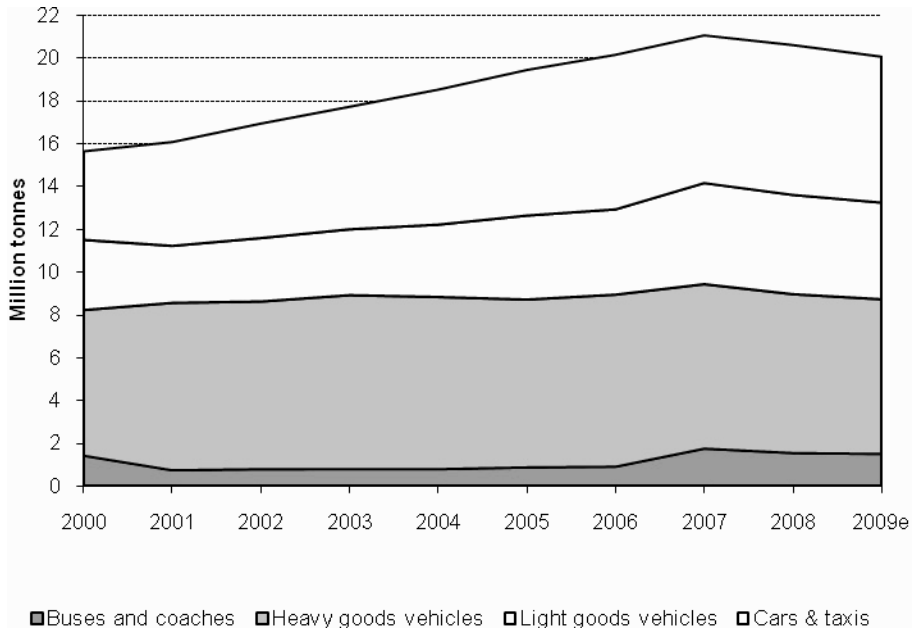
	1995	2000	2005	2008
Motor spirit:				
Cars and taxis	93%	95%	97%	97%
Light goods vehicles	7%	4%	2%	2%
Motor cycles etc	1%	1%	1%	1%
DERV:				
Cars and taxis	21%	27%	32%	34%
Light goods vehicles	15%	21%	23%	22%
Heavy goods vehicles	55%	44%	37%	36%
Buses and coaches	9%	9%	9%	7%

Source: AEA Energy and Environment

3.43 Chart 3.7 illustrates how demand for DERV fuel has increased since 2000. The most significant increase has been for use in cars and taxis, an increase of over a third since 2000 with their share of overall DERV increasing from 27 per cent in 2000 to 34 per cent in 2008. DERV consumption in goods vehicles (both light and heavy) has also increased. Bus and coach use has remained flat at around 1 million tonnes a year, meaning their share of demand has decreased.

3.44 In 2008, AEA revised their methodology for calculating the spilt of DERV demand between vehicle types. The time series in Chart 3.7 has been revised to reflect this. The change was due to a survey by the Department for Transport (National Travel Survey 2006, www.dft.gov.uk/pgr/statistics/datatablespublications/personal/) showing that diesel cars tend to have higher mileage than petrol cars. Previously the split had been made simply using vehicle licensing statistics. In order to keep total DERV consumption consistent with published DECC figures, the proportion of DERV demand by goods vehicles, buses and coaches has been revised downwards.

Chart 3.7: Demand for DERV fuel



3.45 Tables 3.2 to 3.4 include estimates for the use of gas for road vehicles. These estimates were based on information on the amounts of duty received by HMRC from the tax on gas used as a road fuel. It is estimated that some 107 thousand tonnes of gas (mostly butane or propane) was used in road vehicles in the UK in 2009. Although this is a very small use when compared to overall consumption of these fuels and the total consumption of fuels for road transport, the consumption of these gases for road transport grew rapidly until 2003, but has since remained broadly flat.

Biofuels

3.46 Biofuels have previously not been included in the commodity balances or the supplementary tables because information on them has been limited. Biofuels are not included in tables in this chapter, but are included in overall energy balances in Chapter 1. Given the increasing importance of biofuels, DECC are currently reviewing how biofuels should be treated in Chapter 3. HMRC has the best available information covering duty clearances or volumes on which excise duty has been paid which effectively equates to the deliveries reported in this chapter. Biodiesel clearances began in 2002 with bioethanol clearances commencing in 2005. The amounts reported are very small in comparison with overall DERV and petrol deliveries but have been increasing rapidly. Note that table 3B is based entirely on HMRC excise data and that there are small mismatches between the DERV and motor spirit volumes produced that are reported in the main tables in Chapter 3.

3.47 Table 3B shows biofuel clearances since they began in 2002. In 2009, biodiesel clearances were 1,044 million litres (up 18 per cent from 2008), while bioethanol clearances were 317 million litres (up by 54 per cent). Biodiesel represented 4.2 per cent of the total DERV delivered in the calendar year 2009, whilst bioethanol represented 1.4 per cent of the total motor spirit. Overall, biofuels represented 2.9 per cent of the total road fuels.

Table 3B: Consumption of Biodiesel and Bioethanol in the UK

Unit: Million litres

Year	Biodiesel	DERV	Biodiesel as % Diesel share	Bioethanol	Motor Spirit	Bioethanol as % Motor Spirit share	Biofuels as % of road fuels
2003	19	20,906	0.1%	0	27,393	0.0%	0.0%
2004	21	22,181	0.1%	0	27,025	0.0%	0.0%
2005	33	23,233	0.1%	85	25,608	0.3%	0.2%
2006	169	24,286	0.7%	95	24,672	0.4%	0.5%
2007	347	25,476	1.4%	152	24,045	0.6%	1.0%
2008	886	25,686	3.5%	206	22,709	0.9%	2.3%
2009	1,044	25,084	4.2%	317	22,027	1.4%	2.9%

Source: HM Revenue and Customs

3.48 The UK has an obligation to increase the level of biofuels in road transport to 3.4 per cent by the year ending April 2010, and 5.3 per cent by 2013/14. Further information about biofuels and the Renewable Transport Fuel Obligation (RTFO) can be found in paragraphs 7.26 to 7.30 and www.renewablefuelsagency.gov.uk/

Super/hypermarket share

3.49 Volumes of motor spirit sold by super/hypermarkets decreased by 10 per cent from 2008, whilst their DERV deliveries increased by 2 per cent. Sales by super/hypermarkets have taken a slightly larger share of retail deliveries (i.e. deliveries to final consumers) of motor spirit and DERV fuel in since 2005, as Table 3C shows. The share of total deliveries (i.e. including deliveries direct to commercial consumers) is shown in the second column.

Table 3C Super/hypermarkets share of retail deliveries, 2005 to 2009

per cent

	Motor spirit		DERV fuel	
	Share of retail	Share of total	Share of retail	Share of total
2005	37	36	29	16
2006	41	39	34	19
2007	41	39	34	20
2008	43	41	34	21
2009	41	39	35	22

3.50 The increases seen in recent years represent an increase in sales by super/hypermarket companies, although the percentage shares are also affected by the decline in the overall deliveries of motor spirit in the UK, as mentioned earlier.

Transport fuels - aviation

3.51 Data in Tables 3.2 to 3.4 show the changing amounts of aviation turbine fuel (ATF) kerosene being consumed in the UK between 2007 and 2009. The long term trends section on the internet (paragraph 3.1.12) discusses the trend seen since 1970 in the use of ATF kerosene in the UK. Deliveries in 2009 were 5 per cent lower than 2008 and 8 per cent lower than 2007.

3.52 Chart 3.8 shows annual deliveries of ATF kerosene in the UK over the last decade. The 11th September terrorist attacks on the United States in 2001 had a significant impact on the global aviation industry, and reversed the previous trend of growth for a period lasting more than twelve months. The increase in ATF deliveries between 2002 and 2006 illustrates the subsequent recovery of the global aviation industry. However deliveries have declined again each year since 2007 and particularly in 2009.

Chart 3.8: Aviation Turbine Fuel deliveries over the last decade

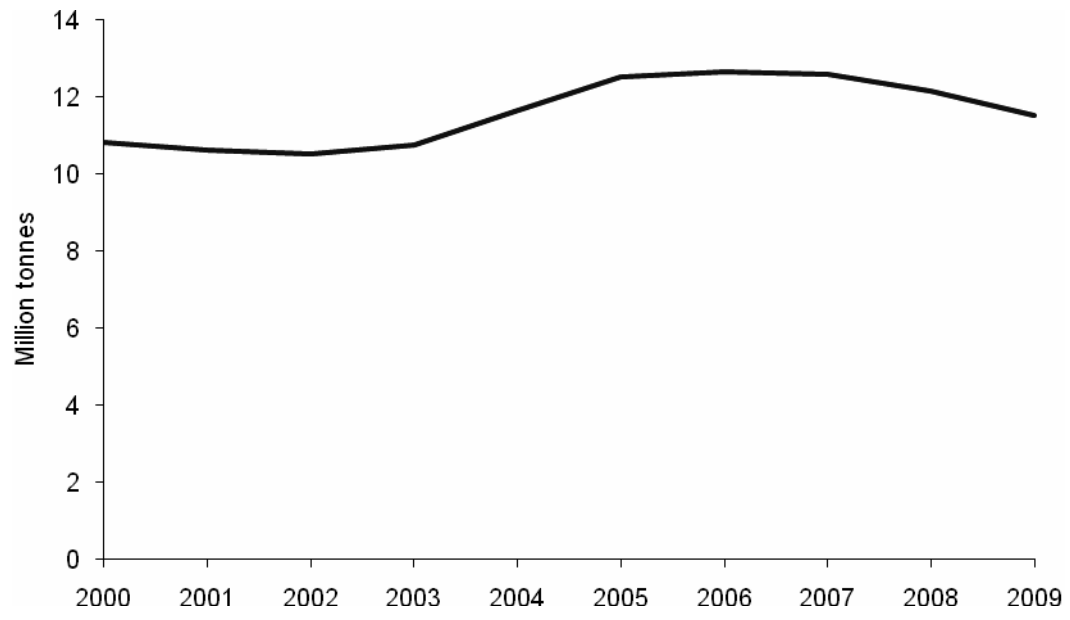
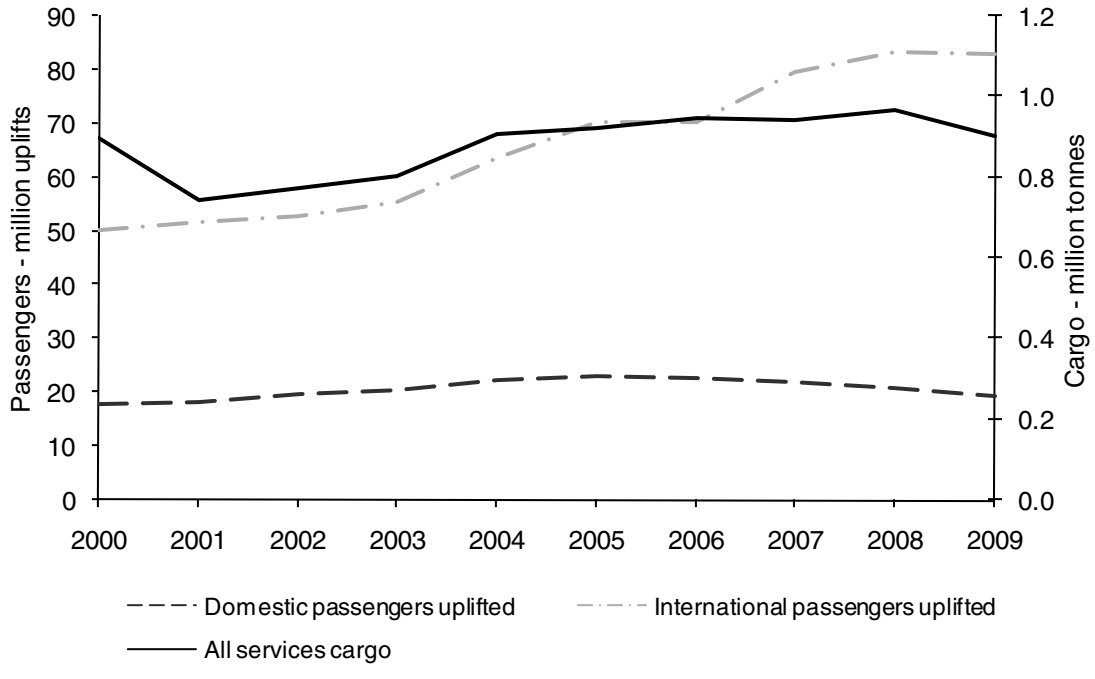


Chart 3.9: Aviation Turbine Fuel usage over the last decade by type



3.53 Chart 3.9 shows the aviation industry's activities over the last ten years, split by the domestic and international passenger uplifts and cargo delivery categories. It is clear to see that the events of 11th September 2001 had varied effects on the different sections of the industry. International air passenger movements suffered a fall in the rate of growth, while domestic flights appear to have been largely unaffected. The most significant effect however was within the cargo division of the industry, which saw a fall of 21 per cent in 2001. The differing ways in which the demand for the industry's separate services reacted to the terrorist attack implies that rather than causing a reluctance of passengers in the UK to fly, the negative effect on the economy - causing cargo demand to fall - had the greatest impact. Since 2001, cargo use has steadily grown and in 2008 was slightly higher than the level seen in 2000. However, all passengers and cargo decreased in 2009, with cargo seeing the largest fall of 7 per cent.

Inland deliveries for non-energy uses

3.54 Table 3D below summarises additional data on the non–energy uses made of the total deliveries of oil products included as the bottom line in the commodity balances in Tables 3.2 to 3.4. It provides extra information on the uses of lubricating oils and greases by use, and details of products used as petro-chemical feedstocks.

Table 3D: Additional information on inland deliveries for non-energy uses, 2007 to 2009

Thousand tonnes

	2007	2008	2009
Feedstock for petroleum chemical plants:			
Propane	811	1,119r	1,190
Butane	691r	824r	726
Other gases	1,514	1,458	1,286
Total gases	3,016r	3,401r	3,203
Naphtha (LDF)	1,607r	818r	1,011
Middle Distillate Feedstock (MDF)	238r	201r	142
Other products	-	-	-
Total feedstock	4,861r	4,420r	4,356
Lubricating oils and grease:			
Aviation	4	3	3
Industrial	450	342	340
Marine	24	18	18
Motors	189	143	142
Agricultural	5	4	4
Fuel oil sold as lubricant	-	-	-
Total lubricating oils and grease	672	510	507
Other non-energy products:			
Industrial spirit/white spirit	167	145	143
Bitumen	1,563	1,741	1,373
Petroleum wax	39	46	34
Petroleum coke	544	928	312
Miscellaneous products	419	544	530
Total non-energy use	7,967r	7,883r	7,255

3.55 All inland deliveries of lubricating oils have been classified as non-energy use only. Some deliveries are used for energy purposes, but it is difficult to estimate energy use figures with any degree of accuracy, hence no such estimates appear in the commodity balance tables.

3.56 For lubricating oils, about 50 to 55 per cent of inland deliveries each year are consumed during use (e.g. burnt within engines), or lost as a film on manufactured goods, lost due to evaporation, or for products like process oils and white oils, the oil becomes part of the product. During 2007, the Court of Appeal ruled that a non waste status fuel can be produced from waste oil, subject to certain conditions being met. As a result, post use oil is reprocessed for several industrial uses, for example as a chemical for steel making, and some is burnt locally in licensed and unlicensed small space heaters. However, the split for each of these is unclear. Previous studies have shown that the UK's 85 per cent collection rate of used lubricating oils was one of the highest in Europe, but the changes to legislation will make estimating this figure more difficult for some time.

3.57 In 2009 there was a rise of 24 per cent for inland deliveries of naphtha. There was also an increase of 63 per cent in naphtha imports in 2009 when compared with 2008. Naphtha deliveries have shown some volatility historically, and in both 2008 and 2009, deliveries have been low when compared to longer term averages. The increases seen this year are still some way short of the pre-2007 average.

3.58 Around 0.8 million tonnes of petroleum coke were imported for inland deliveries in 2009. It has been possible to analyse the data available for the imports to identify which type of company is importing the product. This work indicates that at least half of that amount is employed by energy companies, such as power generators or fuels merchants, and from this year's Digest, this has been included in Tables 3.2 to 3.4. The remainder is used for non-energy purposes, for example in the petro-chemical and manufacturing industries.

3.59 Analysis of the data on the quantity and value of imports of petroleum coke into the UK from HMRC provides some estimates of the cost of imports and gives some indication of the prices being paid. These are only indicative of the prices being paid in the port of importation, and do not include the extra transport costs from the port to the final destination that would be part of a more rigorous price estimate. Details of these estimates are included in Annex G on trade in fuels, as part of Table G.3 on DECC's energy statistics web site. A breakdown has been made by grade of petroleum coke and type of use for imports into the UK, which is given in Table 3E below. Calcined petroleum coke is virtually pure carbon, and as such is more valuable than non-calcined (otherwise known as "green") petroleum coke, as shown by the higher price per tonne it commands and the fact that it is not used simply as a fuel.

Table 3E Estimated £ per tonne for imports of petroleum coke into the UK

	Non-calcined ("green") petroleum coke			Calcined petroleum coke
	Energy	Non-energy	Total	Non-energy
2006	35.7	54.8	42.2	138.7
2007	43.2	49.5	47.5	137.0
2008	64.0	81.5	72.4	224.6
2009	47.6	45.9	46.2	220.3

3.60 Petroleum coke is a relatively low energy content fuel, having a calorific value of 35.8 GJ per tonne, compared with an average for petroleum products of 45.0 GJ per tonne, and 43.5 GJ per tonne for fuel oil. It is, however, higher than coal (25.8 GJ per tonne) and in certain areas is competing with coal as a fuel. It has the advantage of being a very cheap fuel, since it is often regarded as a waste product rather than a specific output from the refining process.

Refinery capacity

3.61 Data for refinery capacity as at the end of 2009 are presented in Table 3F, with the location of these refineries illustrated in Map 3A. These figures are collected annually by DECC from individual oil companies. Capacity per annum for each refinery is derived by applying the rated capacity of the plant per day when onstream by the number of days the plant was on stream during the year. Fluctuations in the number of days the refinery is active are usually the main reasons for annual changes in the level of capacity. Reforming capacity covers catalytic reforming, while cracking/conversion capacity covers processes for upgrading residual oils to lighter products, e.g. catalytic, thermal or hydro-cracking, visbreaking and coking.

Table 3F: UK refinery processing capacity as at end 2009 (1)

(Symbols relate to Map 3A)	Distillation	Reforming	Cracking and Conversion
	Million tonnes per annum		
❶ Stanlow – Shell UK Ltd	11.5	1.5	3.8
❷ Fawley – ExxonMobil Co. Ltd	16.8	3.0	5.2
❸ Coryton – Petroplus International Ltd	8.8	1.8	3.4
❹ Grangemouth – Ineos Refining Ltd	9.8	2.0	3.3
❺ Lindsey Oil Refinery Ltd – Total (UK)	11.9	1.5	4.1
❻ Pembroke – Chevron Ltd	10.1	1.5	6.1
❼ Killingholme – ConocoPhillips UK	11.1	2.1	9.5
❽ Milford Haven - Murco Pet. Ltd	5.3	0.9	2.0
① Harwich – Petrochem Carless Ltd	0.4	-	-
② Eastham – Eastham Refinery Ltd	1.1	-	-
③ Dundee (Camperdown) – Nynas UK AB	0.7	-	-
Total all refineries	**87.5**	**14.2**	**37.4**

(1) Rated design capacity per day on stream multiplied by the average number of days on stream. Refinery production at North Tees is currently suspended, so North Tees has been removed from this table.

Map 3A: Distribution of UK refineries active as at end 2009

Symbols relate to refinery details given in Table 3F

3.62 At the end of 2009, the UK had eight major refineries operating, with three minor refineries in existence. The North Tees refinery is not currently operating as a refinery, which has decreased the UK's distillation capacity (but not the reforming and cracking and coversion capacity as North Tees did not have these capabilities). The distillation capacity in the UK at the end of 2009 was 87.5 million tonnes, 3.5 million tonnes lower than at the end of 2008 with the potential 6 per cent decline in UK capacity resulting from the cessation of operations at North Tees being offset by higher capacities elsewhere. Total UK reforming capacity at the end of 2009 was 14.2 million tonnes, 0.1 million tonnes higher than at the end of 2008, while cracking and conversion capacity remained the same at 37.0 million tonnes.

Inland deliveries by country

3.63 Over recent years DECC has been developing more detailed information on regional consumption data, which can be found at www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx . Although this information is one year in arrears, it provides useful information on differing patterns of fuel use on a sub-national basis.

Stocks of oil (Table 3.7)

3.64 This table shows stocks of crude oil, feedstocks (including partly processed oils) and products (in detail) at the end of each year. Details are given of stocks of products held within the UK either at refineries or oil distribution centres such as coastal oil terminals (undistributed stocks). However, these figures exclude any details of stocks held by distributors of fuels or stocks held at retail sites, such as petrol stations. The figures for stocks in the balances also solely relate to those stocks currently present in the UK and specifically exclude any stocks that might be held by UK oil companies in other countries under bilateral agreements. Stocks of crude oil and feedstocks decreased by 11 per cent in 2009, with a decrease in stocks held at refineries.

3.65 The UK holds emergency stocks of oil to help reduce the adverse impact on the UK of any disruptions of supplies of oil arising from domestic or international incidents. European Union (EU) legislation (EC Directive 2006/07) requires EU member states to hold oil stocks equivalent to 90 days worth of average daily consumption calculated from the previous calendar year. These stocks are

held to deal with oil supply emergencies, not to manage or affect prices. The UK, as a producer, receives a derogation of 25 per cent on its obligation and is only required to hold stocks equivalent to 67½ days of consumption.

3.66 The International Energy Agency (IEA) also requires its members to hold stocks for use in the event of global disruption. Until 2007, the UK as a net exporter was exempt from this requirement. However, in 2006 the UK became a net importer and so since 2007 has had an IEA obligation to hold stocks as well as its EU obligation. The same stocks count towards meeting both sets of obligations, and as IEA obligations are based on net imports, we do not expect a significant net increase in total UK obligations until after 2016. The timing of this change depends on a range of factors, including the decline rate of indigenous oil production and the pattern of future UK oil product demand.

3.67 To meet these obligations, the UK Government requires companies supplying oil products into the UK market (production plus net imports) to maintain a certain level of emergency stocks of oil products as fuels. As part of this, oil companies are allowed to hold stocks in other EU countries subject to bilateral agreements between Governments, and count these stocks towards their stocking obligations. The stock figures in Table 3.7 take account of these stocks to give a true picture of the amount of stocks available to the UK.

3.68 Stocks of petroleum products at the end of 2009 were 8 per cent higher than a year earlier. This was helped by the fact that net stocks held overseas on behalf of the UK increased by almost a third during the period. Stocks of gas/diesel oil, motor spirit and aviation turbine fuel held in the UK have all increased. The total stocks of crude oil and products held by UK companies at the end of 2009 were equivalent to approximately 84 days of UK consumption.

Technical notes and definitions

3.69 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy as a whole in Chapter 1, paragraphs 1.26 to 1.60. For notes on the commodity balances and definitions of the terms used in the row headings see the Annex A, paragraphs A.7 to A.42. While the data in the printed and bound copy of this Digest cover only the most recent seven years, these notes also cover data for earlier years that are available on DECC's energy statistics web site.

Indigenous production

3.70 The term indigenous is used throughout this chapter and includes oil from the UK Continental Shelf, both offshore and onshore.

Deliveries

3.71 These are deliveries into consumption, as opposed to being estimates of actual consumption or use. They are split between inland deliveries and deliveries to marine bunkers. Inland deliveries will not necessarily be consumed in the UK (e.g. aviation fuels).

Sources of data

3.72 The majority of the data included in the text and tables of this chapter are derived from DECC's Downstream Oil Reporting System (DORS), which replaced the UK Petroleum Industry Association (UKPIA) reporting system in 2005. Data relating to the inland operations of the UK oil industry (i.e. information on the supply, refining and distribution of oil in the UK) are collected from companies. The data format and coverage have been designed to meet most of the needs of both Government and the industry itself. Each member of UKPIA and a number of other contributing companies provides returns on its refining activities and deliveries of various products to the internal UK market. This information is supplemented whenever necessary to allow for complete coverage within the statistics, with separate exercises carried out on special topics (for example, the work on super/hypermarkets referred to in paragraph 3.49) or with the use of additional data (such as trade data from HM Customs and Revenue to cover import activity by non-reporting companies).

Statistical differences

3.73 In Tables 3.1 to 3.5, there are headings titled "statistical differences". These are differences between the separately observed figures for production and delivery of crude oil and products during the path of their movement from the point of production to the point of consumption.

3.74 The statistical differences headings listed in the primary oil commodity balances (Table 3.1) are differences between the separately observed and reported figures for production from onshore or offshore fields and supply to the UK market that cannot be accounted for by any specific factors. Primarily they result from inaccuracies in the meters at various points along offshore pipelines. These meters vary slightly in their accuracy within accepted tolerances, giving rise to both losses and gains when the volumes of oil flowing are measured. Errors may also occur when non-standard conditions are used to meter the oil flow.

3.75 The statistical difference for primary oils in the table includes own use in onshore terminals and gas separation plants, losses, platform and other field stock changes. Another factor is the time lag that can exist between production and loading onto tankers being reported at an offshore field and the arrival of these tankers at onshore refineries and oil terminals. This gap is usually minimal and works such that any effect of this at the start of a month is balanced by a similar counterpart effect at the end of a month. However, there can be instances where the length of this interval is considerable and, if it happens at the end of a year, there can be significant effects on the statistical differences seen for the years involved.

3.76 Another technical factor that can contribute to the statistical differences relates to the recording of quantities at the producing field (which is the input for the production data) and at oil terminals and refineries, since they are in effect measuring different types of oil. Terminals and refineries are able to measure a standardised, stabilised crude oil, that is, with its water content and content of Natural Gas Liquids (NGLs) at a standard level and with the amounts being measured at standard conditions. However, at the producing field they are dealing with a "live" crude oil that can have a varying level of water and NGLs within it. While offshore companies report live crude at field, the disposals from oil

terminals and offshore loading fields are reported as stabilised crude oil. This effectively assumes that terminal disposals are stabilised crude production figures. These changes were introduced in the 2002 edition of this Digest.

3.77 Part of the overall statistical difference may also be due to problems with the correct reporting of individual NGLs at the production site and at terminals and refineries. It is known that there is some mixing of condensate and other NGLs in with what might otherwise be stabilised crude oil before it enters the pipeline. This mixing occurs as it removes the need for separate pipeline systems for transporting the NGLs and it also allows the viscosity of the oil passing down the pipeline to be varied as necessary. While the quantity figures recorded by terminals are in terms of stabilised crude oil, with the NGL component removed, there may be situations where what is being reported does not comply with this requirement.

3.78 With the downstream sector, the statistical differences can similarly be used to assess the validity and consistency of the data. From the tables, these differences are generally a very small proportion of the totals involved.

3.79 Refinery data are collated from details of individual shipments received and made by each refinery and terminal operating company. Each year there are thousands of such shipments, which may be reported separately by two or three different companies involved in the movement. While intensive work is carried out to check these returns, it is possible that some double counting of receipts may occur.

3.80 Temperature, pressure and natural leakage also contribute to the statistical differences. In addition, small discrepancies can occur between the estimated calorific values used at the field and the more accurate values measured at the onshore terminal where data are shown on an energy basis. The statistical differences can also be affected by rounding, clerical errors or unrecorded losses, such as leakage. Other contributory factors are inaccuracies in the reporting of the amounts being disposed of to the various activities listed, including differences between the quantities reported as going to refineries and the actual amounts passing through refineries.

3.81 Similarly, the data under the statistical difference headings in Tables 3.2 to 3.4 are the differences between the deliveries of petroleum products to the inland UK market reported by the supplying companies and estimates for such deliveries. These estimates are calculated by taking the output of products reported by refineries and then adjusting it by the relevant factors (such as imports and exports of the products, changes in the levels of stocks etc.).

3.82 It may be thought that such differences should not exist as the data underlying both the observed deliveries into the UK market and the individual components of the estimates (i.e. production, imports, exports, stocks) come from the same source (the oil companies). While it is true that each oil company provides data on its own activities in each area, there are separate areas of operation within the companies that report their own part of the overall data. Table 3G below illustrates this.

Table 3G Sources of data within oil companies

Area covered	Source
Refinery production	Refinery
Imports and exports	Refinery, logistics departments, oil traders
Stocks	Refinery, crude and product terminals, major storage and distribution sites
Final deliveries	Sales, marketing and accounts departments

3.83 Each individual reporting source will have direct knowledge of its own data. For example, refineries will know what they produce and how much leaves the refinery gate as part of routine monitoring of the refinery operations. Similarly other data such as sales to final consumers or imports and exports will be closely monitored. Companies will ensure that each component set of data reported is as accurate as possible but their reporting systems may not be integrated, meaning that internal consistency checks across all reported data cannot be made. Each part of a company may also work to different timings as well, which may further add to the degree of differences seen.

3.84 The main area where there is known to be a problem is with the “Transfers” heading in the commodity balances. The data reported under this heading have two components. Firstly, there is an allowance for reclassification of products within the refining process. For example, butane can be added to motor spirit to improve the octane rating, aviation turbine fuel could be reclassified as domestic kerosene if its quality deteriorates, and much of the fuel oil imported into the UK is further refined into other petroleum products. Issues can arise with product flows between different reporting companies, for example when company A delivers fuel oil to company B who report a receipt of a feedstock. Secondly, and in addition to these inter-product transfers, the data also include an allowance to cover the receipt of backflows of products from petrochemical plants that are often very closely integrated with refineries. A deduction for these backflows thus needs to be included under the "Transfers" heading so that calculated estimates reflect net output and are thus more comparable with the basis of the observed deliveries data.

3.85 There is scope for error in the recording of these two components of transfers. With inter-product transfers, the data are recorded within the refinery during the refining and blending processes where the usual units used to record the changes are volumes rather than masses. Different factors apply for each product when converting from a volume to mass basis, as shown by the conversion factors given in Annex A of this Digest. Thus, a balanced transfer in volume terms may not be equivalent when converted to a mass basis. This is thought to be the main source of error within the individual product balances.

3.86 With the backflows data, the scope for error results from the recording of observed deliveries data being derived from sales data on a "net" basis and will therefore exclude the element of backflows data as received at the refinery. For example, these could be seen simply as an input of fuel oils to be used as a feedstock, and thus recorded as an input without their precise nature being recorded – in effect a form of double-counting. This relationship between the petrochemical sector and refineries is thought to be one of the main sources of error in the overall oil commodity balances.

Imports and exports

3.87 The information given under the headings "imports" and "exports" in this chapter are the figures recorded by importers and exporters of oil. They can differ in some cases from the import and export figures provided by HMRC that are given in Annex G on DECC’s energy statistics website. Such differences arise from timing differences between actual and declared movements but also result from the Customs figures including re-exports. These are products that may have originally entered the UK as imports from another country and been stored in the UK prior to being exported back out of the UK, as opposed to having been actually produced in the UK.

Marine bunkers

3.88 This covers deliveries to ocean going and coastal vessels under international bunker contracts. Other deliveries to fishing, coastal and inland vessels are excluded. As part of DECC’s audit programme, UK refinery contacts have reviewed the provision of fuel to marine bunkers in 2009. As a result, a number of companies have reviewed their methodology. Data for previous years are not available on this basis, and DECC will continue to work with the returning companies to refine and improve these estimates.

Crude and process oils

3.89 These are all feedstocks, other than distillation benzene, for refining at refinery plants. Gasoline feedstock is any process oil whether clean or dirty which is used as a refinery feedstock for the manufacture of gasoline or naphtha. Other refinery feedstock is any process oil used for the manufacture of any other petroleum products.

Refineries

3.90 Refineries distilling crude and process oils to obtain petroleum products. This excludes petrochemical plants, plants only engaged in re-distilling products to obtain better grades, crude oil stabilisation plants and gas separation plants.

Products used as fuel (energy use)

3.91 The following paragraphs define the product headings used in the text and tables of this chapter. The products are used for energy in some way, either directly as a fuel or as an input into electricity generation.

Refinery fuel - Petroleum products used as fuel at refineries.

Ethane – A naturally gaseous straight-chain hydrocarbon (C_2H_6) in natural gas and refinery gas streams. Primarily used, or intended to be used, as a chemical feedstock.

Propane - Hydrocarbon containing three carbon atoms(C_3H_8), gaseous at normal temperature but generally stored and transported under pressure as a liquid. Used mainly for industrial purposes, but also as transport Liquid Petroleum Gas (LPG), and some domestic heating and cooking.

Butane - Hydrocarbon containing four carbon atoms(C_4H_{10}), otherwise as for propane. Additionally used as a constituent of motor spirit to increase vapour pressure and as a chemical feedstock.

Naphtha (Light distillate feedstock) - Petroleum distillate boiling predominantly below 200°C.

Aviation spirit - All light hydrocarbon oils intended for use in aviation piston-engine power units, including bench testing of aircraft engines.

Motor spirit - Blended light petroleum components used as fuel for spark-ignition internal-combustion engines other than aircraft engines:

(i) Premium unleaded grade - all finished motor spirit, with an octane number (research method) not less than 95.

(ii) Lead Replacement petrol / Super premium unleaded grade - finished motor spirit, with an octane number (research method) not less than 97.

Aviation turbine fuel (ATF) - All other turbine fuel intended for use in aviation gas-turbine power units and including bench testing of aircraft engines.

Burning oil (kerosene or "paraffin") - Refined petroleum fuel, intermediate in volatility between motor spirit and gas oil, used primarily for heating. White spirit and kerosene used for lubricant blends are excluded.

Gas/diesel oil - Petroleum fuel having a distillation range immediately between kerosene and light-lubricating oil:

(i) **DERV (Diesel Engined Road Vehicle) fuel** - automotive diesel fuel for use in high speed, compression ignition engines in vehicles subject to Vehicle Excise Duty.

(ii) **Gas oil** - used as a burner fuel in heating installations, for industrial gas turbines and as for DERV (but in vehicles not subject to Vehicle Excise Duty e.g. Agriculture vehicles, fishing vessels, construction equipment).

(iii) **Marine diesel oil** - heavier type of gas oil suitable for heavy industrial and marine compression-ignition engines.

Fuel oil - Heavy petroleum residue blends used in atomising burners and for heavy-duty marine engines (marine bunkers, etc.) with heavier grades requiring pre-heating before combustion. Excludes fuel oil for grease making or lubricating oil and fuel oil sold as such for road making.

Products not used as fuel (non-energy use)

3.92 The following paragraphs define the product headings used in the text and tables of this chapter, which are used for non-energy purposes.

Feedstock for petroleum chemical plants - All petroleum products intended for use in the manufacture of petroleum chemicals. This includes middle distillate feedstock of which there are several grades depending on viscosity. The boiling point ranges between 200°C and 400°C. (A deduction has been made from these figures equal to the quantity of feedstock used in making the conventional petroleum products that are produced during the processing of the feedstock. The output and deliveries of these conventional petroleum products are included elsewhere as appropriate.)

White spirit and specific boiling point (SBP) spirits – These are refined distillate intermediates with a distillation in the naphtha / kerosene range. **White spirit** has a boiling range of about 150°C to 200°C and is used as a paint or commercial solvent. **SBP spirit** is also known as **Industrial spirit** and has a wider boiling range that varies up to 200°C dependent upon its eventual use. It has a variety of uses that vary from use in seed extraction, rubber solvents and perfume.

Lubricating oils (and grease) - Refined heavy distillates obtained from the vacuum distillation of petroleum residues. Includes liquid and solid hydrocarbons sold by the lubricating oil trade, either alone or blended with fixed oils, metallic soaps and other organic and/or inorganic bodies. A certain percentage of inland deliveries are re-used as a fuel (see paragraphs 3.54 to 3.56).

Bitumen - The residue left after the production of lubricating oil distillates and vacuum gas oil for upgrading plant feedstock. Used mainly for road making and building construction purposes. Includes other petroleum products such as creosote and tar mixed with bitumen for these purposes and fuel oil sold specifically for road making.

Petroleum wax - Includes paraffin wax, which is a white crystalline hydrocarbon material of low oil content normally obtained during the refining of lubricating oil distillate, paraffin scale, slack wax, microcrystalline wax and wax emulsions. Used for candle manufacture, polishes, food containers, wrappings etc.

Petroleum cokes - Carbonaceous material derived from hydrocarbon oils, uses for which include metallurgical electrode manufacture. Quantities of imports of this product are used as a fuel (see paragraphs 3.58 to 3.60).

Miscellaneous products - Includes aromatic extracts, defoament solvents and other minor miscellaneous products.

Main classes of consumer

3.93 The following are definitions of the main groupings of users of petroleum products used in the text and tables of this chapter.

Electricity generators - Petroleum products delivered for use by major power producers and other companies for electricity generation including those deliveries to the other industries listed below which are used for autogeneration of electricity (Tables 3.2 to 3.4). This includes petroleum products used to generate electricity at oil refineries and is recorded in the Transformation sector, as opposed to other uses of refinery fuels that are recorded in the Energy Industry Use sector. From this edition of the Digest, data in Chapter 3 (Table 3.2 to 3.4) has been aligned with Chapter 5 (Table 5.4). The data on oil used for electricity generation collected from major power producers and autogenerators is judged to be at least as accurate as the data from refiners on deliveries, and has the advantage of consistency. These data have been revised back to 2005.

Agriculture - Deliveries of fuel oil and gas oil/diesel for use in agricultural power units, dryers and heaters. Burning oil for farm use.

Iron and steel - Deliveries of petroleum products to steel works and iron foundries. This is now based on information from the Iron and Steel Statistics Bureau.

Other industries - The industries covered correspond to the industrial groups shown in Table 1E of Chapter 1, excluding Iron and Steel.

National navigation - Fuel oil and gas/diesel oil delivered, other than under international bunker contracts, for fishing vessels, UK oil and gas exploration and production, coastal and inland shipping and for use in ports and harbours.

Railways - Deliveries of fuel oil, gas/diesel oil and burning oil to railways now based on estimates produced by AEA Energy and Environment as part of their work to compile the UK National Atmospheric Emissions Inventory (NAEI).

Air transport - Total inland deliveries of aviation turbine fuel and aviation spirit. The figures cover deliveries of aviation fuels in the UK to international and other airlines, British and foreign

Governments (including armed services) and for private flying. In order to compile the NAEI, AEA Energy and Environment need to estimate how aviation fuel usage splits between domestic and international consumption. Information from AEA Energy and Environment suggests that virtually all aviation spirit is used domestically while just 6 per cent (691 thousand tonnes) of civilian aviation turbine fuel use is for domestic consumption.

Road transport - Deliveries of motor spirit and DERV fuel for use in road vehicles of all kinds.

Domestic - Fuel oil and gas oil delivered for central heating of private houses and other dwellings and deliveries of kerosene (burning oil) and liquefied petroleum gases for domestic purposes (see Tables 3.2 to 3.4).

Public services - Deliveries to national and local Government premises (including educational, medical and welfare establishments and British and foreign armed forces) of fuel oil and gas oil for central heating and of kerosene (burning oil).

Miscellaneous - Deliveries of fuel oil and gas oil for central heating in premises other than those classified as domestic or public.

Monthly and quarterly data

3.94 Monthly or quarterly aggregate data for certain series presented in this chapter are available. This information can be obtained free of charge by following the links given in the Energy Statistics section of the DECC web site, at: www.decc.gov.uk/en/content/cms/statistics/statistics.aspx

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3.1 Commodity balances 2007 - 2009[(1)]

Primary oil

Thousand tonnes

	Crude oil	Ethane	Propane	Butane	Condensate	Total NGL	Feedstock	Total primary oil
2007								
Supply								
Production	70,357	1,153	1,796	1,412	1,858	6,218	-	76,575
Imports	49,893	62	84	50	61	257	7,206	57,357
Exports	-45,129	-13	-836	-548	-1,186	-2,584	-3,287	-50,999
Stock change *(2)*	+650	..	..	..	..	+9	+125	+784
Transfers	-	-1,203	-861	-362r	-328r	-2,754r	+547	-2,207r
Total supply	**75,772**	..	..	..	..	**1,146r**	**4,591r**	**81,509r**
Statistical difference *(3)(4)*	+66	..	..	..	..	-6r	-28r	32r
Total demand *(4)*	**75,707**	..	..	..	..	**1,152r**	**4,619r**	**81,477r**
Transformation (Petroleum refineries) *(4)*	75,707	..	..	..	..	1,152r	4,619r	81,477r
Energy industry use	-	-	-	-	-	-	-	-
2008								
Supply								
Production	65,497	1,202	1,953	1,439	1,574	6,168	-	71,665
Imports	51,466	180	223	124	122	649	7,926r	60,041r
Exports	-41,504	-12	-1,369	-683	-975	-3,039	-3,858r	-48,401r
Stock change *(2)*	+261r	..	..	..	..	+59	-86r	+234r
Transfers	-	-1,328	-727r	-433r	-312r	-2,800r	+208r	-2,592r
Total supply	**75,720r**	..	..	..	..	**1,037r**	**4,190r**	**80,947r**
Statistical difference *(3)(4)*	-124r	..	..	..	..	60r	272r	208r
Total demand *(4)*	**75,844**	..	..	..	..	**978r**	**3,918r**	**80,740r**
Transformation (Petroleum refineries) *(4)*	75,844	..	..	..	..	978r	3,918r	80,740r
Energy industry use	-	-	-	-	-	-	-	-
2009								
Supply								
Production	62,820	999	1,692	1,284	1,403	5,378	-	68,199
Imports	47,104	155	198	113	94	561	6,683	54,347
Exports	-39,446	-9	-1,015	-589	-743	-2,356	-3,399	-45,202
Stock change *(2)*	+393	..	..	..	..	-30	+182	+545
Transfers	-	-1,139	-798	-363	-318	-2,618	+44	-2,573
Total supply	**70,870**	..	..	..	..	**935**	**3,510**	**75,315**
Statistical difference *(3)(4)*	+155	..	..	..	..	+7	-72	+89
Total demand *(4)*	**70,716**	..	..	..	..	**928**	**3,582**	**75,225**
Transformation (Petroleum refineries) *(4)*	70,716	..	..	..	..	928	3,582	75,225
Energy industry use	-	-	-	-	-	-	-	-

(1) As there is no use made of primary oils and feedstocks by industries other than the oil and gas extraction and petroleum refining industries, other industry headings have not been included in this table. As such, this table is a summary of the activity of what is known as the Upstream oil industry.

(2) Stock fall (+), stock rise (-).

(3) Total supply minus total demand.

(4) Figures for total demand for the individual NGLs (and thus for the statistical differences as well) are not availble.

Note:

Differences between the upstream and downstream balance are currently being investigated.

3.2 Commodity balances 2009

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,544	569	2,895	1,529	-	20,404	61	6,022
Other sources	1,139	798	363	-	318	-	-	-	-
Imports	-	229	281	-	1,034	26	2,966	96	7,513
Exports	-	-530	-129	-	-1,812	-1	-7,811	-10	-1,451
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	1	13	-	83	-2	30	-5	-7
Transfers	-	-	-	-	-179	-	198	-	-485
Total supply	**1,139**	**2,042**	**1,097**	**2,895**	**973**	**23**	**15,787**	**142**	**11,593**
Statistical difference *(3)*	**-**	**14**	**44**	**2**	**-38**	**1**	**25**	**-0**	**79**
Total demand	**1,139**	**2,028**	**1,053**	**2,893**	**1,011**	**22**	**15,762**	**143**	**11,514**
Transformation	**-**	**-**	**-**	**296**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	296	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	296	-	-	-	-	-
Heat generation	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,449**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,449	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**1,139**	**2,028**	**1,053**	**148**	**1,011**	**22**	**15,762**	**143**	**11,514**
Industry	**-**	**355**	**294**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	355	294	-	-	-	-	-	-
Iron & steel	-	-	-	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-	-	-
Paper, printing etc	-	-	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-
Transport	**-**	**107**	**-**	**-**	**-**	**22**	**15,762**	**-**	**11,514**
Air	-	-	-	-	-	22	-	-	11,514
Rail	-	-	-	-	-	-	-	-	-
Road	-	107	-	-	-	-	15,762	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**376**	**33**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	278	33	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	98	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**1,139**	**1,190**	**726**	**148**	**1,011**	**-**	**-**	**143**	**-**

(1) Includes marine diesel oil.
(2) Stock fall (+), stock rise (-).
(3) Total supply minus total demand.
(4) For further details on non-energy usage see paragraphs 3.54 to 3.60.

Note:
Differences between the upstream and downstream balance are currently being investigated.

3.2 Commodity balances 2009 (continued)

Petroleum products

Thousand tonnes

Burning oil	Gas/ Diesel Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum wax	Petroleum coke	Misc. products	Total Products	
									Supply
2,830	25,393	8,648	350	1,338	-	2,070	1,204	74,857	Production
-	-	-	-	-	-	-	-	2,618	Other sources
668	6,616	1,241	710	231	35	761	52	22,458	Imports
-241	-6,033	-5,547	-590	-324	-11	-548	-696	-25,733	Exports
-	-716	-1,774	-	-	-	-	-	-2,490	Marine bunkers
4	157	82	10	-8	3	-60	21	322	Stock change *(2)*
487	35	-74	-29	20	14	-	-5	-16	Transfers
3,749	**25,452**	**2,576**	**452**	**1,256**	**41**	**2,223**	**576**	**72,017**	**Total supply**
18	**83**	**-75**	**-55**	**-117**	**7**	**-0**	**46**	**34**	**Statistical difference *(3)***
3,731	**25,369**	**2,651**	**507**	**1,373**	**34**	**2,223**	**530**	**71,983**	**Total demand**
-	**27**	**945**	**-**	**-**	**-**	**502**	**-**	**1,771**	**Transformation**
-	22	732	-	-	-	502	-	1,552	Electricity generation
-	10	607	-	-	-	502	-	1,119	Major power producers
-	12	125	-	-	-	-	-	433	Autogenerators
-	5	52	-	-	-	-	-	57	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	162	-	-	-	-	-	162	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**685**	**-**	**-**	**-**	**1,410**	**-**	**4,544**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	-	-	-	Oil & gas extraction
-	-	685	-	-	-	1,410	-	4,544	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,731	**25,342**	**1,021**	**507**	**1,373**	**34**	**312**	**530**	**65,668**	**Final Consumption**
1,449	**2,466**	**376**	**-**	**-**	**-**	**-**	**-**	**4,939**	**Industry**
1,449	-	-	-	-	-	-	-	2,097	Unclassified
-	-	52	-	-	-	-	-	52	Iron & steel
-	16	26	-	-	-	-	-	42	Non-ferrous metals
-	136	34	-	-	-	-	-	170	Mineral products
-	83	63	-	-	-	-	-	146	Chemicals
-	62	19	-	-	-	-	-	81	Mechanical engineering etc
-	30	8	-	-	-	-	-	38	Electrical engineering etc
-	74	22	-	-	-	-	-	96	Vehicles
-	187	54	-	-	-	-	-	242	Food, beverages etc
-	74	10	-	-	-	-	-	85	Textiles, leather, etc
-	26	32	-	-	-	-	-	57	Paper, printing etc
-	1,666	37	-	-	-	-	-	1,703	Other industries
-	110	18	-	-	-	-	-	129	Construction
12	**21,669**	**528**	**-**	**-**	**-**	**-**	**-**	**49,614**	**Transport**
-	-	-	-	-	-	-	-	11,536	Air
12	674	-	-	-	-	-	-	686	Rail
-	20,057	-	-	-	-	-	-	35,926	Road
-	939	528	-	-	-	-	-	1,467	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
2,270	**1,064**	**117**	**-**	**-**	**-**	**-**	**-**	**3,861**	**Other**
2,270	131	-	-	-	-	-	-	2,713	Domestic
-	298	47	-	-	-	-	-	345	Public administration
-	283	51	-	-	-	-	-	334	Commercial
-	148	13	-	-	-	-	-	260	Agriculture
-	204	6	-	-	-	-	-	209	Miscellaneous
-	**142**	**-**	**507**	**1,373**	**34**	**312**	**530**	**7,255**	**Non energy use *(4)***

3.3 Commodity balances 2008

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,612	636	2,980r	1,863	-	20,319	55	6,549
Other sources	1,328	727r	433r	-	312r	-	-	-	-
Imports	12	257	548	-	634	22	3,302	89	7,961
Exports	-	-565	-495	-	-2,066r	-2	-7,017	-4	-1,908
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	-	80r	-	76r	1	27	5	-154
Transfers	-	-	-54	-	-4	1	17	-	-300
Total supply	**1,340**	**2,032r**	**1,148r**	**2,980r**	**814r**	**22**	**16,648**	**144**	**12,148**
Statistical difference *(3)*	**12**	**25r**	**-21r**	**-24r**	**-4r**	**-8**	**-30**	**-**	**6**
Total demand	**1,328**	**2,006r**	**1,169r**	**3,005r**	**818r**	**30**	**16,678**	**145**	**12,142**
Transformation	**-**	**-**	**-**	**343**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	343	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	343	-	-	-	-	-
Heat generation	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,532r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,532r	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**1,328**	**2,006r**	**1,169r**	**130**	**818r**	**30**	**16,678**	**145**	**12,142**
Industry	**-**	**361**	**312**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	361	312	-	-	-	-	-	-
Iron & steel	-	-	-	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-	-	-
Paper, printing etc	-	-	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-
Transport	**-**	**125**	**-**	**-**	**-**	**30**	**16,678**	**-**	**12,142**
Air	-	-	-	-	-	30	-	-	12,142
Rail	-	-	-	-	-	-	-	-	-
Road	-	125	-	-	-	-	16,678	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**401**	**33**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	297	33	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	104	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**1,328**	**1,119r**	**824r**	**130**	**818r**	**-**	**-**	**145**	**-**

(1) Includes marine diesel oil.
(2) Stock fall (+), stock rise (-).
(3) Total supply minus total demand.
(4) For further details on non-energy usage see paragraphs 3.54 to 3.60.

Note:
Differences between the upstream and downstream balance are currently being investigated.

3.3 Commodity balances 2008 (continued)

Petroleum products

Thousand tonnes

Burning oil	Gas/ Diesel Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum wax	Petroleum coke	Misc. products	Total Products	
									Supply
3,092	26,761r	11,349	514	1,485	8	2,029	1,174	80,425r	Production
-	-	-	-	-	-	-	-	2,800r	Other sources
528	7,632r	1,198	448	422	38	883	107	24,080r	Imports
-213	-7,246r	-7,304	-399	-195	-13	-608	-756	-28,791r	Exports
-	-680	-1,915	-	-	-	-	-	-2,594	Marine bunkers
5	-5	150	-40	-7	-1	-7	15	145r	Stock change *(2)*
288	11	-186	-12	5	12	-	13	-208	Transfers
3,699	**26,474r**	**3,292**	**512**	**1,710**	**44**	**2,296**	**552**	**75,857r**	**Total supply**
6	**-106r**	**1**	**2**	**-31**	**-2**	**1r**	**8**	**-164r**	**Statistical difference *(3)***
3,694	**26,580**	**3,291**	**510**	**1,741**	**46**	**2,295r**	**544**	**76,021r**	**Total demand**
-	**24r**	**1,164r**	**-**	**-**	**-**	**450**	**-**	**1,982r**	**Transformation**
-	19r	904r	-	-	-	450	-	1,716r	Electricity generation
-	15r	825r	-	-	-	450	-	1,290r	Major power producers
-	4r	78r	-	-	-	-	-	426r	Autogenerators
-	5r	52r	-	-	-	-	-	57r	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	208	-	-	-	-	-	208	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**853**	**-**	**-**	**-**	**1,367**	**-**	**4,751r**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	-	-	-	Oil & gas extraction
-	-	853	-	-	-	1,367	-	4,751r	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,693	**26,556r**	**1,275r**	**510**	**1,741**	**46**	**478r**	**544**	**69,289r**	**Final Consumption**
1,445	**2,881r**	**447r**	**-**	**-**	**-**	**-**	**-**	**5,446r**	**Industry**
1,445	-	-	-	-	-	-	-	2,118	Unclassified
-	-	60r	-	-	-	-	-	60r	Iron & steel
-	19	25	-	-	-	-	-	44	Non-ferrous metals
-	158	49r	-	-	-	-	-	207r	Mineral products
-	96	68	-	-	-	-	-	165	Chemicals
-	72	19	-	-	-	-	-	91	Mechanical engineering etc
-	35	8	-	-	-	-	-	43	Electrical engineering etc
-	86	22	-	-	-	-	-	107	Vehicles
-	218	54r	-	-	-	-	-	272r	Food, beverages etc
-	86	10	-	-	-	-	-	96	Textiles, leather, etc
-	30	31	-	-	-	-	-	61	Paper, printing etc
-	1,953r	82r	-	-	-	-	-	2,034r	Other industries
-	128	19	-	-	-	-	-	147	Construction
4	**22,301**	**644**	**-**	**-**	**-**	**-**	**-**	**51,924**	**Transport**
-	-	-	-	-	-	-	-	12,172	Air
4	682	-	-	-	-	-	-	686	Rail
-	20,613	-	-	-	-	-	-	37,416	Road
-	1,005	644	-	-	-	-	-	1,649	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
2,244	**1,173**	**183**	**-**	**-**	**-**	**-**	**-**	**4,035**	**Other**
2,236	164	-	-	-	-	-	-	2,730	Domestic
4	362	71	-	-	-	-	-	437	Public administration
-	295	77	-	-	-	-	-	372	Commercial
4	140	24	-	-	-	-	-	272	Agriculture
-	212	11	-	-	-	-	-	223	Miscellaneous
-	**201**	**-**	**510**	**1,741**	**46**	**478r**	**544**	**7,883r**	**Non energy use *(4)***

3.4 Commodity balances 2007

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,697	601	2,737r	2,561	-	21,313	70	6,176
Other sources	1,203	861	362r	-	328r	-	-	-	-
Imports	-	386r	473	8	1,713	21	3,265	107	7,708
Exports	-	-979r	-578	-	-3,014	-4	-7,331	-7	-1,221
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	2	11	111r	-	69	5	106	2	182
Transfers	-	-	-40	8	14	8	59	-1	-338
Total supply	**1,204**	**1,976**	**929r**	**2,752r**	**1,671r**	**30**	**17,413**	**171**	**12,507**
Statistical difference *(3)*	**8**	**22**	**17r**	**-86r**	**64r**	**-3**	**-181**	**4**	**-67**
Total demand	**1,197**	**1,955**	**911r**	**2,838r**	**1,608r**	**33**	**17,594**	**167**	**12,574**
Transformation	**-**	**-**	**-**	**251**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	251	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	251	-	-	-	-	-
Heat generation	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**39**	**-**	**2,220r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	39	-	2,220r	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**1,197**	**1,916**	**911r**	**367**	**1,608r**	**33**	**17,594**	**167**	**12,574**
Industry	**49**	**664**	**194**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	49	664	194	-	-	-	-	-	-
Iron & steel	-	-	-	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-	-	-
Paper, printing etc	-	-	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-
Transport	**-**	**119**	**-**	**-**	**-**	**33**	**17,594**	**-**	**12,574**
Air	-	-	-	-	-	33	-	-	12,574
Rail	-	-	-	-	-	-	-	-	-
Road	-	119	-	-	-	-	17,594	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**323**	**26**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	225	26	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	98	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**1,148**	**811**	**691r**	**367**	**1,607r**	**-**	**-**	**167**	**-**

(1) Includes marine diesel oil.
(2) Stock fall (+), stock rise (-).
(3) Total supply minus total demand.
(4) For further details on non-energy usage see paragraphs 3.54 to 3.60.

Note:
Differences between the upstream and downstream balance are currently being investigated.

3.4 Commodity balances 2007 (continued)

Petroleum products

Thousand tonnes

Burning oil	Gas/ Diesel Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum wax	Petroleum coke	Misc. products	Total Products	
									Supply
2,968	26,397r	11,452	547	1,628	12	2,074r	1,045r	81,278r	Production
-	-	-	-	-	-	-	-	2,754r	Other sources
551	8,172	1,141	375	477	37	485	173	25,093	Imports
-356	-6,551	-7,739	-194	-532r	-21	-613	-877	-30,017	Exports
-	-901	-1,471	-	-	-	-	-	-2,371	Marine bunkers
33	462	132	-47	26	19	-4	-42	1,068r	Stock change *(2)*
363	-240	-419	33	9	16	-	-19	-547	Transfers
3,560	**27,338r**	**3,096r**	**715**	**1,607**	**62**	**1,942r**	**282r**	**77,257r**	**Total supply**
-70	**159r**	**-132r**	**43**	**44**	**23**	**-**	**-17r**	**-173r**	**Statistical difference *(3)***
3,631	**27,180r**	**3,228r**	**672**	**1,563**	**39**	**1,942r**	**299r**	**77,430r**	**Total demand**
-	**47r**	**913r**	**-**	**-**	**-**	**178r**	**-**	**1,390r**	**Transformation**
-	42r	660r	-	-	-	178r	-	1,131r	Electricity generation
-	27r	515r	-	-	-	178r	-	720r	Major power producers
-	14	145r	-	-	-	-	-	411r	Autogenerators
-	5	52	-	-	-	-	-	57	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	201	-	-	-	-	-	201	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
1	**5**	**1,019**	**-**	**-**	**-**	**1,398r**	**-**	**4,681r**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	-	-	-	Oil & gas extraction
1	5	1,019	-	-	-	1,398r	-	4,681r	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,630	**27,127r**	**1,296r**	**672**	**1,563**	**39**	**366r**	**299r**	**71,359r**	**Final Consumption**
1,424	**2,940r**	**611r**	**-**	**-**	**-**	**-**	**-**	**5,881r**	**Industry**
1,424	-	-	-	-	-	-	-	2,331	Unclassified
-	-	64r	-	-	-	-	-	64r	Iron & steel
-	20	25	-	-	-	-	-	46	Non-ferrous metals
-	180	41r	-	-	-	-	-	221r	Mineral products
-	104	76	-	-	-	-	-	180	Chemicals
-	81	18	-	-	-	-	-	99	Mechanical engineering etc
-	25	8	-	-	-	-	-	33	Electrical engineering etc
-	91	23	-	-	-	-	-	114	Vehicles
-	208	55r	-	-	-	-	-	263r	Food, beverages etc
-	100	10	-	-	-	-	-	110	Textiles, leather, etc
-	29	32	-	-	-	-	-	61	Paper, printing etc
-	1,967r	237r	-	-	-	-	-	2,204r	Other industries
-	135	21	-	-	-	-	-	156	Construction
12	**22,639**	**569**	**-**	**-**	**-**	**-**	**-**	**53,541**	**Transport**
-	-	-	-	-	-	-	-	12,607	Air
12	632	-	-	-	-	-	-	644	Rail
-	21,065	-	-	-	-	-	-	38,779	Road
-	942	569	-	-	-	-	-	1,511	National navigation
-	-	-	-	-	-	-	-		Pipelines
2,194	**1,310**	**116**	**-**	**-**	**-**	**-**	**-**	**3,969**	**Other**
2,170	173	-	-	-	-	-	-	2,594	Domestic
12	393	45	-	-	-	-	-	450	Public administration
-	323	55	-	-	-	-	-	378	Commercial
12	143	10	-	-	-	-	-	262	Agriculture
-	278	7	-	-	-	-	-	286	Miscellaneous
-	**238**	**-**	**672**	**1,563**	**39**	**366r**	**299r**	**7,967r**	**Non energy use *(4)***

3.5 Supply and disposal of petroleum[(1)]

Thousand tonnes

	2005	2006	2007	2008	2009
Primary oils (Crude oil, NGLs and feedstocks)					
Indigenous production *(2)*	84,721	76,578	76,575r	71,665	68,199
Imports	58,885	59,443	57,357	60,041r	54,347
Exports *(3)*	-54,099	-50,195	-50,999	-48,401r	-45,202
Transfers - Transfers to products *(4)*	-3,387	-3,024	-2,754r	-2,800r	-2,618
Product rebrands (5)	+332	+683	+547	+208r	+44
Stock change *(6)*	-385	-355	+784	+234r	+545
Use during production *(7)*	-1	-	-	-	-
Calculated refinery throughput *(8)*	86,069	83,130	81,509r	80,947r	75,315
Overall statistical difference *(9)*	-65	-83	32r	208r	89
Actual refinery throughput	**86,134**	**83,213**	**81,477r**	**80,740r**	**75,225**
Petroleum products					
Losses in refining process *(10)*	371	374	199r	315r	368
Refinery gross production *(11)*	85,763	82,839	81,278r	80,425r	74,857
Transfers - Transfers to products *(4)*	+3,387	+3,024	2,754r	2,800r	2,618
Product rebrands *(5)*	-333	-683r	-547	-208	-16
Imports	22,512	26,828	25,093	24,080r	22,458
Exports *(12)*	-29,722	-29,009	-30,017	-28,791r	-25,733
Marine bunkers	-2,055	-2,348	-2,371	-2,594	-2,490
Stock changes *(6)* - Refineries	+1,043	-890	1,062r	18r	195
Power generators	+3	+51	+5	+127	+127
Calculated total supply	80,598	79,811	77,257r	75,857r	72,017
Statistical difference *(9)*	-138r	-3r	-173r	-164r	34
Total demand *(4)*	**80,736r**	**79,814r**	**77,430r**	**76,021r**	**71,983**
Of which:					
Energy use	70,298r	70,058r	69,463r	68,138r	64,728
Of which, for electricity generation *(13)*	1,268r	1,237r	1,131r	1,716r	1,552
total refinery fuels *(13)*	5,601	4,878r	4,681r	4,751r	4,544
Non-energy use	10,439	9,756r	7,967r	7,883r	7,255

(1) Aggregate monthly data on oil production, trade, refinery throughput and inland deliveries are available - see paragraph 3.94 and Annex C.
(2) Crude oil plus condensates and petroleum gases derived at onshore treatment plants.
(3) Includes NGLs, process oils and re-exports.
(4) Disposals of NGLs by direct sale (excluding exports) or for blending.
(5) Product rebrands (inter-product blends or transfers) represent petroleum products received at refineries/ plants as process for refinery or cracking unit operations.
(6) Impact of stock changes on supplies. A stock fall is shown as (+) as it increases supplies, and vice-versa for a stock rise (-).
(7) Own use in onshore terminals and gas separation plants. These figures ceased to be available from January 2001 with the advent of the new PPRS system.
(8) Equivalent to the total supplies reported against the upstream transformation sector in Table 3.1.
(9) Supply greater than (+) or less than (-) recorded throughput or disposals.
(10) Calculated as the difference between actual refinery throughput and gross refinery production.
(11) Includes refinery fuels.
(12) Excludes NGLs.
(13) Figures cover petroleum used to generate electricity by all major power producers and by all other generators, including petroleum used to generate electricity at refineries. These quantities are also included in the totals reported as used as refinery fuel, so there is thus some overlap in these figures.

Note:
Differences between the upstream and downstream balance are currently being investigated.

3.6 Additional information on inland deliveries of selected products[(1)(2)(3)]

Thousand tonnes

	2005	2006	2007	2008	2009
Motor spirit					
Retail deliveries (4)					
Hypermarkets (5)					
Lead Replacement Petrol/Super premium unleaded (6)	130	229	263	195	188
Premium unleaded	6,580	6,838	6,616	6,722	6,036
Total hypermarkets	6,710	7,067	6,879	6,917	6,223
Refiners/other traders					
Lead Replacement Petrol/Super premium unleaded (6)	818	509	551	629r	678
Premium unleaded	10,374	9,866	9,376	8521r	8,293
Total Refiners/other traders	11,193	10,375	9,927	9,150	8,970
Total retail deliveries					
Lead Replacement Petrol/Super premium unleaded (6)	949	738	814	825r	865
Premium unleaded	16,954	16,704	15,991	15243r	14,328
Total retail deliveries	17,903	17,442	16,806	16,068	15,194
Commercial consumers (7)					
Lead Replacement Petrol/Super premium unleaded (6)	16	65	25	21r	4
Premium unleaded	812	637	764	590r	564
Total commercial consumers	828	702	789	611	568
Total motor spirit (10)	**18,731**	**18,144**	**17,594**	**16,678**	**15,762**
Gas oil/diesel oil					
DERV fuel:					
Retail deliveries (4):					
Hypermarkets (5)	3,091	3,917	4,161	4,352	4,447
Refiners/other traders	7,587	7,536	8,182	8,518	8,167
Total retail deliveries	10,678	11,453	12,344	12,870	12,614
Commercial consumers (7)	8,757	8,693	8,718r	7,743	7,443
Total DERV fuel	19,435	20,146	21,062r	20,614	20,057
Other gas oil (8)	6,794	6,567	6,109	6,524	5,313
Total gas oil/diesel oil	**26,229**	**26,713**	**27,171r**	**27,137**	**25,369**
Fuel oils (9)					
Light	209	287	624r	617	385
Medium	918	875	201r	291	190
Heavy	837	989	1,384r	1,531	1,391
Total fuel oils	**1,965**	**2,151**	**2,209**	**2,439**	**1,966**

(1) Aggregate monthly data for inland deliveries of oil products are available - see paragraph 3.94 and Annex C. See also Table 3A in the main text.
(2) The end use section analyses are based partly on recorded figures and on estimates. They are intended for general guidance only. See also the main text of this chapter.
(3) This table contains information on hydrocarbons only (no biofuels). For a full breakdown of the end-uses of all oil products, see Tables 3.2 to 3.4.
(4) Retail deliveries - deliveries to garages, etc. mainly for resale to final consumers.
(5) Data for sales by super and hypermarket companies are collected via a separate reporting system, but are consistent with the main data collected from UKPIA member companies - see paragraph 3.49.
(6) Sales of Leaded Petrol ceased on 31 December 1999. Separate breakdowns for lead replacement and super premium unleaded petrol are no longer provided, see Digest of UK Energy Statistics 2007 chapter 3 paragraph 3.47 for details.
(7) Commercial consumers - direct deliveries for use in consumer's business.
(8) Includes marine diesel oil.
(9) Inland deliveries excluding that used as a fuel in refineries, but including that used for electricity generation by major electricity producers and other industries.
(10) Unleaded motor spirit has been 100 per cent of consumption since 2005

3.7 Stocks of crude oil and petroleum products at end of year[(1)]

Thousand tonnes

	2005	2006	2007	2008	2009
Crude and process oils					
Refineries *(2)*	4,875	4,720	4,664r	4,616	3,848
Terminals *(3)*	1,129	1,635	1,131	1,092	1,136
Offshore *(4)*	798	766	638	664	682
Total crude and process oils *(5)*	**7,067**	**7,415**	**6,834r**	**6,787**	**6,033**
Petroleum products					
Ethane	6	8	6	6	6
Propane	111	111	83	83	88
Butane	100	140	143r	74	75
Other petroleum gases	0	0	0	0	0
Naphtha	500	543	463	469	430
Aviation spirit	4	10	5	4	6
Motor spirit	1,047	1,081	865	1,085r	1,150
White spirit & SBP	24	51	22	18	22
Aviation turbine fuel	663	919	833	1,116	1,380
Burning oil	290	397	233	228	224
Gas/Diesel oil *(6)*	2,956	3,083	3,357	4,339	4,623
Fuel oils	1,063	1,264	959	839	927
Lubricating oils	103	84	131	163r	153
Bitumen	204	193	166	173	184
Petroleum wax	33	29	10	11	8
Petroleum coke	280	295	420	427	488
Miscellaneous products	179	106	147	121r	100
Total all products	**7,562**	**8,312**	**7,845r**	**9,156r**	**9,867**
Of which : net bilateral stocks *(7)*	1,322	1,231	886	2,104	2,728

(1) Aggregate monthly data on the level of stocks of crude oil and oil products are available - see paragraph 3.97 and Annex C.
(2) Stocks of crude oil, NGLs and process oils at UK refineries.
(3) Stocks of crude oil and NGLs at UKCS pipeline terminals.
(4) Stocks of crude oil in tanks and partially loaded tankers at offshore fields.
(5) Includes process oils held abroad for UK use approved by bilateral agreements.
(6) Includes middle distillate feedstock and marine diesel oil.
(7) The difference between stocks held abroad for UK use under approved bilateral agreements and the equivalent stocks held in the UK for foreign use.

Chapter 4
Natural gas

Introduction

4.1 This chapter presents five data tables on the production, transmission and consumption of natural gas and colliery methane, and a map showing the gas transmission system in the UK (page 105).

4.2 An energy flow chart for 2009, showing the flows of natural gas from production and imports through to consumption, is included overleaf, as a way of simplifying the figures that can be found in the commodity balance tables. It illustrates the flow of gas from the point at which it becomes available from home production or imports (on the left) to the eventual final use of gas (on the right) as well as the gas transformed into other forms of energy or exported.

4.3 Table 4.1 shows the commodity balances for natural gas and colliery methane, both separately and in aggregate. In Table 4.2, the two gases are aggregated and presented as a five year time-series, showing supply, transmission and consumption. A more detailed examination of the various stages of natural gas from gross production through to consumption is given in Table 4.3. Table 4.4 details the UK's gas storage sites and interconnector pipelines, while Table 4.5 shows the UK's imports and exports of gas. Long term trends commentary and a table on production and consumption of gas back to 1970 are to be found on DECC's energy statistics web site at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

4.4 Petroleum gases are covered in Chapter 3. Gases manufactured in the coke making and iron and steel making processes (coke oven gas and blast furnace gas) appear in Chapter 2. Biogases (landfill gas and sewage gas) are part of Chapter 7. Details of net selling values of gas for the domestic, industrial and other sectors are to be found in Chapter 1.

Commodity balances for gas (Tables 4.1 and 4.2)

4.5 Total supply of gas is made up of production, net trade and stock change.

4.6 UK Continental Shelf (UKCS) production of natural gas has been in decline since the turn of the decade. After falls of 9.9 per cent and 3.4 per cent in 2007 and 2008, production fell by 14.3 per cent in 2009, to 694 TWh, a level 45 per cent below the 2000 peak. UKCS production in 2009 was approximately 69 per cent of total supply.[1] Since 2000, gas production has fallen off at a rate of just over 6 per cent per year. However, the rate of decline varies each year, and 2009 production was lower, partly as a result of lower demand and maintenance work.

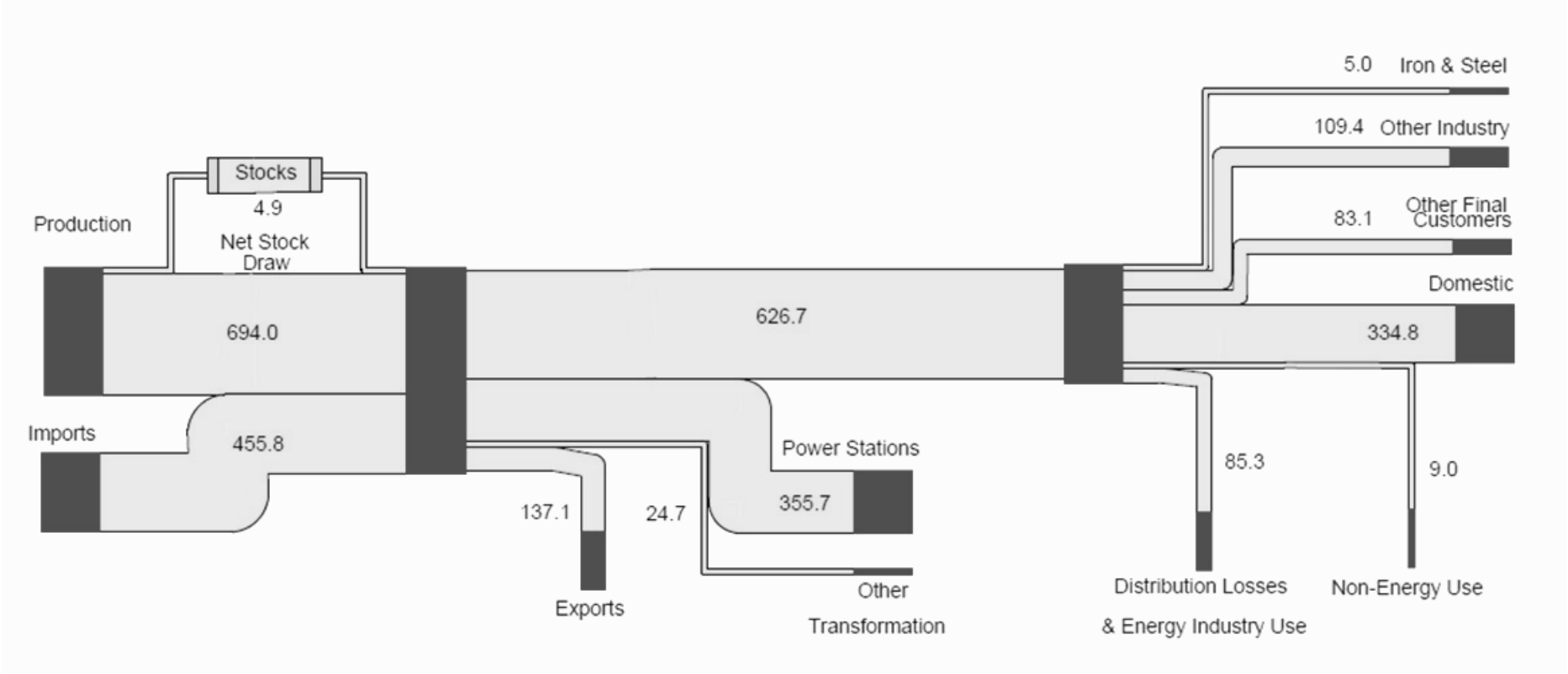
4.7 The UK imports natural gas by pipelines from Norway, Belgium and the Netherlands and Liquefied Natural Gas (LNG) by ship. In 2009, the UK was a net importer of gas (as it has been since 2004) with imports of gas 319 TWh higher than exports (and approximately 32 per cent of total gas supply). This was an increase of 12 per cent on 2008's level of 284 TWh (26 per cent of total supply), and 48 per cent on 2007's level of 215 TWh. Chart 4.1 shows that that the UK became a net importer of gas in 2004, and has been in each year since.

4.8 After increases of 1.1 per cent and 3.1 per cent in 2007 and 2008, total gas demand fell 7.7 per cent in 2009, from 1,091 TWh to 1,008 TWh, largely a reflection of lower industrial demand as a result of the recession and lower demand from electricity generators. Demand is traditionally slightly less than supply because of the various measurement differences described in paragraphs 4.53 to 4.56. In 2009, demand was 0.3 TWh (under 0.1 per cent) less than supply.[2]

[1] Due to stock changes and transfers, total gas production and net imports' combined shares of total supply is over 100 per cent in 2009.

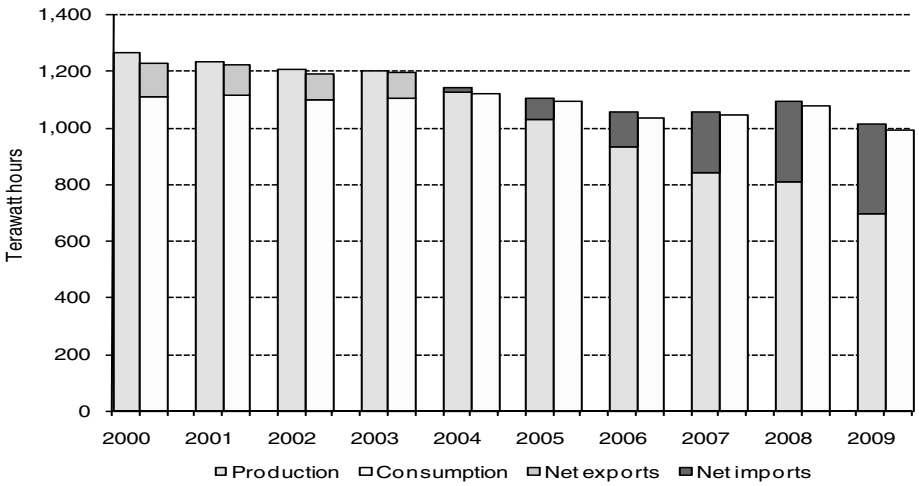
[2] The term statistical difference is used to define the difference between total supply and total demand – see paragraph 4.53

Natural gas flow chart 2009 (TWh)



Notes:
This flow chart is based on the data that appear in Table 4.1, excluding colliery methane.

Chart 4.1: Natural gas production, net exports/imports and consumption[1] 2000 to 2009



(1) Consumption plus net exports will differ from production plus net imports because of stock changes, losses and the statistical difference item.

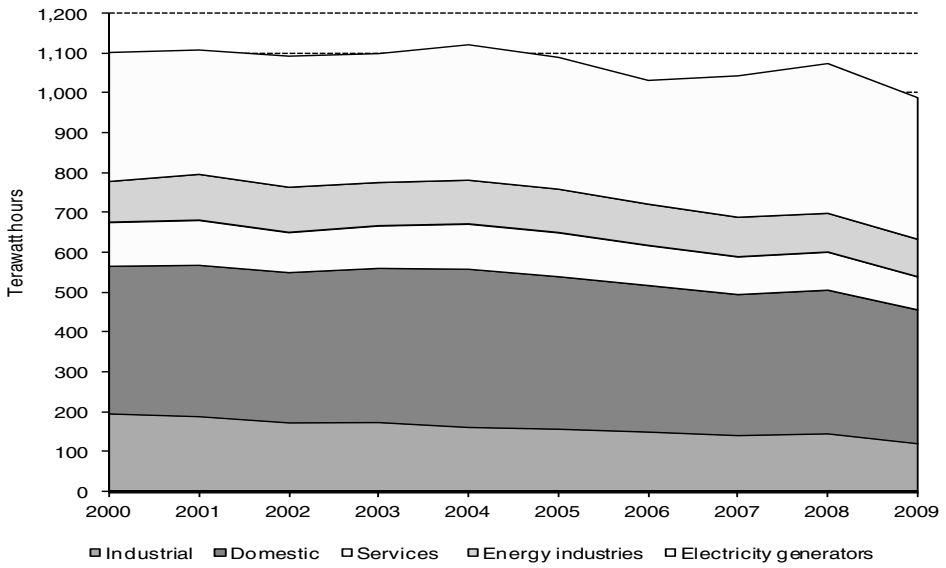
4.9 In 2009, 35 per cent of natural gas demand (356 TWh) was for electricity generation (transformation sector), 1 percentage point more than in 2008, although the volume was down 5.5 per cent on 2008. A further 7 per cent was consumed within the energy industries, while 2 per cent was accounted for by distribution losses within the gas network. (For an explanation of the items included under losses, see paragraph 4.17). Of the remaining 56 per cent, 2 per cent was transformed into heat for sale to a third party, and 11 per cent was accounted for by the industrial sector, with the chemicals industry (excluding natural gas for petrochemical feedstocks), food, mineral products and paper making industries being the largest consumers. The chemicals sector accounted for almost a quarter of the industrial consumption of natural gas.

4.10 Sales of gas to households (domestic sector) accounted for a third of gas demand, while public administration (including schools and hospitals) consumed 4 per cent of total demand, which was more than was sold to the chemicals sector. The commercial, agriculture and miscellaneous sectors together took up 5 per cent. Non-energy use of gas accounted for the remaining 1 per cent. (See paragraph 4.46 for more details on non-energy use of gas).

4.11 As Chart 4.2 shows, gas consumption is split roughly equally in thirds between electricity generation and domestic use with the remaining third going to a combination of industry/services and energy industries. Most gas for electricity generation was used in Combined Cycle Gas Turbine (CCGT) stations. However, gas use for electricity generation has fluctuated with changes in the relative price of coal and gas. Price increases during 2005 and 2006 saw gas use for generation fall in both years. In 2007, however, gas use by generators rose by 14 per cent and by a further 5.9 per cent in 2008 to 377 TWh. With electricity demand falling, gas use for generation fell by 5.5 per cent in 2009 to 356 TWh.

4.12 Between 2000 and 2007, industrial use of gas has been on a downward trend apart from a small recovery in 2003. In 2008, however, consumption increased by 4 per cent, with most industrial sectors, notably excepting iron and steel, showing increases in demand. With the economic downturn, however, overall industrial demand fell by 17 per cent in 2009, from 139 TWh to 114 TWh. At the same time, there was a 2.6 per cent fall in gas used for heat that was then sold to other companies. If heat use and total industrial use are combined then the decrease in gas use in 2009 is 15 per cent. Use by the public administration sector was 13 per cent lower in 2009, at 37 TWh, while the commercial sector was down 12 per cent, at 29 TWh. Consumption in the energy industries other than electricity (and heat) generation fell by 4.4 per cent on 2008 to 69 TWh.

Chart 4.2: Consumption of natural gas 2000 to 2009



4.13 Gas use in the domestic sector is particularly dependent on winter temperatures. Whilst the average temperature in 2009 was much the same as for 2008, the first quarter of 2009 was a degree colder than a year earlier 2008, with the coldest January since 1997. December 2009 too was over half a degree cooler than a year earlier. However, the shoulder heating seasons saw higher temperatures and, with the poorer economic climate and increasing energy efficiency measures, domestic sector consumption fell by 6.9 per cent on 2008, down from 360 TWh to 335 TWh, its lowest level since 1995.

4.14 Maximum daily demand for natural gas through the National Transmission System in winter 2009/2010 was a new record high of 5,115 GWh on 8th January 2010. This total maximum daily demand was 4.7 per cent higher than the 2008/2009 level, and 2.8 per cent higher than January 2003's previous record level.

4.15 It is estimated that sales of gas supplied on an interruptible basis accounted for around 19 per cent of total gas sales in 2009, roughly 3 percentage points lower than in 2008.

UK continental shelf and onshore natural gas (Table 4.3)

4.16 Table 4.3 shows the flows for natural gas from production through transmission to consumption. The footnotes to the table give more information about each row. This table departs from the standard balance methodology and definitions in order to maintain the link with past data and with monthly data given on DECC's energy statistics web site (see paragraph 4.52). The relationship between total UK gas consumption shown in this table and total demand for gas given in the balance Table 4.1 is illustrated for 2009 as follows:

			GWh
Total UK consumption (Table 4.3)			926,831
plus Producers' own use			61,110
plus Operators' own use			2,810
equals			
"Consumption of natural gas"			990,751
plus Other losses and metering differences (upstream)			-
plus Downstream losses	- leakage assessment	4,880)	7,245
	- own use gas	394)	
	- theft	1,971)	
plus Metering differences (transmission)			9,111
equals			
Total demand for natural gas (Table 4.1)			1,007,107

4.17 The box below shows how, in 2009, the wastage, losses and metering differences figures in Table 4.3 are related to the losses row in the balance Table 4.1. [3]

		GWh
Table 4.3		
	Upstream gas industry:	
	Other losses and metering differences	-
	Downstream gas industry:	
	Transmission system metering differences	9,111
	Leakage assessment	4,880
	Own use gas	394
	Theft	1,971
Table 4.1		
	Losses	16,356

4.18 The statistical difference row in Table 4.1 is made up of the following components in 2009:

		GWh
Table 4.3		
	Statistical difference between gas available from upstream and gas input to downstream	-1,173
plus	Downstream gas industry:	
	Distribution losses and metering differences	1,490
Table 4.1		
	Statistical difference	318

4.19 Gross production of natural gas rose steadily from the year indigenous production began in 1967 until it peaked in 2000 at 1.3 TWh. It has since fallen steadily as reserves on the UKCS deplete. In 2009, natural gas production had fallen by nearly a half of the 2000 peak. Gas available at UK terminals has remained fairly constant over this period mainly due to the changes in exports and imports described in paragraph 4.7. Producers' and operators' own use of gas have tended to change in proportion to the volumes of gas produced and transmitted. Gas put into the transmission systems fell by 7.9 per cent between 2008 and 2009, while output of natural gas fell by 8.3 per cent. Output from the transmission system was lower than input due to stock changes and metering differences.

4.20 For a discussion of the various statistical difference terms in this table, see paragraphs 4.53 to 4.55 in the technical notes and definitions section below. The statistical difference between output from the National Transmission System and total UK consumption has been disaggregated using information obtained from Transco on leakage from local distribution zone pipes, theft and use regarded as own use by pipeline operators. The convention used is set out in paragraph 4.54.

4.21 Losses and metering differences attributable to the information provided on the upstream gas industry are zero from 2001 onwards because these data are no longer reported in the revised Petroleum Production Reporting System. This simplified system for reporting the production of crude oil, NGLs and natural gas in the UK was implemented from 1 January 2001; it reduced the burden on the respondents and improved the quality of data reported on gas production.

4.22 Table 4.3 also includes two rows showing gas stocks and gas storage capacity at the end of the year. Storage data are not available before 2004. Stocks data for 2005 onwards have been sourced from the National Grid's weekly brief, and storage data from its 2009 Ten Year Statement.

Gas storage sites and import/export pipelines (Table 4.4)

4.23 This table details current gas storage facilities in the UK as at 31 May 2010, and also the two operational pipelines that bring gas to the UK from continental Europe. Significant increases in storage capacity/deliverability are being planned or contemplated at existing or new sites, both onshore and offshore. National Grid's Gas Transportation Ten Year Statement (www.nationalgrid.com/uk/Gas/TYS/) includes public details of such projects.

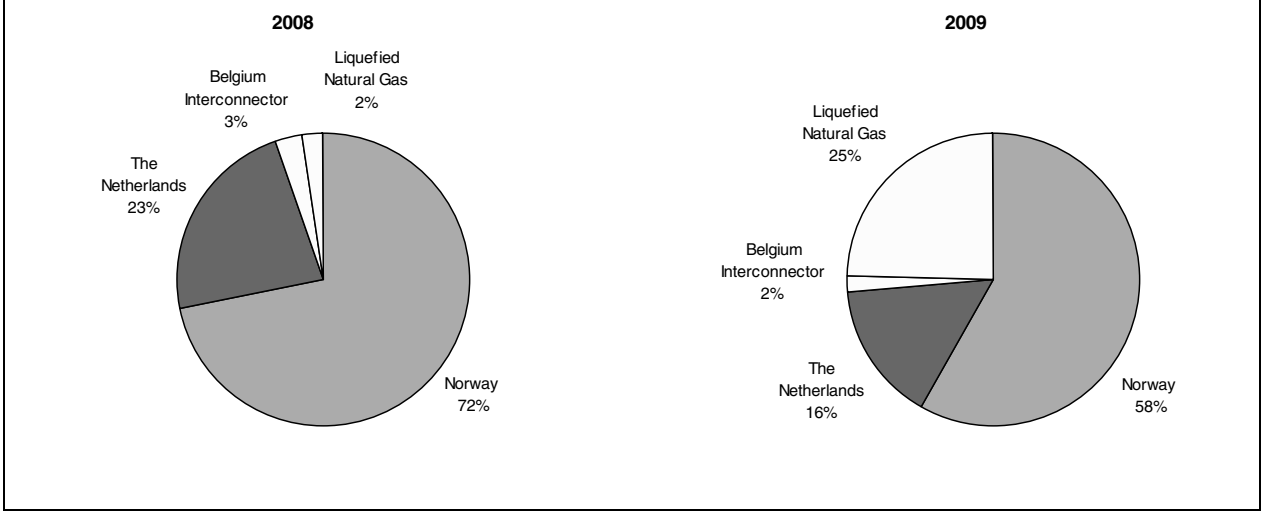
[3] Losses from 2001 onwards are lower than in earlier years because figures for losses and metering differences in the upstream gas industry are no longer available (see paragraph 4.54 to 4.55)

Natural gas imports and exports (Table 4.5)

4.24 This table shows how much gas is imported to, and exported from, the UK, via the interconnector pipelines and LNG. In 2009, 58 per cent of the UK's gross gas imports were from Norway, down from 72 per cent in 2008. In 2009, 58 per cent of our gas exported was to continental Europe, and 42 per cent to the Republic of Ireland. Chart 4.3 shows the shares of natural gas imports by interconnector pipelines and LNG, while the flows of gas across Europe are illustrated in Map 4.1.

4.25 In July 2005, imports of LNG commenced at the Isle of Grain LNG import facility, the first time LNG had been imported to the UK since the early 1980s. In 2009 two new LNG terminals became operational at Milford Haven, South Hook and Dragon, the second phase of the Isle of Grain expansion was completed at the Isle of Grain terminal. As a result, LNG's share of total gas imports rose from 2 per cent in 2008 to 25 per cent in 2009, with LNG imported from Algeria, Trinidad and Tobago, Qatar, Egypt, Norway, the USA and Australia. LNG imports are seen as increasingly important in meeting the UK's gas demand.

Chart 4.3: Natural gas imports



4.26 Imports of natural gas from the Norwegian sector of the North Sea began to decline in the late 1980s as output from the Frigg field tailed off. Frigg finally ceased production in October 2004. Whilst Frigg production was declining a spur line (Vesterled) from the Norwegian Heimdal field to the existing Frigg pipeline was laid and became operational in October 2001. As part of the Statfjord late life project a pipeline called Tampen Link was laid from Statfjord B to the UK's FLAGS (Far North Liquids and Associated Gas System) pipeline. This pipeline bringing additional Norwegian gas supplies to the UK became operational In October 2007. The southern part of the Langeled pipeline from Sleipner to the UK became operational in October 2006 and has a potential capacity of 27 billion cubic metres per year (bcm/y).

4.27 The interconnector linking the UK's transmission network with Belgium via a Bacton to Zeebrugge pipeline began to operate in October 1998, allowing both imports from and exports to mainland Europe. Whilst the flow was initially to the continent, since 1998 there has been an increase in imports. In 2009, UK imports from Belgium fell by 35 per cent, from 12,174 TWh to 7,945 TWh, whilst exports increased by 35 per cent, from 45,949 TWh to 62,084 TWh, with specifically high exports in early 2009 due to the Russia/Ukraine gas supply situation. A second interconnector linking the Netherlands to the UK began transporting gas to the UK in December 2006 - the Balgzand-Bacton (BBL) pipeline comes ashore at Bacton in Norfolk and has a potential capacity of 16 bcm/y. Exports to mainland Europe from the UK's share of the Markham field began in 1992 with Windermere's output being added in 1997, Minke, Grove and Chiswick in 2007 and Stamford in 2008. Exports to the Republic of Ireland started in 1995. (See Map 4.2).

Sub-national gas data

4.28 Table 4A gives the number of consumers with a gas demand below 73,200 kWh per year in 2008 and the total number of gas consumers. The table covers customers receiving gas from the national transmission system. The below 73,200 kWh category covers both domestic and small business customers, and it was this section of the market that was progressively opened up to competition between April 1996 and May 1998. Note that the data are for 2008, one year in arrears of the other data presented in this chapter, and exclude around 2,000 customers not allocated to a government office region.

4.29 In December 2009, DECC published in *Energy Trends* and on its sub-national energy statistics website (www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx) gas consumption data at both regional and local level. The local level data are at "LAU1" level (see article in December 2009 *Energy Trends* for definition) and the regional data at "NUTS1" level. Data for earlier years are presented on the web site but only 2008 data appear in the article. Domestic sector sales are shown separately from commercial and industrial sales, along with the numbers of consumers. DECC has produced electricity and gas consumption estimates since 2004 at Middle Layer Super Output Area (MLSOA) level and, for Scotland, intermediate geography zones. MLSOAs are a statistical geography developed by the Office for National Statistics (ONS) as part of the 2001 census. There are 7,193 MLSOAs (plus the Isles of Scilly) which are areas containing a minimum population of 5,000 or around 2,000 households. In addition to this in Scotland there are 1,235 intermediate geography zones which are designed to contain between 2,500 and 6,000 people. In 2008, consumption data at Lower Layer Super Output Area (LLSOA) was also produced for all 34,378 areas within England and Wales, which contain a minimum population of 1,000 based on the 2001 census. Further details about the MLSOA and LLSOA data can be found on the sub-national energy statistics website www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_llsoa.aspx.

Table 4A: Consumption by gas customers by region in 2008

	Consumption by customers below 73,200 kWh (2,500 therms) annual demand		Consumption by all customers (where regional classification is possible)	
Government Office Region	Number of consumers (thousands)	Gas sales 2008 (GWh)	Number of consumers (thousands)	Gas sales 2008 (GWh)
North West	2,806	48,420	2,846	75,755
South East	3,077	52,376	3,125	74,526
Greater London	2,970	48,528	3,020	72,799
Yorkshire and the Humber	2,050	35,502	2,079	59,528
Scotland	1,848	33,341	1,877	57,424
West Midlands	2,041	34,452	2,070	52,783
East of England	1,972	33,015	1,998	51,738
East Midlands	1,684	28,750	1,706	44,145
South West	1,733	26,200	1,756	38,799
North East	1,066	18,604	1,079	29,236
Wales	1,080	18,255	1,093	29,684
Great Britain	22,327	377,473	22,651	586,455

Source: xoserve and the independent gas transporters

4.30 By December 2009, 12.4 million gas consumers (57 per cent) were no longer supplied by British Gas (see paragraph 4.35). Table 4B gives market penetration in more detail, by local distribution zone (LDZ). For all types of domestic customer, it is in the markets in Northern England and Wales that new suppliers have had most success. Since the market has opened up, British Gas had lost around 43 per cent of the credit market, 67 per cent of the direct debit market, and 53 per cent of the pre-payment market. At the end of May 2010, 44 suppliers were licensed to supply gas to domestic customers.

4.31 Competition in the domestic market remained broadly unchanged between 2007 and 2009, with the largest three suppliers accounting for 71 per cent of sales in 2009. In the industrial sector, after an increase in 2007, the market share of the three largest suppliers fell back to 60 per cent in 2008, before increasing to 64 per cent in 2009. The commercial sector is more competitive, with the

three largest suppliers accounting for 46 per cent of sales in 2009, an increase of 3 percentage points on 2008.

Table 4B: Domestic gas market penetration (in terms of percentage of customers supplied) by local distribution zone and payment type, fourth quarter of 2009

	British Gas Trading			Non-British Gas		
Region	Credit	Direct Debit	Prepayment	Credit	Direct Debit	Prepayment
Wales	51	33	30	49	67	70
Northern	49	26	35	51	74	65
Scotland	57	33	41	43	67	59
North West	60	35	57	40	65	43
East Midlands	55	32	52	45	68	48
Eastern	54	33	47	46	67	53
South East	57	34	48	43	66	52
Southern	52	30	43	48	70	57
North East	56	31	38	44	69	62
North Thames	64	41	56	36	59	44
South Western	60	37	44	40	63	56
West Midlands	63	34	56	37	66	44
Great Britain	57	33	47	43	67	53

The gas supply industry in Great Britain

4.32 When British Gas was privatised in 1986, it was given a statutory monopoly over supplies of natural gas (methane) to premises taking less than 732,000 kWh (25,000 therms) a year. Under the Oil and Gas (Enterprise) Act 1982, contract customers taking more than this were able to buy their gas from other suppliers, but no other suppliers entered the market until 1990.

4.33 In 1991, the Office of Fair Trading (OFT) followed up an examination of the contract market, in 1988, by the Monopolies and Mergers Commission (MMC). It reviewed progress towards a competitive market, and found that the steps taken in 1988 had been ineffective in encouraging self-sustaining competition. British Gas undertook in March 1992: to allow competitors to take, by 1995, at least 60 per cent of the contract market above 732,000 kWh (25,000 therms) a year (subsequently redefined as 45 per cent of the market above 73,200 kWh (2,500 therms)); to release to competitors the gas necessary to achieve this; and to establish a separate transport and storage unit with regulated charges. In the 1992 Competition and Service (Utilities) Act, the Government also took powers to reduce or remove the tariff monopoly, and in July 1992 it lowered the tariff threshold to 73,200 kWh.

4.34 Difficulties in implementing the March 1992 undertakings led to further references to the MMC. As a result of the new recommendations made by the MMC earlier in 1993, the President of the Board of Trade decided in December 1993 to require full internal separation of British Gas's supply and transportation activities, but not divestment, and to accelerate removal of the tariff monopoly to April 1996, with a phased opening of the domestic market by the regulator over the following two years.

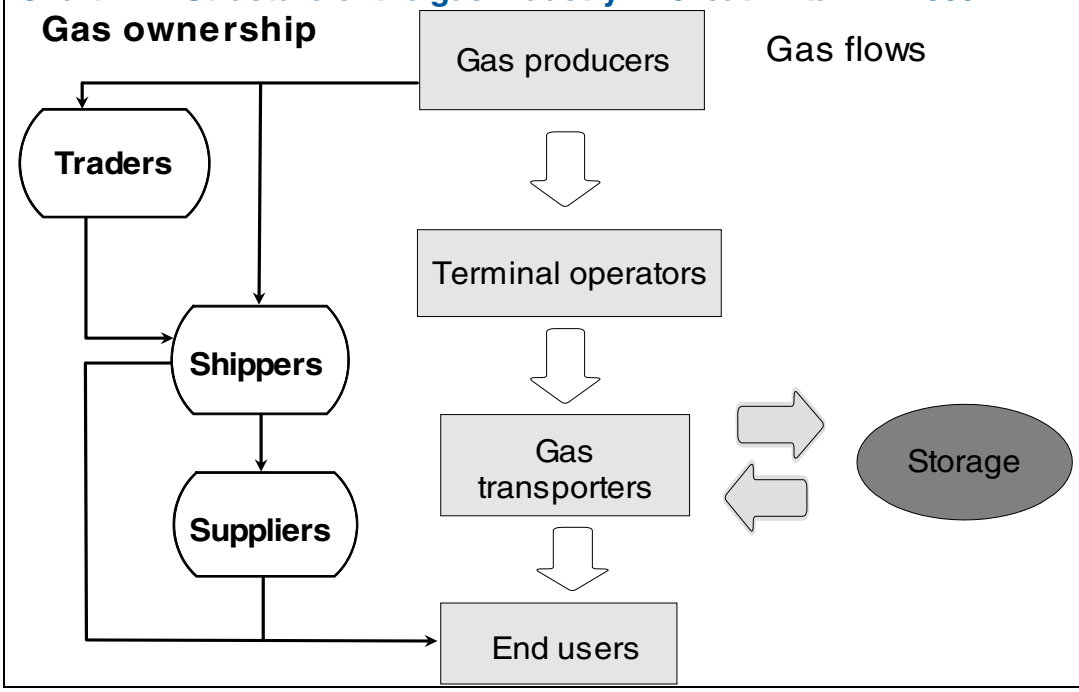
4.35 In November 1995, the Gas Bill received Royal Assent, clearing the way for the extension of competition into the domestic gas supply market on a phased basis between 1996 and 1998. This was carried out in stages between April 1996 and May 1998.

4.36 For the non-domestic market, about three-quarters (by volume) in Great Britain was opened to competition at the end of 1982 and the remainder in August 1992 (with the reduction in the tariff threshold). However, no other suppliers entered the market until 1990. After 1990, there was a rapid increase in the number of independent companies supplying gas, although from 1999 some consolidation started, and in recent years sales of gas have become more concentrated in the hands of the largest companies in the domestic, industrial and commercial sectors. This came about through larger companies absorbing smaller suppliers and through mergers between already significant suppliers.

4.37 Following the 1995 Gas Act, the business of British Gas was fully separated into two corporate entities. The supply and shipping businesses were devolved to a subsidiary, British Gas Trading Limited, while the transportation business (Transco) remained within British Gas plc. In February 1997, Centrica plc was demerged from British Gas plc (which was itself renamed as BG plc) completing the division of the business into two independent entities. Centrica became the holding company for British Gas Trading, British Gas Services, the Retail Energy Centres and the company producing gas from the North and South Morecambe fields. BG plc comprised the gas transportation and storage business of Transco, along with British Gas's other exploration and production, international downstream, research and technology and property activities. In October 2000, BG plc demerged into two separately listed companies, of which Lattice Group plc was the holding company for Transco, while BG Group plc included the international and gas storage businesses. On 21 October 2002, Transco and the National Grid Company merged to form National Grid.

4.38 From 1 October 2001, under the Utilities Act, gas pipeline companies have been able to apply for their own national Gas Transporter Licences so that they can compete with Transco. In some areas, low pressure spur networks had already been developed by new transporters competing with Transco to bring gas supplies to new customers (mainly domestic). In addition, some very large loads (above 60 GWh) are serviced by pipelines operated independently, some by North Sea producers. The structure of the gas industry in Great Britain, as it stood at the end of 2009, is shown in Chart 4.4.

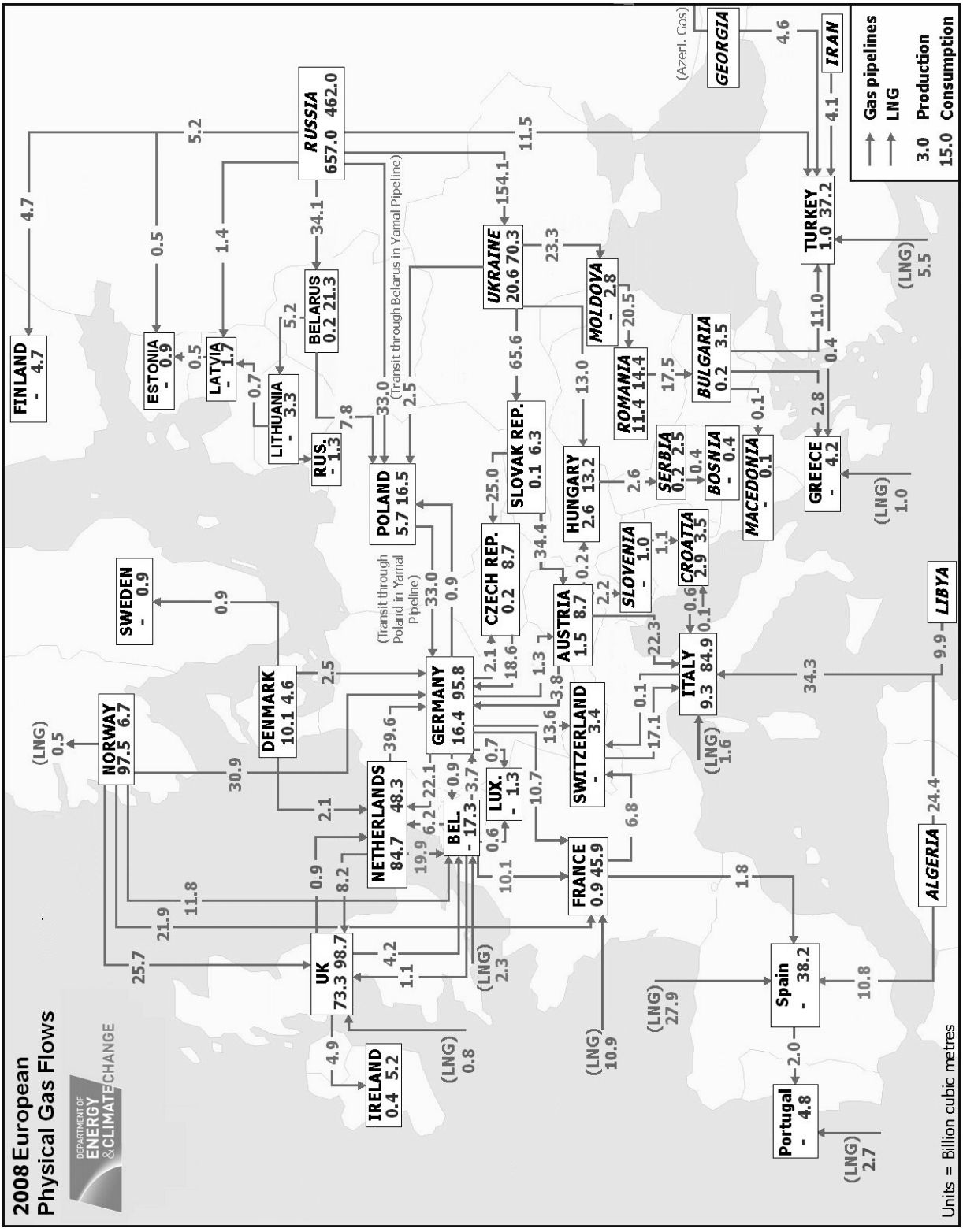
Chart 4.4: Structure of the gas industry in Great Britain in 2009



Northern Ireland

4.39 Before 1997, Northern Ireland did not have a public natural gas supply. The construction of a natural gas pipeline from Portpatrick in Scotland to Northern Ireland was completed in 1996 and provided the means of establishing such a system. The initial market was Ballylumford power station, which was purchased by British Gas in 1992 and converted from oil to gas firing (with a heavy fuel oil back up). A second gas-fired power station was built at Coolkeeragh in 2005. The onshore line has been extended to serve wider industrial, commercial and domestic markets and this extension is continuing. In late 2007, the South-North gas pipeline was completed, to allow gas to be imported to Northern Ireland from the Republic of Ireland. In 2009, 76 per cent of all gas supplies in Northern Ireland were used to generate electricity.

Map 4.1: Gas European Transit System



4.40 Gas data are less transparent at the wider European level given missing information on transit flows and incomplete trade information. The above map was produced using published International Energy Agency data to reconstruct the missing physical gas flow data and was prepared as part of DECC's contribution to a Eurostat project to improve gas data transparency and quality.

Map 4.2: The National Gas Transmission System 2009

Source: International Energy Agency and DECC

Technical notes and definitions

4.41 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy as a whole in Chapter 1, paragraphs 1.26 to 1.60. For notes on the commodity balances and definitions of the terms used in the row headings see Annex A, paragraphs A.7 to A.42. While the data in the printed and bound copy of this Digest cover only the most recent five years, these notes also cover data for earlier years that are available on the DECC energy statistics web site.

Definitions used for production and consumption

4.42 **Natural gas** production in Tables 4.1 and 4.2 relates to the output of indigenous methane at land terminals and gas separation plants (includes producers' and processors' own use). For further explanation, see Annex F, paragraph F.10 on DECC's energy statistics web site under 'Production of gas' - www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx. Output of the Norwegian share of the Frigg and Murchison fields is included under imports. A small quantity of onshore produced methane (other than colliery methane) is also included.

4.43 Table 4.3 shows production, transmission and consumption figures for UK continental shelf and onshore natural gas. Production includes waste and own use for drilling, production and pumping operations, but excludes gas flared. Gas available in the United Kingdom excludes waste, own use for drilling etc, stock change, and includes imports net of exports. Gas transmitted (input into inland transmission systems) is after stock change, own use, and losses at inland terminals. The amount consumed in the United Kingdom differs from the total gas transmitted by the gas supply industry because of losses in transmission, differences in temperature and pressure between the points at which the gas is measured, delays in reading meters and consumption in the works, offices, shops, etc of the undertakings. The figures include an adjustment to the quantities billed to consumers to allow for the estimated consumption remaining unread at the end of the year.

4.44 **Colliery methane** production is colliery methane piped to the surface and consumed at collieries or transmitted by pipeline to consumers. As the output of deep-mined coal declines so does the production of colliery methane, unless a use can be found for gas that was previously vented. The supply of methane from coal measures that are no longer being worked or from drilling into coal measures is licensed under the same legislation as used for offshore gas production.

4.45 **Transfers** of natural gas include natural gas use within the iron and steel industry for mixing with blast furnace gas to form a synthetic coke oven gas. For further details see paragraph 2.43 in Chapter 2.

4.46 **Non-energy gas**: Non-energy use is gas used as feedstock for petrochemical plants in the chemical industry as raw material for the production of ammonia (an essential intermediate chemical in the production of nitrogen fertilisers) and methanol. The contribution of liquefied petroleum gases (propane and butane) and other petroleum gases is shown in Tables 3.2 to 3.4 of Chapter 3. Firm data for natural gas are not available, but estimates for 2005 to 2009 are shown in Table 4.2 and estimates for 2007 to 2009 in Table 4.1. The estimates for the years up to 2008 have been obtained from AEA's work for the National Atmospheric Emissions Inventory; 2009 data are DECC extrapolations.

Sectors used for sales/consumption

4.47 For definitions of the various sectors used for sales and consumption analyses see Chapter 1 paragraphs 1.54 to 1.59 and Annex A, paragraphs A.31 to A.42. However, **miscellaneous** has a wider coverage than in the commodity balances of other fuels. This is because some gas supply companies are unable to provide a full breakdown of the services sector and the gas they supply to consumers is allocated to miscellaneous when there is no reliable basis for allocating it elsewhere. See also paragraph 4.50, below, for information on the source of the sectoral data for consumption of gas.

Data collection

4.48 Production figures are generally obtained from returns made under DECC's Petroleum Production Reporting System (PPRS) and from other sources. DECC obtain data on the transmission of natural gas from National Grid (who operate the National Transmission System) and from other pipeline operators. Data on consumption are based on returns from gas suppliers and UK Continental Shelf (UKCS) producers who supply gas directly to customers.

4.49 The production data are for the United Kingdom (including natural gas from the UKCS - offshore and onshore). The restoration of a public gas supply to parts of Northern Ireland in 1997 (see paragraph 4.39), means that all tables in this chapter, except Tables 4A and 4B, cover the UK.

4.50 DECC carry out an annual survey of gas suppliers to obtain details of gas sales to the various categories of consumer. Estimates are included for the suppliers with the smallest market share since the DECC inquiry covers only the largest suppliers (ie those with more than about a 0.5 per cent share of the UK market up to 1997 and those known to supply more than 1,750 GWh per year for 1998 onwards). For 2000 and subsequent years, gas consumption for the iron and steel sector is based on data provided by the Iron and Steel Statistics Bureau (ISSB) rather than gas suppliers since gas suppliers were over estimating their sales to this sector. The difference between the ISSB and gas suppliers figures has been re-allocated to other sectors. The data are validated using information on sectors from EU Emissions Trading Scheme (EU-ETS) sources.

Period covered

4.51 Figures generally relate to years ended 31 December. However, before 2004, data for natural gas for electricity generation relate to periods of 52 weeks as set out in Chapter 5, paragraphs 5.73 and 5.74.

Monthly and quarterly data

4.52 Monthly data on natural gas production and supply are available from DECC's energy statistics web site www.decc.gov.uk/en/content/cms/statistics/source/gas/gas.aspx in monthly Table 4.2. A quarterly commodity balance for natural gas (which includes consumption data) is published in DECC's quarterly statistical bulletin *Energy Trends* and is also available from quarterly Table 4.1 on DECC's energy statistics web site. See Annex C for more information about *Energy Trends* and DECC's energy statistics web site.

Statistical and metering differences

4.53 In Table 4.3 there are several headings that refer to statistical or metering differences. These arise because measurement of gas flows, in volume and energy terms, takes place at several points along the supply chain. The main sub-headings in the table represent the instances in the supply chain where accurate reports are made of the gas flows at that particular key point in the supply process. It is possible to derive alternative estimates of the flow of gas at any particular point by taking the estimate for the previous point in the supply chain and then applying the known losses and gains in the subsequent part of the supply chain. The differences seen when the actual reported flow of gas at any point and the derived estimate are compared are separately identified in the table wherever possible, under the headings statistical or metering differences.

4.54 The differences arise from several factors:-

- Limitations in the accuracy of meters used at various points of the supply chain. While standards are in place on the accuracy of meters, there is a degree of error allowed which, when large flows of gas are being recorded, can become significant.
- Differences in the methods used to calculate the flow of gas in energy terms. For example, at the production end, rougher estimates of the calorific value of the gas produced are used which may be revised only periodically, rather than the more accurate and more frequent analyses carried out further down the supply chain. At the supply end, although the calorific value of gas shows day-to-day variations, for the purposes of recording the gas supplied to customers a single calorific value is used. Until 1997 this was the lowest of the range of calorific values for the actual gas being supplied within each LDZ, resulting in a "loss" of gas in energy terms. In 1997 there was a change to a "capped flow-weighted average" algorithm for calculating calorific values resulting in a reduction in the losses shown in the penultimate row of Table 4.3. This change in algorithm, along with improved meter validation and auditing procedures, also reduced the level of the "metering differences" row within the downstream part of Table 4.3.
- Differences in temperature and pressure between the various points at which gas is measured. Until February 1997 British Gas used "uncorrected therms" on their billing system for tariff customers when converting from a volume measure of the gas used to an energy measure. This made their supply figure too small by a factor of 2.2 per cent, equivalent to about 1 per cent of the wholesale market.

- Differences in the timing of reading meters. While National Transmission System meters are read daily, customers' meters are read less frequently (perhaps only annually for some domestic customers) and profiling is used to estimate consumption. Profiling will tend to underestimate consumption in a strongly rising market.
- Other losses from the system, for example theft through meter tampering by consumers.

4.55 The headings in Table 4.3 show where, in the various stages of the supply process, it has been possible to identify these metering differences as having an effect. Usually they are aggregated with other net losses as the two factors cannot be separated. Whilst the factors listed above can give rise to either losses or gains, losses are more common. However, the negative downstream gas metering difference within the transmission system in 2003 was an anomaly that was investigated by National Grid during 2004. They concluded that this unaccounted for element of National Transmission System shrinkage was due to an exceptional run of monthly negative figures between February and June 2003 within what is usually a variable but mainly positive series. However, after a comprehensive investigation of this exceptional period no causal factors were identified. It is probable that the meter error or errors that caused this issue were corrected during the validation of metering.

4.56 Care should be exercised in interpreting the figures for individual industries in these commodity balance tables. As companies switch contracts between gas suppliers, it has not been possible to ensure consistent classification between and within industry sectors and across years. The breakdown of final consumption includes a substantial amount of estimated data. For 2009, the allocation of about 4 per cent of consumption is estimated.

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4.1 Commodity balances

Natural gas

GWh

	2007			2008			2009		
	Natural gas	**Colliery methane**	**Total Natural gas**	**Natural gas**	**Colliery methane**	**Total Natural gas**	**Natural gas**	**Colliery methane**	**Total Natural gas**
Supply									
Production	838,092	717	838,809	809,649	560r	810,209r	693,965	573	694,539
Other sources	-	-	-	-	-	-	-	-	-
Imports	338,026	-	338,026	407,054	-	407,054	455,789	-	455,789
Exports	-123,158	-	-123,158	-122,670	-	-122,670	-137,100	-	-137,100
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(1)*	+5,480	-	+5,480	-3,087	-	-3,087	-4,876	-	-4,876
Transfers *(2)*	-78	-	-78	-68	-	-68	-354	-	-354
Total supply	**1,058,363**	**717**	**1,059,080**	**1,090,878**	**560r**	**1,091,438r**	**1,007,424**	**573**	**1,007,998**
Statistical difference *(3)*	+186r	-	+186r	+137r	-	+137r	+318	-	+318
Total demand	**1,058,177r**	**717**	**1,058,894r**	**1,090,742r**	**560r**	**1,091,301r**	**1,007,107**	**573**	**1,007,680**
Transformation	**378,932r**	**586**	**379,518r**	**401,762r**	**431r**	**402,192r**	**380,446**	**455**	**380,902**
Electricity generation	355,292r	586	355,878r	376,380r	431r	376,810r	355,730	455	356,186
Major power producers	319,836r	-	319,836r	344,454r	-	344,454r	325,769	-	325,769
Autogenerators	35,456r	586	36,042r	31,926r	431r	32,357r	29,961	455	30,416
Heat generation	23,640r		23,640r	25,382r		25,382r	24,716		24,716
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**75,934r**	**91**	**76,025r**	**72,185r**	**95**	**72,280r**	**68,983**	**89**	**69,072**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil and gas extraction	64,230r	-	64,230r	61,292r	-	61,292r	61,110	-	61,110
Petroleum refineries	5,206r	-	5,206r	4,971r	-	4,971r	3,924	-	3,924
Coal extraction	-	91	91	-	95	95	-	89	89
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	719	-	719	718	-	718	450	-	450
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	5,779r	-	5,779r	5,204r	-	5,204r	3,499	-	3,499
Losses *(4)*	**12,078r**	-	**12,078r**	**13,647r**	-	**13,647r**	**16,356**	-	**16,356**
Final consumption	**591,234r**	**40**	**591,274r**	**603,148r**	**34**	**603,182r**	**541,321**	**29**	**541,350**
Industry	**133,310r**	**40**	**133,350r**	**138,685r**	**34**	**138,719r**	**114,420**	**29**	**114,449**
Unclassified	-	40	40	-	34	34	-	29	29
Iron and steel	7,323r	-	7,323r	6,920r	-	6,920r	5,037	-	5,037
Non-ferrous metals	2,864r	-	2,864r	2,989r	-	2,989r	2,472	-	2,472
Mineral products	16,878r	-	16,878r	18,363r	-	18,363r	15,042	-	15,042
Chemicals	30,140r	-	30,140r	31,182r	-	31,182r	25,740	-	25,740
Mechanical Engineering, etc	7,670r	-	7,670r	7,704r	-	7,704r	6,454	-	6,454
Electrical engineering, etc	3,736r	-	3,736r	3,895r	-	3,895r	3,249	-	3,249
Vehicles	8,532r	-	8,532r	8,613r	-	8,613r	7,210	-	7,210
Food, beverages, etc	22,973r	-	22,973r	24,361r	-	24,361r	20,057	-	20,057
Textiles, leather, etc	6,078r	-	6,078r	6,099r	-	6,099r	5,164	-	5,164
Paper, printing, etc	15,511r	-	15,511r	16,602r	-	16,602r	13,857	-	13,857
Other industries	9,229r	-	9,229r	9,475r	-	9,475r	8,040	-	8,040
Construction	2,378r	-	2,378r	2,482r	-	2,482r	2,098	-	2,098
Transport	-	-	-	-	-	-	-	-	-
Air	-	-	-	-	-	-	-	-	-
Rail	-	-	-	-	-	-	-	-	-
Road *(5)*	-	-	-	-	-	-	-	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**447,695r**	-	**447,695r**	**455,190r**	-	**455,190r**	**417,922**	-	**417,922**
Domestic	352,868r	-	352,868r	359,554r	-	359,554r	334,823	-	334,823
Public administration	42,444r	-	42,444r	42,565r	-	42,565r	37,001	-	37,001
Commercial	33,098r	-	33,098r	33,358r	-	33,358r	29,227	-	29,227
Agriculture	1,998r	-	1,998r	2,161	-	2,161	1,840	-	1,840
Miscellaneous	17,286r	-	17,286r	17,552r	-	17,552r	15,031	-	15,031
Non energy use	**10,228**	-	**10,228**	**9,273**	-	**9,273**	**8,979**	-	**8,979**

(1) Stock fall (+), stock rise (-).

(2) Natural gas used in the manufacture of synthetic coke oven gas.

(3) Total supply minus total demand.

(4) See paragraphs 4.53 to 4.56.

(5) See footnote 5 to Table 4.2.

4.2 Supply and consumption of natural gas and colliery methane[(1)]

GWh

	2005	2006	2007	2008	2009
Supply					
Production	1,025,989	930,538	838,809	810,209r	694,539
Imports	173,328	244,029	338,026	407,054	455,789
Exports	-96,181	-120,591	-123,158	-122,670	-137,100
Stock change *(2)*	+1,321	-6,435	+5,480	-3,087	-4,876
Transfers	-51	-55r	-78	-68	-354
Total supply	**1,104,406**	**1,047,486r**	**1,059,080**	**1,091,438r**	**1,007,998**
Statistical difference *(3)*	+111r	+148r	+186r	+137r	+318
Total demand	**1,104,295r**	**1,047,338r**	**1,058,894r**	**1,091,301r**	**1,007,680**
Transformation	**354,146r**	**333,431r**	**379,518r**	**402,192r**	**380,902**
Electricity generation	331,658r	311,408r	355,878r	376,810r	356,186
Major power producers	295,643	278,149	319,836r	344,454r	325,769
Autogenerators	36,015r	33,259r	36,042r	32,357r	30,416
Heat generation	22,488	22,023	23,640r	25,382r	24,716
Other	-	-	-	-	-
Energy industry use	**87,161r**	**81,859r**	**76,025r**	**72,280r**	**69,072**
Electricity generation	-	-	-	-	-
Oil and gas extraction	73,372r	69,252r	64,230r	61,292r	61,110
Petroleum refineries	5,163r	5,161r	5,206r	4,971r	3,924
Coal extraction	114	112	91	95	89
Coke manufacture	-	-	-	-	-
Blast furnaces	941	611	719	718r	450
Other	7,572r	6,723r	5,779r	5,204r	3,499
Losses *(4)*	**10,964**	**12,014r**	**12,078r**	**13,647r**	**16,356**
Final consumption	**652,024r**	**620,035r**	**591,274r**	**603,182r**	**541,350**
Industry	**151,441r**	**144,541r**	**133,350r**	**138,719r**	**114,449**
Unclassified	55	47	40	34	29
Iron and steel	8,453r	8,391r	7,323r	6,920r	5,037
Non-ferrous metals	3,168r	3,106r	2,864r	2,989r	2,472
Mineral products	18,302r	17,803r	16,878r	18,363r	15,042
Chemicals	36,076r	34,334r	30,140r	31,182r	25,740
Mechanical engineering, etc	8,577r	8,180r	7,670r	7,704r	6,454
Electrical engineering, etc	4,134r	3,922r	3,736r	3,895r	3,249
Vehicles	9,959r	9,470r	8,532r	8,613r	7,210
Food, beverages, etc	24,921r	23,714r	22,973r	24,361r	20,057
Textiles, leather, etc	7,031r	6,637r	6,078r	6,099r	5,164
Paper, printing, etc	17,689r	16,518r	15,511r	16,602r	13,857
Other industries	10,400r	9,864r	9,229r	9,475r	8,040
Construction	2,676r	2,555	2,378r	2,482r	2,098
Transport	-	-	-	-	-
Road *(5)*	-	-	-	-	-
Other	**492,670r**	**467,582r**	**447,695r**	**455,190r**	**417,922**
Domestic	381,879r	366,928r	352,868r	359,554r	334,823
Public administration	50,319	45,803r	42,444r	42,565r	37,001
Commercial	38,197r	34,273r	33,098r	33,358r	29,227
Agriculture	2,261	2,013	1,998r	2,161	1,840
Miscellaneous	20,014r	18,564r	17,286r	17,552r	15,031
Non energy use	**7,913r**	**7,913**	**10,228**	**9,273**	**8,979**

(1) Colliery methane figures included within these totals are as follows:

	2005	2006	2007	2008	2009
Total production	**757**	**754**	**717**	**560r**	**573**
Electricity generation	588	595	586	431r	455
Coal extraction	114	112	91	95	89
Other industries	55	47	40	34	29
Total consumption	**757**	**754**	**717**	**560r**	**573**

(2) Stock fall (+), stock rise (-).

(3) Total supply minus total demand.

(4) For an explanation of what is included under losses, see paragraphs 4.53 to 4.56.

(5) A small amount of natural gas is consumed by road transport, but gas use in this sector is predominantly of petroleum gas, hence road use of gas is reported in the petroleum products balances in Chapter 3

4.3 UK continental shelf and onshore natural gas production and supply *(1)*

GWh

	2005	2006	2007	2008	2009
Upstream gas industry:					
Gross production *(2)*	1,025,232	929,784	838,092	809,649	693,965
Minus Producers' own use *(3)*	73,372r	69,252r	64,230r	61,292r	61,110
Exports	96,181	120,591	123,158	122,670	137,100
Plus Imports of gas	173,328	244,029	338,026	407,054	455,789
Gas available at terminals *(4)*	1,029,007r	983,971r	988,731r	1,032,742r	951,544
Minus Statistical difference *(5)*	-514r	147r	45r	213r	-1,173
Downstream gas industry:					
Gas input into the national transmission system *(6)*	1,029,521	983,824	988,686	1,032,529r	952,717
Minus Operators' own use (7)	6,555	5,831	4,698	4,265	2,810
Stock change (storage sites) *(8)*	-1,321	+6,435	-5,480	3,087	4,876
Metering differences *(5)*	1,230	4,544	4,472	5,759	9,111
Gas output from the national transmission system *(9)*	1,023,057	967,014	984,996	1,019,418r	935,920
Minus Leakage assessment *(10)*	5,291	5,032r	5,123r	5,313r	4,880
Own use gas *(11)*	427	406	414r	429r	394
Theft *(12)*	2,137	2,032r	2,069r	2,146r	1,971
Transfers *(13)*	51	52	78r	68r	354
Statistical difference and metering differences *(5)*	2,504r	4r	141r	-76r	1,490
Total UK consumption *(14)*	**1,012,647r**	**959,488r**	**977,172r**	**1,011,538r**	**926,831**
Stocks of gas (at end year)	35,479	41,914	36,434	39,521	44,397
Storage capacity *(15)*	47,971	48,126	48,126	47,530	47,310

(1) For details of where to find monthly updates of natural gas production and supply see paragraph 4.52.
(2) Includes waste and producers' own use, but excludes gas flared.
(3) Gas used for drilling, production and pumping operations.
(4) The volume of gas available at terminals for consumption in the UK as recorded by the terminal operators. The percentage of gas available for consumption in the UK from indigenous sources in 2009 was 67 per cent, compared with 72 per cent in 2008.
(5) Measurement of gas flows, in volume and energy terms, occurs at several points along the supply chain. As such, differences are seen between the actual recorded flow through any one point and estimates calculated for the flow of gas at that point. More detail on the reasons for these differences is given in the technical notes and definitions section of this chapter, paragraphs 4.53 to 4.56.
(6) Gas received as reported by the pipeline operators. The pipeline operators include National Grid, who run the national pipeline network, and other pipelines that take North Sea gas supplies direct to consumers.
(7) Gas consumed by pipeline operators in pumping operations and on their own sites.
(8) Stocks of gas held in specific storage sites, either as liquefied natural gas, pumped into salt cavities or stored by pumping the gas back into an offshore field. Stock rise (+), stock fall (-).
(9) Including public gas supply, direct supplies by North Sea producers, third party supplies and stock changes.
(10) This is a National Grid assessment of leakage through the local distribution system based on the National Leakage Reduction Monitoring Model.
(11) Equivalent to about 0.06 per cent of LDZ throughput, this is an assessment of the energy used to counter the effects of gas cooling on pressure reduction.
(12) Calculated by National Grid as 0.3 per cent of LDZ throughput, this is theft before the gas reaches customer meters.
(13) Transfers are the use within the iron and steel industry for the manufacture of synthetic coke oven gas.
(14) See paragraph 4.16 for an explanation of the relationship between these "Total UK consumption" figures and "Total demand" shown within the balance tables.
(15) Data compiled by DECC from individual storage site information. Converted from billion cubic metres to GWh assuming 11.02 kWh per cubic metre. See paragraph 4.22.

4.4 Gas storage sites and import/export pipelines in the United Kingdom at 31 May 2010 (1)

Owner	Site	Location	Capacity (Billion m3)	Max flow rate (Million m3/day)	Type	Status *(1)*
Operational storage						
Centrica Storage Ltd	Rough	Southern North Sea	3.30	43	Depleted field	Long
National Grid	Avonmouth	Bristol	0.08	13	LNG	Short
	Glenmavis	North Lanarkshire	0.05	8	LNG	Short
	Partington	Manchester	0.05	14	LNG	Short
Scottish and Southern Energy	Hornsea	East Yorkshire	0.30	18	Salt cavern	Medium
Energy Merchants Gas Storage	Holehouse Farm	Cheshire	0.05	6	Salt cavern	Medium
Scottish Power	Hatfield Moor	South Yorkshire	0.10	2	Depleted field	Medium
Star Energy Ltd	Humbly Grove	Hampshire	0.30	7	Depleted field	Medium
Scottish and Southern Energy & Statoil	Aldbrough	East Yorkshire	0.06	10	Salt cavern	Medium

Pipeline	Owner	Between	Max flow rate (Million m3/day)
Operational pipelines			
Imports			
Bacton-Zeebrugge Interconnector	Interconnector (UK) Limited	Zeebrugge and Bacton	72
BBL Pipeline	BBL Company	Balgzand and Bacton	41
Vesterled Pipeline	Gassco	Heimdal Riser Platform and St Fergus	36
Tampen Link	Gassco	Links Statfjord to FLAGS (terminating at St Fergus)	18
Langeled Pipeline	Norsk Hydro	Nyhamna and Easington	74
Exports			
Bacton-Zeebrugge Interconnector	Interconnector (UK) Limited	Bacton and Zeebrugge	55
UK- Irish Gas Interconnector	Bord Gais	Moffat and Ireland	30

(1) Long range, medium range or short range storage. Status is determined both by capacity size and injection, deliverability and storage re-cycling rates.

4.5 Natural gas imports and exports (1)

GWh

	2005	2006	2007	2008	2009
Imports from:					
Belgium *(2)*	24,108	30,505	6,471	12,174	7,945
The Netherlands *(3)*	-	9,135	76,602	90,563	69,529
Norway *(4)*	127,895	157,035	225,764	283,722	260,438
Liquefied Natural Gas *(5)*	5,453	37,576	14,903	8,912	110,579
Total Imports	**157,456**	**234,251**	**323,740**	**395,371**	**448,491**
Exports to:					
Belgium *(2)*	36,641	60,195	51,390	45,949	62,084
The Netherlands *(6)*	4,261	3,371	6,358	10,389	13,094
Norway *(7)*	-	-	153	389	276
Republic of Ireland *(8)*	39,407	47,247	50,972	54,260	54,355
Total Exports	**80,309**	**110,813**	**108,873**	**110,987**	**129,809**
Net Imports *(9)*	**77,147**	**123,438**	**214,867**	**284,384**	**318,682**

(1) This table is also shown as Table G.6 of the Internet Annex G to the Digest.

(2) Physical flows of gas through the Bacton-Zeebrugge Interconnector. In tables 4.1 to 4.3 the nominated flows of gas through the pipeline are used. Nominated flows are the amounts of gas that companies requested be supplied through the pipeline. Net imports are the same whichever measurement is used.

(3) Via the Bacton-Balgzand (BBL) pipeline. Commissioned in November 2006.

(4) Currently via the Langeled and Vesterled pipelines, and the Tampen Link (from Statfjord to FLAGS). Prior to 2005 includes the Norwegian share of the Frigg field.

(5) From various sources to the Isle of Grain and Gasport Teesside.

(6) Direct exports from the Grove, Chiswick, Markham, Minke, Stamford and Windermere offshore gas fields using the Dutch offshore gas pipeline infrastructure.

(7) With effect from September 2007, UK gas from the Blane field to the Norwegian Ula field for injection into the Ula reservoir.

(8) Includes gas to the Isle of Man for which separate figures are not available.

(9) A negative figure means the UK was a net exporter of gas.

Chapter 5
Electricity

Introduction

5.1 This Chapter presents statistics on electricity from generation through to sales, and it includes statistics on generating capacity, fuel used for generation, load factors and efficiencies, and a map showing the transmission system in Great Britain and the location of the main power stations (page 126).

5.2 An energy flow chart for 2009, showing the flows of electricity from fuel inputs through to consumption, is included, overleaf. This is a way of simplifying the figures that can be found in the commodity balance tables. It illustrates the flow of primary fuels from the point at which they become available for the production of electricity (on the left) to the eventual final use of the electricity produced or imported (on the right) as well as the energy lost in conversion, transmission and distribution.

5.3 Commodity balances for electricity, for each of the last three years, form the introductory table (Table 5.1). The supply and consumption elements of the electricity balance are presented as a five-year time series in Table 5.2. Table 5.3 separates out the public distribution system for electricity from electricity generated and consumed by autogenerators and uses a commodity balance format. Fuels used to generate electricity in the UK in each of the last five years are covered in Table 5.4. Table 5.5 shows the relationship between the commodity balance definitions and traditional Digest definitions for electricity, so that the most recent data can be linked to the long term trends data, which can be found on DECC's energy statistics web site. Table 5.6 shows the relationship between fuels used, generation and supply in each of the latest five years. Tables on plant capacity (Tables 5.7, 5.8 and 5.9) and on plant loads and efficiency (Table 5.10) have been included. Two of these contain data at a sub-national level. Table 5.11 lists individual power stations in operation and is supplemented by a table showing large scale Combined Heat and Power (CHP) schemes in the UK (Table 5.12). The long term trends commentary and tables on fuel use, generation, supply and consumption back to 1970 are to be found on DECC's energy statistics web site:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Commodity balances for electricity (Tables 5.1 and 5.2)

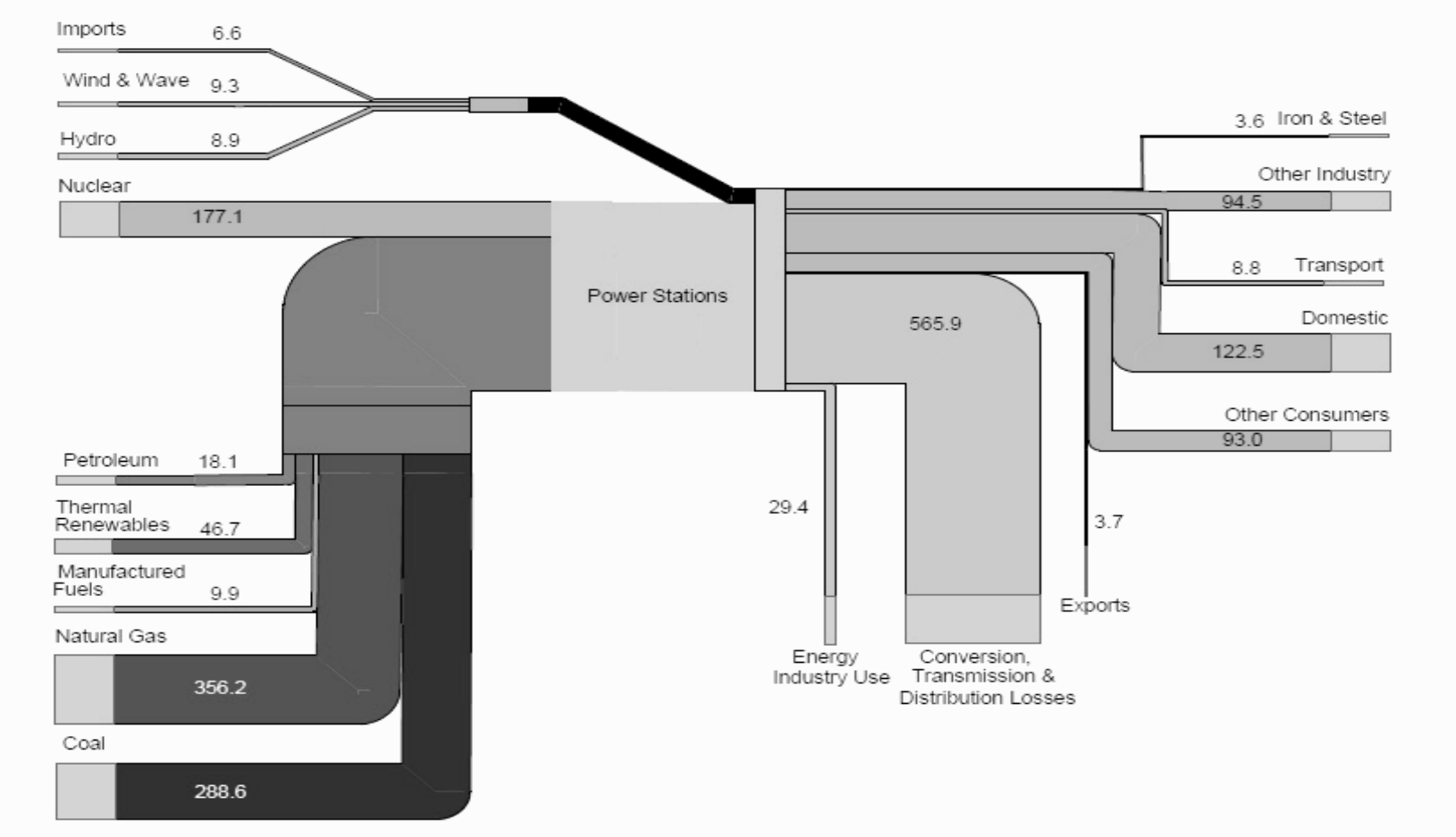
GWh

	2007	2008	2009
Total Generation (excl. pumped storage)	392,972	384,579	371,978
Total Supply	402,046	399,690	378,524

5.4 In 2009, total supply was 379 TWh, a decrease of 5.3 per cent on 2008, and its lowest level since 1998. Of this, just over 99 per cent of UK electricity supply was home produced and just under 1 per cent was from imports net of exports. For electricity, supply is totally driven by demand, and the impact of the recession is a major factor in the decrease in supply of electricity in 2009, along with energy efficiency and weather factors, which also partly explain falls of between 0.5 and 0.7 per cent in 2006 to 2008. Prior to this, 2006 had shown the first year on year fall in supply since 1997. The table above summarises the trend in total generation and supply over the last three years.

5.5 Domestic production fell by 3.3 per cent on 2008, to its lowest level since 1999. In 2009, of the 372 TWh produced (excluding pumped storage production), 91 per cent was from major power producers and 9 per cent from other generators, while 22 per cent was from primary sources and 78 per cent from secondary sources.

Electricity flow chart 2009 (TWh)



Notes:
This flow chart is based on the data in Tables 5.1(for imports, exports, use, losses and consumption) and 5.6 (fuel used).
(1) Solar photovoltaics included under wind & wave.
(2) Hydro includes generation from pumped storage while electricity used in pumping is included under Energy Industry Use.

5.6 In 2009, net imports fell to around a quarter of the level of 2008, its lowest level since 2003. This was after doubling in 2008 to a then eight-year record high. This large fall was driven by imports falling to almost half of 2008's level; whilst exports almost trebled. There was a 71 per cent fall in net imports from continental Europe, which accounted for 99 per cent of imports to the UK in 2009. A 65 per cent rise in net exports to the Republic of Ireland was also seen which accounted for 12 per cent of UK exports in 2009[1].

5.7 Electricity generated by each type of fuel is also shown on the second page of Table 5.1. The link between electricity generated and electricity supplied is made in Table 5.6, and is discussed further in paragraphs 5.23 to 5.27.

5.8 Overall demand fell by 5.2 per cent, from 399 TWh in 2008 to 379 TWh in 2009[2]. Of total demand, 29 TWh (8 per cent) was used within the energy industry, 27 TWh (7 per cent) was accounted for by losses, and 322 TWh (85 per cent) was final consumption.

5.9 Domestic demand fell by 2.6 per cent, from 126 TWh to 123 TWh, reversing the change seen between 2007 and 2008. Demand in the Commercial, Public administration and Agriculture sectors also saw falls in demand of between 5 and 7 per cent, with Commercial demand falling to its lowest level since 2000.

5.10 After a fall of 4.2 per cent in 2008, industrial consumption of electricity was a further 10 per cent lower in 2009, with the iron and steel industry alone showing a decrease of 23 per cent. These declines reflect the poor economic climate, with industry as a whole, as well as several component sectors, showing the lowest level of electricity demand in at least the last decade. Consumption by transport, storage and communications was 3.3 per cent lower than in 2008.

5.11 Industrial consumption was 26 per cent of total demand for electricity, less than the consumption by households (32 per cent), with transport, storage and communications and the services sector accounting for 27 per cent. Within the industrial sector, the three largest consuming industries are chemicals, paper and food, which together account for 39 per cent of industrial consumption. Taken together, the engineering industries accounted for a further 14 per cent of industrial consumption of electricity. The iron and steel sector is also a substantial user of electricity but part of its consumption is included against blast furnaces and coke ovens under energy industry uses. A note on the estimates included within these figures is to be found at paragraph 5.77. Chart 5.1 shows diagrammatically the total demand for electricity in 2009.

5.12 Energy industry use as a proportion of total demand, at 7.8 per cent, was slightly higher than in 2008 (7.5 per cent), despite a fall in consumption. The electricity industry itself uses 56 per cent of the energy industries' total use of electricity. This does not include the 16 per cent of energy industry use accounted for by pumping at pumped storage stations. Petroleum refineries are the next most significant consumer with 15 per cent of energy industry use.

5.13 Losses as a proportion of electricity demand in 2009, at 7.1 per cent, were slightly higher than in 2008 (6.9 per cent). The losses item has three components:

- transmission losses from the high voltage transmission system, which represented about 22 per cent of the figure in 2009,
- distribution losses, which occur between the gateways to the public supply system's network and the customers' meters, and accounted for about 74 per cent of losses,
- theft or meter fraud (around 4 per cent)

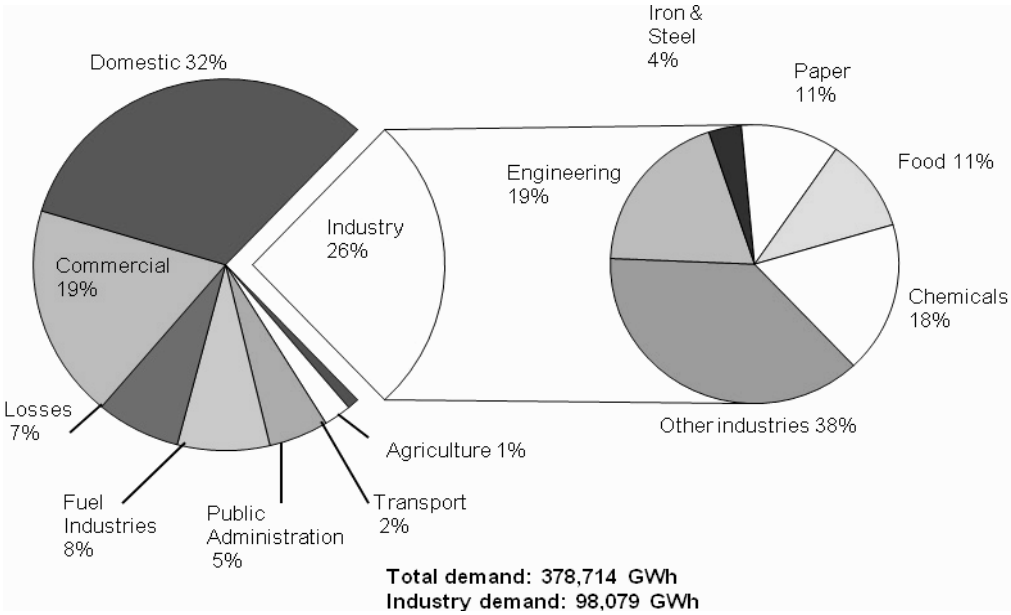
5.14 Temperatures influence the actual level of consumption in any one year in the winter months, as customers adjust heating levels in their homes and businesses. While 2007 was a cool year, 2008 was colder still, with the average temperature across the year the lowest since 1996 and the final

[1] An analysis of electricity flows across Europe was carried out by BERR in 2007 using data published by the International Energy Agency and Eurostat. This was published in *Energy Trends*, March 2008, available at: www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx

[2] The term statistical difference is used to define the difference between total supply and total demand – see paragraph 5.70

quarter the coldest since 1993. Across the year, the average temperature in 2009 was much the same as for 2008. However, the first quarter of 2009 was a degree colder than in 2008, with the coldest January since 1997.

Chart 5.1: Electricity demand by sector 2009



Commodity balances for the public distribution system and for other generators (Table 5.3)

5.15 Table 5.3 expands on the commodity balance format to show consumption divided between electricity distributed over the public distribution system and electricity provided by other generators (largely autogeneration and generation from renewable sources). Further information on the definitions of other generators and major power producers (MPPs) can be found in paragraph 5.57. Table 5.3 also expands both the domestic sector to show consumption by payment type and the commercial sector to show detailed data beyond that presented in Tables 5.1 and 5.2.

5.16 The proportion of electricity supplied by generators other than MPPs rose from 8.4 per cent in 2008 to 9.0 per cent in 2009. The proportion of this electricity transferred to the public distribution system in 2009 was 46 per cent, an increase of around 5 percentage points on 2008.

5.17 In 2009, 4 per cent of final consumption of electricity was by other generators and did not pass over the public distribution system. This was much the same proportion as in 2008. A substantial proportion of electricity used in the energy industries is self-generated (between 17 and 20 per cent in all three years shown in the table). At petroleum refineries the proportion is even higher and in 2009, two-thirds of electricity was self-generated.

5.18 In 2009, 11 per cent of the industrial demand for electricity was met by autogeneration, around the same as the previous year. Table 1.9 in Chapter 1 shows the fuels used by autogenerators to generate this electricity within each major sector and also the quantities of electricity generated and consumed.

5.19 Within the domestic sector, the amount of electricity consumed, reported as being purchased under some form of off-peak pricing structure (eg Economy 7) was 21 per cent, slightly lower than the previous year, but seven percentage points lower than in 2007. Fifteen per cent of consumption was through prepayment systems, about the same proportion as in the two previous years.

Electricity fuel use, generation and supply (Tables 5.4 & 5.6)

5.20 In Table 5.4, fuel used by electricity generators is measured in both original units and, for comparative purposes, in the common unit of million tonnes of oil equivalent. In Table 5.6, figures are quoted in a third unit, namely GWh, in order to show the link between fuel use and electricity generated[3].

5.21 A historical series of fuel used in generation on a consistent, energy supplied, fuel input basis is available at Table 5.1.1 on DECC's energy statistics web site and accessible from the Digest of UK Energy Statistics home page:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

5.22 The main data on generation and supply in Table 5.6 are presented by type of fuel. There also remains an interest in the type of station and so the final part of the table shows generation from conventional steam stations and from combined cycle gas turbine stations over the most recent five years.

5.23 Total electricity generated (including pumped storage) in the United Kingdom in 2009 was 376 TWh, 3.3 per cent lower than generation in 2008. Major power producers (MPPs, as defined in paragraph 5.57) accounted for 91 per cent of electricity generation in 2009. Generation by MPPs was down 3.9 per cent on 2008, at 341 TWh, while by other generators was 2.4 per cent up on a year earlier, at 34 TWh.

5.24 Generation from coal was 17 per cent lower in 2009 than in 2008, at 105 TWh, a record low level. At 165 TWh, generation from gas in 2009 was 6.1 per cent lower than 2008's record high level of 176 TWh. After falling to its lowest level since 1984 in 2008, generation from nuclear sources rose by 32 per cent to 69 TWh, as stations returned from outages for repairs and maintenance. Generation by renewable sources[4] rose 17 per cent (to 26 TWh) between 2008 and 2009. Thermal renewable generation rose 15 per cent to 12 TWh and wind generation increased by 31 per cent to 9 TWh. Hydro saw a small increase of 2 per cent to 5 TWh. More information on renewable electricity can be found in chapter 7.

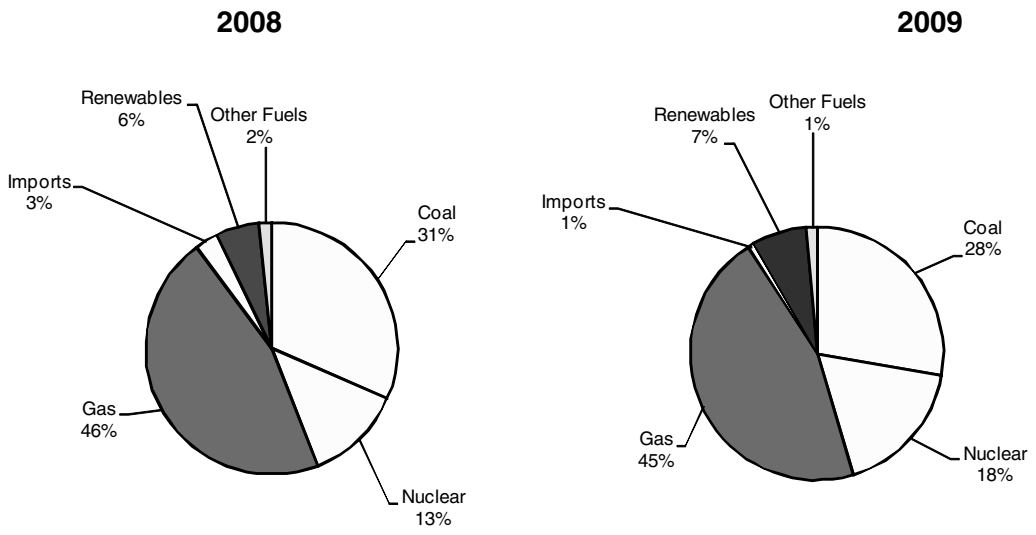
5.25 Table 5.6 also shows electricity supplied data, which deducts stations' own use of electricity from its generation. These data take into account the fact that some stations use relatively more electricity than others in the generation process itself. In total, gross electricity supplied was 3.5 per cent less than in 2008, and at its lowest level since 1999. For gas-fired stations it was 6.1 per cent less, while for nuclear stations it was 32 per cent more.

5.26 Chart 5.2 shows the shares of net electricity supplied (including net imports)[5], by fuel input, on an output basis (ie the percentage of electricity supplied by the fuel), for 2009, compared with 2008. Further information on this, and the alternative, input basis, of comparing fuel use, can be found in paragraphs 5.65 to 5.66

5.27 Gas's share of net electricity supplied plus imports in 2009, at 45 per cent, was 1 percentage point lower than in 2008, the record high. Coal's share at 28 per cent was 3 percentage points less than in 2008 and 6 percentage points lower than in 2007. Nuclear's 18 per cent share in 2009 was 5 percentage points higher than in 2008. Nuclear generation in 2008 was the lowest recorded since 1981 due to maintenance work and outages. Renewables' share[4] increased from 6 per cent in 2008 to 7 per cent in 2009. Of this, wind's share was 3 per cent, up from 2 per cent in 2008. Other fuels, including oil and net pumped storage, fell from 2 per cent in 2008 to 1 per cent in 2009, while net imports' share also fell, to 1 per cent in 2009, the lowest since 2003.

[3] Conversion factors for switching between mtoe, GWh and other units of energy can be found on page 221 and inside back cover flap.
[4] Including non-biodegradable wastes, not considered a renewable source
[5] Net electricity supplied is gross electricity supplied minus electricity used in pumping

Chart 5.2: Shares of net electricity supplied, by fuel input



Relating measurements of supply, consumption and availability (Table 5.5)

5.28 Table 5.5 shows the relationship between these terms for the latest five years. For the full definitions of the terms used in the commodity balances see the Annex A, paragraphs A.7 to A.42.

Plant capacity (Tables 5.7, 5.8 and 5.9)

5.29 Table 5.7 shows capacity, ie the maximum power available at any one time, for major power producers and other generators by type of plant.

5.30 From 2006 onwards, major power producers (MPPs) capacities are measured in Transmission Entry Capacity (TEC) terms, rather than Declared Net Capacity (DNC) before then [6]. The effect of this change has been to increase the capacity of MPPs by about 2,000 GW in total with the majority of fossil fuel stations increasing their capacity under the TEC measurement but some decreasing.

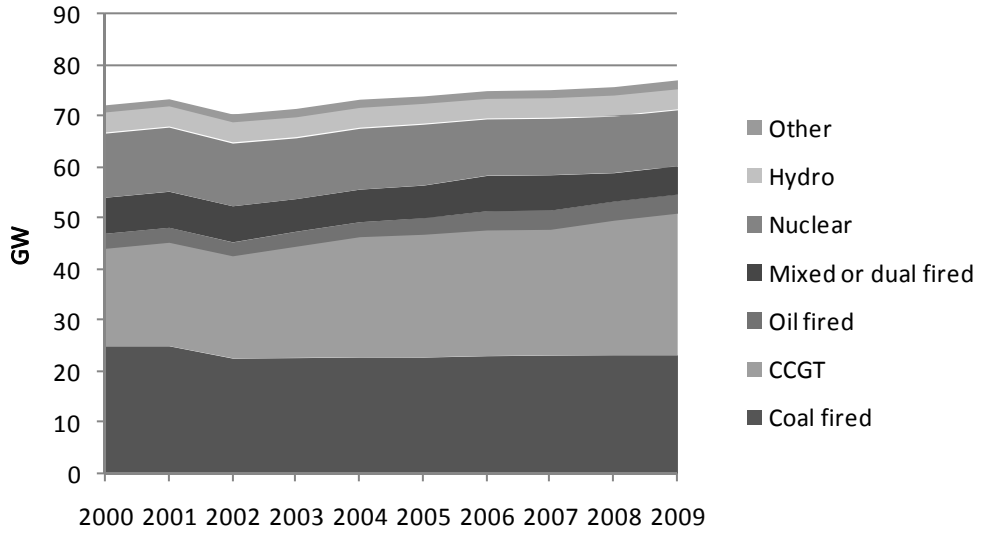
5.31 In 2009, there was an increase of 1,472 MW in the capacity of MPPs to 78,255 MW. The main contributory factors were an increase of over 1,300 MW of Combined Cycle Gas Turbine (CCGT) capacity, largely as a result of one new, and one expanded, station. After an increase of over 200 MW in 2008, wind capacity increased by a further 124 MW in 2009, as many new sites opened. In addition there was a net increase from minor up-ratings and down-ratings. In December 2009, MPPs accounted for 92 per cent of the total generating capacity, the same proportion as at the end of the previous two years. The capacity of other generators rose by 422 MW (6.3 per cent), with over 300 MW coming from increased wind capacity, and 180 MW from thermal renewables. Total capacity increased from 83,443 MW to 85,337 MW.

5.32 A breakdown of the capacity of the MPPs' plants at the end of December each year from 2000 to 2009 is shown in Chart 5.3.

5.33 Table 5.8 separates the capacities of MPPs geographically to show England and Wales, Scotland and Northern Ireland. In 2009, 83 per cent of the generating capacity in the UK owned by MPPs was in England and Wales, 14 per cent was in Scotland and 3 per cent in Northern Ireland. Out of the net increase in UK capacity of 1,472 MW in 2009, 721 MW was in Scotland, 667 MW was in England and Wales, and 84 was in Northern Ireland.

[6] A full definition of TEC and DNC is given in paragraph 5.69

Chart 5.3: Generating capacity of major power producers 2000-2009



(1) Gas turbines, oil engines and renewables other than hydro.
(2) Natural flow and pumped storage.
(3) Includes gas fired stations that are not CCGTs

5.34 In Table 5.9, data for the generating capacity of industrial, commercial and transport undertakings are shown, according to the industrial classification of the generator. Schemes are classified according to the sector that receives the majority of the heat (as opposed to the sector in which the CHP operator was considered to operate). In 2009, 15 per cent of the capacity was in the chemicals sector. Oil and gas terminals and oil refineries had 14 per cent of capacity, engineering and other metal trades had just under a 9 per cent share and paper, printing and publishing had a 7 per cent share. In 2009, 45 per cent of capacity was outside the industrial sector. The total capacity of 'Other Generators' fell in 2007 as the capacity of major wind farm operators are now included under MPPs (see paragraph 5.59). In 2008, Shotton CHP plant was re-classified as a MPP as the electricity generated is now exported to the grid rather than for use in the nearby paper mill. This change in classification led to a fall in capacity in the paper, printing and publishing sector.

Plant loads, demand and efficiency (Table 5.10)

5.35 Table 5.10 shows the maximum load met each year, load factors (by type of plant and for the system in total) and indicators of thermal efficiency. Maximum demand figures cover the winter period ending the following March. With the advent of BETTA (see paragraph 5.48), England, Wales and Scotland are covered by a single network and a single maximum load is shown for Great Britain for 2005 to 2009.

5.36 Maximum demand in the UK during the winter of 2009/2010 occurred in January 2010. At 60,231 MW, this was 0.1 per cent lower than the previous winter's maximum in January 2009. In 2009/10 the maximum load in Great Britain occurred on 7 January 2010 at the half hour period ending 17:30 (58,510 MW). However, in Northern Ireland the maximum load occurred on 12 January 2010 at the period ending 17:30 (1,721 MW), which was 1.0 per cent below that of the previous winter. In Great Britain the highest ever load met was 60,118 MW on 10 December 2002.

5.37 Maximum demand in 2009/2010 was 77 per cent of the UK capacity of major power producers (MPPs) (as shown in Table 5.7) as measured at the end of December 2009, down from 79 per cent in 2008/2009. Both these percentages are lower than the percentages for earlier years, in part due to the definitional change to TEC explained in paragraph 5.30.

5.38 In Great Britain, maximum demand in January 2010 was 77 per cent of the England, Wales and Scotland capacity of MPPs (Table 5.8) compared with 79 per cent for winter 2008/09. For Northern Ireland, the proportion was 73 per cent (72 per cent in 2008/09). These percentages do not include

the capacities available via the interconnectors with neighbouring grid systems nor demand for electricity via these interconnectors.

5.39 Plant load factors measure how intensively each type of plant has been used. The load factor of nuclear stations in 2009 at 65.4 per cent was 14.7 percentage points below the recent peak load factor of 80.1 per cent in 1998, but 16 percentage points higher than in 2008, when there were many planned and unplanned maintenance outages. Very high gas prices in 2006 resulted in a particularly low CCGT load factor but this recovered in the last three years to levels comparable to 2003 to 2005, with 2008 showing the highest load factor since 2000. With slightly less generation, and an increase in capacity, the CCGT load factor in 2009 fell back by 8 percentage points to 62.8 per cent. More intensive use of coal fired stations saw their plant load factor rise to 72.9 per cent in 2006, but these fell continuously over the next three years, to just 49.8 per cent in 2009, with the implementation of the Large Combustion Plant Directive, as well as higher prices relative to gas, restricting their use.

5.40 The wet year of 2007 saw a greater use of large scale hydro plant, with hydro's load factor the highest since 2000. 2008 saw a slight fall in load factor, as the increase in capacity was not quite matched by the increase in generation. With less rainfall in 2009, hydro's load factor was lower still. Pumped storage use is less affected by the dry weather and high electricity prices encouraged its use from 2006 to 2008. 2009's load factor fell back from 2008's peak, as overall demand for electricity and lower prices deterred its use.

5.41 Thermal efficiency measures the efficiency with which the heat energy in fuel is converted into electrical energy. CCGT efficiency has remained around the 46-47 per cent mark over the last few years, with little new (more efficient) capacity coming online prior to 2009. The efficiency of nuclear stations has been on a rising trend in recent years as older, less efficient stations have closed, with 2009 showing the highest efficiency yet, of 39.0 per cent. However, outages have tended to counteract these efficiency gains in some years, notably in 2008. The efficiencies presented in this table are calculated using **gross** calorific values to obtain the energy content of the fuel inputs. [7]

Power stations in the United Kingdom (Tables 5.11 and 5.12)

5.42 Table 5.11 lists the operational power stations in the United Kingdom as at the end of May 2010 along with their installed capacity and the year they began to generate electricity. Where a company operates several stations they are grouped together. In general the table aims to list all stations of 1 MW installed capacity or over.

5.43 Table 5.12 shows CHP schemes of 1 MW and over for which the information is publicly available, but it is the total power output of these stations that is given, not just that which is classed as good quality CHP under the CHP Quality Assurance programme (CHPQA, see Chapter 6), since CHPQA information for individual sites is not publicly available.

5.44 In Table 5.11, generating stations using renewable sources are also listed in aggregate form in the "Other power stations" section apart from hydro stations and wind farms operated by the major power producers, which appear in the main table. For completeness, CHP stations not appearing in the main table are also listed in aggregate in this section. Details of the interconnectors between England and France, Scotland and Northern Ireland and Northern Ireland and the Irish Republic are also given in this table. The total installed capacity of all the power stations individually listed in Table 5.11 is 81,632 MW.

Carbon dioxide emissions from power stations

5.45 It is estimated that carbon dioxide emissions from power stations accounted for 31 per cent of the UK's total carbon dioxide emissions in 2009. Emissions vary by type of fuel used to generate the electricity and emission estimates for all electricity generation for 2007 to 2009 are shown in Table 5A below.

[7] For more information on gross and net calorific values, see paragraph 5.72

Table 5A: Estimated carbon dioxide emissions from electricity generation 2007 to 2009

Fuel	Emissions (tonnes of carbon dioxide per GWh electricity supplied)		
	2007	2008	2009
Coal	913	903	915
Oil	623	730	633
Gas	400	404	405
All fossil fuels	626	608	598
All fuels (including nuclear and renewables)	500	496	452

Sub-national electricity data

5.46 The collection of data relating to regional and local consumption of electricity began in autumn 2004 and regional and local data on electricity consumption were published on an experimental basis in December of that year. The exercise has been repeated in each year since and the resulting statistics are no longer experimental having been granted "National Statistics" status in 2008. For details of the availability of local level electricity (and gas) data see Chapter 4, paragraph 4.29 and the sub-national statistics pages of the DECC energy statistics web site:
www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx
A summary of electricity consumption at regional level is given in Table 5B and relates to 2008.

Table 5B: Electricity sales 2008

	Domestic sector sales (GWh)	Number of domestic customers (thousand) *(1)*	Industrial and commercial sector sales (GWh)	Number of I & C customers (thousand) *(1)*	All consumers sales (GWh)
Greater London	13,410	3,327	28,404	406	41,814
South East	16,513	3,635	23,943	333	40,456
North West	12,417	3,063	22,151	235	34,568
Scotland	11,578	2,733	16,732	221	28,310
East of England	11,321	2,494	16,201	214	27,522
West Midlands	9,903	2,339	15,946	196	25,849
South West	10,634	2,373	14,932	246	25,566
Yorkshire and the Humber	8,900	2,304	16,350	178	25,250
East Midlands	8,095	1,958	14,180	157	22,276
Wales	5,307	1,339	10,960	123	16,267
North East	4,224	1,178	8,537	81	12,761
Unallocated Consumption	229	62	3,756	18	3,985
Sales direct from high voltage lines *(2)*					4,244
Great Britain	112,530	26,805	192,094	2,407	308,869
Northern Ireland *(3)*					7,994
Total					316,863

(1) Figures are the number of Meter Point Administration Numbers (MPANs); every metering point has this unique reference number.
(2) Based on estimate provided by Ofgem.
(3) Northern Ireland data are based on data for electricity distributed provided by Northern Ireland Electricity.

5.47 Since May 1999, all of the domestic electricity market in Great Britain has been open to competition. By December 2009, 15 million electricity consumers (56 per cent) were no longer with their home supplier. Table 5C gives market penetration in the fourth quarter of 2009. By the end of 2009, the home suppliers (i.e. the former regional electricity companies) had lost 49 per cent of the credit, 64 per cent of the direct debit, and 53 per cent of the prepayment market. However, as Table 5C shows there is considerable regional variation with much higher retention in Northern Scotland and South Wales.

Table 5C: Domestic electricity market penetration (in terms of percentage of customers supplied) by Public Electricity Supply area and payment type, fourth quarter of 2009

Region	Home Supplier			Non-Home Supplier		
	Credit	Direct Debit	Prepayment	Credit	Direct Debit	Prepayment
North West	43	27	33	57	73	67
East Midlands	45	31	37	55	69	63
West Midlands	42	29	37	58	71	63
Merseyside and North Wales	47	36	50	53	64	50
Eastern	47	34	33	53	66	67
Yorkshire	42	31	36	58	69	64
North East	40	30	30	60	70	70
South East	51	30	48	49	70	52
London	53	35	53	47	65	47
Southern Scotland	51	44	60	49	56	40
South West	57	31	55	43	69	45
Southern	66	49	58	34	51	42
South Wales	71	57	83	29	43	17
Northern Scotland	83	65	72	17	35	28
Great Britain	51	36	47	49	64	53

Structure of the industry

5.48 Up to March 2005 the electricity industries of Scotland, Northern Ireland and England and Wales operated independently although interconnectors joined all three grid systems together. From April 2005 under the British Electricity Trading and Transmission Arrangements (BETTA), introduced in the Energy Act 2004, the electricity systems of England and Wales and Scotland have been integrated. The paragraphs below describe the position up to March 2005 but indicate the further changes that have been made under BETTA.

5.49 From the period immediately after privatisation of the industry in 1990, when there were seven generating companies in England and Wales and 12 Regional Electricity Companies distributing and supplying electricity to customers in their designated area, there were many structural and business changes and residual floatations. At the end of 2009, there were 32 major power producers operating in Great Britain [8]. Competition developed in mainland Britain as follows:

(a) From 1 April 1990, customers with peak loads of more than 1 MW (about 45 per cent of the non-domestic market) were able to choose their supplier.

(b) From 1 April 1994, customers with peak loads of more than 100 kW were able to choose their supplier.

(c) Between September 1998 and May 1999, the remaining part of the electricity market (ie below 100 kW peak load) was opened up to competition. Paragraph 5.47 and Table 5C give more details of the opening up of the domestic gas and electricity markets to competition.

5.50 Since the late 1990s, there have been commercial moves toward vertical re-integration between generating, electricity distribution and/or electricity supply businesses. Those mergers that have taken place were approved by the relevant competition authority. Initially the National Grid Company was owned by the 12 privatised regional electricity companies, but was floated on the Stock Exchange in 1995. National Grid (and its predecessors since 1990) has owned and operated the high voltage transmission system in England and Wales linking generators to distributors and some large

[8] Some of these producers are joint ventures and so the number of generating companies involved is less than 32.

customers. This transmission system is linked to the transmission system of continental Europe via an interconnector to France under the English Channel (see Table 5.11). Up to March 2005, the Scottish transmission system was regarded as being linked to that in England and Wales by two interconnectors but under BETTA National Grid took on responsibility for operating the transmission system in Scotland as well as England and Wales. Thus a single Great Britain market has been created and the transmission network is regarded as a single system.

5.51 In Scotland, until the end of March 2005, the two main companies, Scottish Power and Scottish and Southern Energy, covered the full range of electricity provision. They operated generation, transmission, distribution and supply businesses. In addition, there were a number of small independent hydro stations and some independent generators operating fossil-fuelled stations, which sold their output to Scottish Power and Scottish and Southern Energy.

5.52 The electricity supply industry in Northern Ireland has been in private ownership since 1993 with Northern Ireland Electricity plc (NIE) (part of the Viridian Group) responsible for power procurement, transmission, distribution and supply in the Province. Generation is provided by three private sector companies who own the four major power stations. In December 2001, the link between Northern Ireland's grid and that of Scotland was inaugurated. A link between the Northern Ireland grid and that of the Irish Republic was re-established in 1996, along which electricity is both imported and exported. However, on 1 November 2007 the two grids were fully integrated and a joint body SEMO (Single Electricity Market Operator) was set up by SONI (System Operator for Northern Ireland) and Eirgrid from the Republic to oversee the new single market.

5.53 In March 2001, the means of trading electricity changed with the introduction in England and Wales of the New Electricity Trading Arrangements (NETA). This replaced the Electricity Pool of England and Wales. These arrangements were based on bi-lateral trading between generators, suppliers, traders and customers. They were designed to be more efficient and provide greater choice for market participants, whilst maintaining the operation of a secure and reliable electricity system. The system included forwards and futures markets, a balancing mechanism to enable National Grid, as system operator, to balance the system, and a settlement process. In April 2005 this system was extended to Scotland under BETTA.

The Electricity Supply System in Great Britain in 2009

This map has been adapted from a map provided by Reed Business Publishing and National Grid; it is available in colour on the DECC energy website. Wind farms are now shown on the map in the Renewables Chapter (Page 189 of Chapter 7).

Technical notes and definitions

5.54 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy as a whole in Chapter 1, paragraphs 1.26 to 1.60. For notes on the commodity balances and definitions of the terms used in the row headings see Annex A, paragraphs A.7 to A.42. While the data in the printed and bound copy of this Digest cover only the most recent 5 years, these notes also cover data for earlier years that are available on the DECC energy statistics web site.

Electricity generation from renewable sources

5.55 Figures on electricity generation from renewable energy sources are included in the tables in this section. Further detailed information on renewable energy sources is included in Chapter 7.

Combined heat and power

5.56 Electricity generated from combined heat and power (CHP) schemes, CHP generating capacities and fuel used for electricity generation are included in the tables in this chapter. However, more detailed analyses of CHP schemes are set out in Chapter 6.

Generating companies

5.57 Following the restructuring of the electricity supply industry in 1990, the term "Major generating companies" was introduced into the electricity tables to describe the activities of the former nationalised industries and distinguish them from those of autogenerators and new independent companies set up to generate electricity. The activities of the autogenerators and the independent companies were classified under the heading "Other generating companies". In the 1994 Digest, a new terminology was adopted to encompass the new independent producers, who were then beginning to make a significant contribution to electricity supply. Under this terminology, all companies whose prime purpose is the generation of electricity are included under the heading "Major power producers" (or MPPs). The term "Other generators" ("Autogenerators" in the balance tables) is restricted to companies who produce electricity as part of their manufacturing or other commercial activities, but whose main business is not electricity generation. "Other generators" also covers generation by energy services companies at power stations on an industrial or commercial site where the main purpose is the supply of electricity to that site, even if the energy service company is a subsidiary of a MPP.

5.58 The definition of MPPs was amended in 2008 to include major wind farm companies, but this change only applies to data for 2007 onwards. Most generators of electricity from renewable sources (apart from large scale hydro, large scale wind and some biofuels) are also included as "Other generators" because of their comparatively small size, even though their main activity is electricity generation.

5.59 Major wind farm operators have been included under MPPs, for 2007 onwards, in the monthly, quarterly, and annual tables of electricity statistics produced by DECC. Until then, all generation using wind turbines was excluded from the MPP classification. This was because originally such generation was by small independent companies and collecting data on a monthly basis was prohibitively costly and unnecessarily burdensome on such companies.

5.60 Generation from wind has now become more concentrated in the hands of larger companies and DECC has extended its system of monthly data collection to cover the largest wind power companies. The intention is that, in future, any company whose wind generation capacity increases to above 50 MW will be asked to provide monthly data for generation from wind and thus be included in the list of MPPs.

5.61 The inclusion of major wind farm operators under MPPs affects the majority of the electricity tables in DUKES, with figures for MPPs and the public distribution system increased, and other generators reduced for 2007 onwards.

5.62 **Major power producers at the end of 2009 were:**
AES Electric Ltd., Baglan Generation Ltd., Barking Power Ltd., British Energy plc., Centrica Energy, Coolkeeragh ESB Ltd., Corby Power Ltd., Coryton Energy Company Ltd., Derwent Cogeneration Ltd., Drax Power Ltd., EDF Energy plc., E.On UK plc., Energy Power Resources, Gaz De France, GDP

Suez Teesside Power Ltd., Immingham CHP, International Power Mitsui, Magnox North Ltd., Premier Power Ltd., RGS Energy Ltd, Rocksavage Power Company Ltd., RWE Npower plc., Scottish Power plc., Scottish and Southern Energy plc., Seabank Power Ltd., SELCHP Ltd., Spalding Energy Company Ltd., Western Power Generation Ltd.

5.63 **Additionally, the following major wind farm companies are included**, beginning with data for 2007:

Fred Olsen, HG Capital, Renewable Energy Systems, Vattenfall Wind Power.

Generation from wind farms owned or operated by the following MPPs that had previously been excluded from the MPP category are now included for 2007 onwards:

Centrica Energy, E.On UK plc, RWE Npower plc, Scottish Power plc, Scottish and Southern Energy plc.

Types of station

5.64 The various types of station identified in the tables of this chapter are as follows:

Conventional steam stations are stations that generate electricity by burning fossil fuels to convert water into steam, which then powers steam turbines.

Nuclear stations are also steam stations but the heat needed to produce the steam comes from nuclear fission.

Gas turbines use pressurised combustion gases from fuel burned in one or more combustion chambers to turn a series of bladed fan wheels and rotate the shaft on which they are mounted. This then drives the generator. The fuel burnt is usually natural gas or gas oil.

Combined cycle gas turbine (CCGT) stations combine in the same plant gas turbines and steam turbines connected to one or more electrical generators. This enables electricity to be produced at higher efficiencies than is otherwise possible when either gas or steam turbines are used in isolation. The gas turbine (usually fuelled by natural gas or oil) produces mechanical power (to drive the generator) and waste heat. The hot exhaust gases (waste heat) are fed to a boiler, where steam is raised at pressure to drive a conventional steam turbine that is also connected to an electrical generator.

Natural flow hydro-electric stations use natural water flows to turn turbines.

Pumped storage hydro-electric stations use electricity to pump water into a high level reservoir. This water is then released to generate electricity at peak times. Where the reservoir is open, the stations also generate some natural flow electricity; this is included with natural flow generation. As electricity is used in the pumping process, pumped storage stations are net consumers of electricity.

Wind farms use wind flows to turn turbines.

Other stations include stations burning fuels such as landfill gas, sewage sludge, biomass and waste.

Electricity supplied – input and output basis

5.65 The energy supplied basis defines the primary input (in million tonnes of oil equivalent, Mtoe) needed to produce 1 TWh of hydro, wind, or imported electricity as:

$$\text{Electricity generated (TWh)} \times 0.085985$$

The primary input (in Mtoe) needed to produce 1 TWh of nuclear electricity is similarly

$$\frac{\text{Electricity generated (TWh)} \times 0.085985}{\text{Thermal efficiency of nuclear stations}}$$

5.66 Figures on fuel use for electricity generation can be compared in two ways. Table 5.4 illustrates one way by using the volumes of **fuel input** to power stations (after conversion of inputs to an oil equivalent basis), but this takes no account of how efficiently that fuel is converted into electricity. The fuel input basis is the most appropriate to use for analysis of the quantities of particular fuels used in electricity generation (eg to determine the additional amount of gas or other fuels required as coal use declines under tighter emissions restrictions). A second way uses the amount of electricity generated and supplied by each fuel. This **output** basis is appropriate for comparing how much, and what percentage, of electricity generation comes from a particular fuel. It is the most appropriate method to use to examine the dominance of any fuel and for diversity issues. Percentage shares based on fuel outputs reduce the contribution of coal and nuclear, and increase the contribution of gas (by almost 7 percentage points in 2009) compared with the fuel input basis. This is because of the higher conversion efficiency of gas.

Public distribution system

5.67 This comprises the grid systems in England and Wales, Scotland and Northern Ireland. In April 2005 the Scotland and England and Wales systems were combined into a single grid.

Sectors used for sales/consumption

5.68 The various sectors used for sales and consumption analyses are standardised across all chapters of the 2010 Digest. For definitions of the sectors see Chapter 1 paragraphs 1.54 to 1.59 and Annex A paragraphs A.31 to A.42.

Transmission Entry Capacity, Declared Net Capacity and Installed Capacity

5.69 Transmission Entry Capacity (TEC) is a Connection and Use of System Code term that defines a generator's maximum allowed export capacity onto the transmission system. In the generating capacity statistics of the 2007 Digest, it replaced Declared Net Capacity (DNC) as the basis of measurement of the capacity of Major Power Producers from 2006. DNC is the maximum power available for export from a power station on a continuous basis minus any power generated or imported by the station from the network to run its own plant. It represents the nominal maximum capability of a generating set to supply electricity to consumers. The maximum rated output of a generator (usually under specific conditions designated by the manufacturer) is referred to as its Installed Capacity. For the nuclear industry, the World Association of Nuclear Operators (WANO) recommends that capacity of its reactors is measured in terms of Reference Unit Power (RUP) and it is the RUP figure that is given as the installed capacity of nuclear stations.

5.70 DNC is used to measure the maximum power available from generating stations that use renewable resources. For wind and wave and small scale hydro a factor is applied to declared net capability to take account of the intermittent nature of the energy source (eg 0.43 for wind and 0.365 for small scale hydro). Further information on this can be found in paragraph 7.80.

Load factors

5.71 The following definitions are used in Table 5.10:

Maximum load – Twice the largest number of units supplied in any consecutive thirty minutes commencing or terminating at the hour.

Simultaneous maximum load met – The maximum load on the grid at any one time. From 2005 (following the introduction of BETTA – see paragraph 5.48) it is measured by the sum of the maximum load met in Great Britain and the load met at the same time in Northern Ireland. Prior to 2005 it was measured by the sum of the maximum load met in England and Wales and the loads met at the same time by companies in other parts of the United Kingdom.

Plant load factor – The average hourly quantity of electricity supplied during the year, expressed as a percentage of the average output capability at the beginning and the end of year.

System load factor – The average hourly quantity of electricity available during the year expressed as a percentage of the maximum demand nearest the end of the year or early the following year.

Thermal efficiency

5.72 Thermal efficiency is the efficiency with which heat energy contained in fuel is converted into electrical energy. It is calculated for fossil fuel burning stations by expressing electricity generated as a percentage of the total energy content of the fuel consumed (based on average gross calorific values). For nuclear stations it is calculated using the quantity of heat released as a result of fission of the nuclear fuel inside the reactor. The efficiency of CHP systems is discussed separately in Chapter 6, paragraph 6.24 and 6.25 and Table 6D. Efficiencies based on gross calorific value of the fuel (sometimes referred to as higher heating values or HHV) are lower than the efficiencies based on net calorific value (or lower heating value LHV). The difference between HHV and LHV is due to the energy associated with the latent heat of the evaporation of water products from the steam cycle which cannot be recovered and put to economic use.

Period covered

5.73 Until 2004, figures for the MPPs relate to periods of 52 weeks as listed below (although some data provided by electricity supply companies related to calendar months and were adjusted to the statistical calendar). In 2004, a change was made to a calendar year basis. This change was made in the middle of the year and the data are largely based on information collected monthly. The January to May 2004 data are therefore based on the 21 weeks ended 29 May 2004 and the calendar months June to December 2004, making a total of 361 days. In terms of days, 2004 is therefore 1.1 per cent shorter than 2005:

Year	**52 weeks ended**
2003	28 December 2003
2004	21 weeks ended 29 May 2004 and 7 months ended 31 December 2004
2005 – 2009:	12 months ended 31 December

5.74 Figures for industrial, commercial and transport undertakings relate to calendar years ending on 31 December, except for the iron and steel industry where figures relate to the following 52 or 53 week periods:

Year	**53 weeks ended**
2003	3 January 2004
	52 weeks ended
2004	1 January 2005
2005	31 December 2005
2006	30 December 2006
2007	29 December 2007
2008	27 December 2008
	53 weeks ended
2009	2 January 2010

Monthly and quarterly data

5.75 Monthly and quarterly data on fuel use, electricity generation and supply and electricity availability and consumption are available on DECC's energy statistics web site www.decc.gov.uk/en/content/cms/statistics/source/source.aspx. Monthly data on fuel used in electricity generation by MPPs are given in Monthly Table 5.3 and monthly data on supplies by type of plant and type of fuel are given in Monthly Table 5.4. Monthly data on availability and consumption of electricity by the main sectors of the economy are given in Monthly Table 5.5. A quarterly commodity balance for electricity is published in DECC's quarterly statistical bulletin *Energy Trends* (Quarterly Table 5.2) along with a quarterly table of fuel use for generation, generation, and electricity supplied by all generators (Quarterly Table 5.1). Both these quarterly tables are also available from DECC's energy statistics web site. See Annex C for more information about *Energy Trends*.

Data collection

5.76 For MPPs, as defined in paragraphs 5.57 to 5.59, the data for the tables in this Digest are obtained from the results of an annual DECC inquiry, sent to each company, covering generating capacity, fuel use, generation, sales and distribution of electricity.

5.77 Another annual inquiry is sent to electricity distributors to establish electricity distributed by these companies. Similarly, an annual inquiry is sent to licensed suppliers of electricity to establish electricity sales by these companies. Electricity consumption for the iron and steel sector is based on data provided by the Iron and Steel Statistics Bureau (ISSB) rather than electricity suppliers since electricity suppliers tend to over-estimate their sales to this sector by including some companies that use steel rather than manufacture it. The difference between the ISSB and electricity suppliers' figures has been re-allocated to other sectors. A further means of checking electricity consumption data is now being employed on data for 2006 and subsequent years. The data are validated using information on sectors from EU Emissions Trading Scheme (EU-ETS) sources. The figures could not be used directly in the allocation because not all electricity use is recorded by the EU-ETS as some companies are not signed up to the scheme. The EU-ETS was used to check minimum consumption by sectors against other data collected by DECC.

5.78 A sample of companies that generate electricity mainly for their own use (known as autogenerators or autoproducers – see paragraph 5.57, above) is covered by a quarterly inquiry commissioned by DECC but carried out by the Office for National Statistics (ONS). Where autogenerators operate a combined heat and power (CHP) plant, this survey is supplemented (on an annual basis) by information from the CHP Quality Assessment scheme (for autogenerators who have registered under the scheme – see Chapter 6 on CHP). There are two areas of autogeneration that are covered by direct data collection by DECC, mainly because the return contains additional energy information needed by the Department. These are the Iron and Steel industry, and generation on behalf of London Underground.

Statistical differences

5.79 Statistical differences are included in Tables 5.1, 5.2 and 5.3. These arise because data collected on production and supply do not match exactly with data collected on sales or consumption. One of the reasons for this is that some of the data are based on different calendars as described in paragraphs 5.73 and 5.74, above. Sales data based on calendar years will always have included more electricity consumption than the slightly shorter statistical year of exactly 52 weeks.

5.80 Care should be exercised in interpreting the figures for individual industries in the commodity balance tables. Where companies have moved between suppliers, it has not been possible to ensure consistent classification between and within industry sectors and across years. The breakdown of final consumption includes some estimated data. In 2009, for about 3 per cent of consumption of electricity supplied by the public distribution system, the sector figures are partially estimated.

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5.1 Commodity balances

Electricity

GWh

	2007	2008	2009
Total electricity			
Supply			
Production	392,972r	384,579r	371,978
Other sources *(1)*	3,859	4,089	3,685
Imports	8,613	12,294	6,609
Exports	-3,398	-1,272	-3,748
Marine bunkers	-	-	-
Stock change	-	-	-
Transfers	-	-	-
Total supply	**402,046r**	**399,690r**	**378,524**
Statistical difference *(2)*	+377r	+304r	-190
Total demand	**401,669r**	**399,387r**	**378,714**
Transformation	-	-	-
Electricity generation	-	-	-
Major power producers	-	-	-
Other generators	-	-	-
Heat generation	-	-	-
Petroleum refineries	-	-	-
Coke manufacture	-	-	-
Blast furnaces	-	-	-
Patent fuel manufacture	-	-	-
Other	-	-	-
Energy industry use	**32,556r**	**29,915r**	**29,386**
Electricity generation	17,692r	16,266r	16,474
Oil and gas extraction	560	598	605
Petroleum refineries	5,634r	4,351r	4,347
Coal extraction and coke manufacture	1,073	1,058	1,006
Blast furnaces	479	452	464
Patent fuel manufacture	-	-	
Pumped storage	5,071	5,371	4,843
Other	2,047r	1,818r	1,648
Losses	**26,469**	**27,619r**	**26,912**
Final consumption	**342,643r**	**341,853r**	**322,417**
Industry	**114,036r**	**109,302r**	**98,079**
Unclassified	-	-	-
Iron and steel	4,924	4,661r	3,606
Non-ferrous metals	7,386r	7,094r	6,374
Mineral products	7,811r	7,630r	6,993
Chemicals	20,197r	18,993r	17,189
Mechanical engineering, etc	8,457r	8,113r	7,401
Electrical engineering, etc	7,290r	6,990r	6,367
Vehicles	5,723r	5,511r	5,053
Food, beverages, etc	12,082r	11,655r	10,659
Textiles, leather, etc	3,349	3,188r	2,884
Paper, printing, etc	12,741r	11,961r	10,822
Other industries	22,278r	21,789r	19,254
Construction	1,799r	1,717r	1,478
Transport	**8,604r**	**9,064r**	**8,764**
Air	-	-	-
Rail	2,900	2,900	2,900
Road	-	-	-
National navigation	-	-	-
Pipelines	-	-	-
Other	**220,003r**	**223,487r**	**215,574**
Domestic	122,756r	125,811r	122,543
Public administration	20,087r	20,055r	19,073
Commercial	73,035r	73,554r	70,191
Agriculture	4,125	4,067	3,766
Miscellaneous	-	-	-
Non energy use	-	-	-

5.1 Commodity balances (continued)

Electricity

GWh

	2007	2008	2009
Electricity production			
Total production *(3)*	**392,972r**	**384,579r**	**371,978**
Primary electricity			
Major power producers	**70,741**	**62,067**	**80,296**
Nuclear	63,028	52,486	69,098
Large scale hydro *(3)*	3,906	3,971	4,029
Small scale hydro	238	253	265
Wind *(4)*	3,569	5,357	6,904
Other generators	**2,664**	**2,701**	**3,388**
Nuclear	-	-	-
Large scale hydro	648	629	635
Small scale hydro	297	315	333
Wind *(4)*	1,719	1,757	2,420
Secondary electricity			
Major power producers	**286,810**	**289,128**	**257,486**
Coal	132,675	121,299r	100,857
Oil	2,401	3,591r	2,228
Gas	149,346	161,579	151,665
Renewables	2,388	2,659r	2,736
Other	-	-	-
Other generators	**32,758r**	**30,683r**	**30,809**
Coal	3,870	4,077r	3,751
Oil	2,093r	2,152r	2,140
Gas	16,447r	14,636r	13,817
Renewables	7,595r	7,375r	8,775
Other	2,753r	2,444r	2,327

Primary and secondary production *(5)*			
Nuclear	63,028	52,486	69,098
Hydro	5,088	5,168	5,262
Wind	5,288	7,114	9,324
Coal	136,545	125,376r	104,608
Oil	4,494r	5,743r	4,368
Gas	165,793r	176,215r	165,482
Other renewables	9,983r	10,034r	11,510
Other	2,753r	2,444r	2,327
Total production	**392,972r**	**384,579r**	**371,978**

(1) Pumped storage production.
(2) Total supply minus total demand.
(3) Excludes pumped storage production.
(4) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59
(5) These figures are the same as the electricity generated figures in Table 5.6 except that they exclude pumped storage production. Table 5.6 shows that electricity used on works is deducted to obtain electricity supplied. It is electricity supplied that is used to produce Chart 5.2 showing each fuel's share of electricity output (see paragraph 5.26).

5.2 Electricity supply and consumption

GWh

	2005	2006	2007	2008	2009
Supply					
Production	395,430	393,440	392,972r	384,579r	371,978
Other sources *(1)*	2,930r	3,853	3,859	4,089	3,685
Imports	11,160	10,282	8,613	12,294	6,609
Exports	-2,839	-2,765	-3,398	-1,272	-3,748
Total supply	**406,681r**	**404,809**	**402,046r**	**399,690r**	**378,524**
Statistical difference *(2)*	227r	+114r	+377r	+304r	-190
Total demand	**406,454r**	**404,695r**	**401,669r**	**399,387r**	**378,714**
Transformation	**-**	**-**	**-**	**-**	**-**
Energy industry use	**30,105r**	**32,055**	**32,556r**	**29,915r**	**29,386**
Electricity generation	17,873r	18,504	17,692r	16,266r	16,474
Oil and gas extraction	505	546	560	598	605
Petroleum refineries	4,459	4,660	5,634r	4,351r	4,347
Coal and coke	1,165	1,133	1,073	1,058	1,006
Blast furnaces	515	497	479	452	464
Pumped storage	3,707	4,918	5,071	5,371	4,843
Other	1,881	1,798	2,047r	1,818r	1,648
Losses	**27,674**	**27,410**	**26,469**	**27,619r**	**26,912**
Final consumption	**348,675r**	**345,229r**	**342,643r**	**341,853r**	**322,417**
Industry	**116,024r**	**114,918r**	**114,036r**	**109,302r**	**98,079**
Unclassified	-	-	-	-	-
Iron and steel	5,020	5,860	4,924	4,661r	3,606
Non-ferrous metals	7,693	7,524	7,386r	7,094r	6,374
Mineral products	7,978	7,869r	7,811r	7,630r	6,993
Chemicals	21,125	20,391	20,197r	18,993r	17,189
Mechanical engineering. etc	8,633	8,490	8,457r	8,113r	7,401
Electrical engineering, etc	7,420	7,341	7,290r	6,990r	6,367
Vehicles	5,841	5,748r	5,723r	5,511r	5,053
Food, beverages, etc	12,273r	12,117r	12,082r	11,655r	10,659
Textiles, leather, etc	3,393	3,382	3,349	3,188r	2,884
Paper, printing, etc	13,225r	12,906r	12,741r	11,961r	10,822
Other industries	21,495r	21,449r	22,278r	21,789r	19,254
Construction	1,929	1,840r	1,799r	1,717r	1,478
Transport	**8,816**	**8,232**	**8,604r**	**9,064r**	**8,764**
Other	**223,835r**	**222,079r**	**220,003r**	**223,487r**	**215,574**
Domestic	125,711r	124,381r	122,756r	125,811r	122,543
Public administration	20,028r	20,292r	20,087r	20,055r	19,073
Commercial	74,094r	73,376r	73,035r	73,554r	70,191
Agriculture	4,002r	4,030r	4,125	4,067	3,766
Miscellaneous	-	-	-	-	-
Non energy use	**-**	**-**	**-**	**-**	**-**

(1) Pumped storage production.
(2) Total supply minus total demand.

5.3 Commodity balances

Public distribution system and other generators

GWh

	2007			2008			2009		
	Public distribution system	**Other generators**	**Total**	**Public distribution system**	**Other generators**	**Total**	**Public distribution system**	**Other generators**	**Total**
Supply									
Major power producers *(1)*	357,551	-	357,551	351,195	-	351,195	337,781	-	337,781
Other generators	-	35,422r	35,422r	-	33,384r	33,384r	-	34,197	34,197
Other sources *(2)*	3,859	-	3,859	4,089	-	4,089	3,685	-	3,685
Imports	8,613	-	8,613	12,294	-	12,294	6,609	-	6,609
Exports	-3,398	-	-3,398	-1,272	-	-1,272	-3,748	-	-3,748
Transfers	12,623r	-12,623r	-	13,545r	-13,545r	-	15,765	-15,765	-
Total supply	**379,247r**	**22,799r**	**402,046r**	**379,852r**	**19,839r**	**399,690r**	**360,092**	**18,432**	**378,524**
Statistical difference *(3)*	+388r	-11r	+377r	+303r	+0r	+304r	-190	+0	-190
Total demand	**378,859r**	**22,809r**	**401,669r**	**379,548r**	**19,839r**	**399,387r**	**360,283**	**18,432**	**378,714**
Transformation	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy industry use	**25,937**	**6,620r**	**32,556r**	**24,788**	**5,127r**	**29,915r**	**24,087**	**5,298**	**29,386**
Electricity generation	16,099	1,594r	17,692r	14,671	1,595r	16,266r	14,738	1,736	16,474
Oil and gas extraction	560	-	560	598	-	598	605	-	605
Petroleum refineries	1,461	4,173r	5,634r	1,482	2,869r	4,351r	1,461	2,885	4,347
Coal and coke	983	90	1,073	979	79	1,058	916	89	1,006
Blast furnaces	-	479	479	-	452	452	-	464	464
Pumped storage	5,071	-	5,071	5,371	-	5,371	4,843	-	4,843
Other fuel industries	1,763	285r	2,047r	1,687	132r	1,818r	1,524	124	1,648
Losses	**26,443**	**26**	**26,469**	**27,597r**	**23**	**27,619r**	**26,882**	**29**	**26,912**
Final consumption	**326,479r**	**16,164r**	**342,643r**	**327,164r**	**14,689r**	**341,853r**	**309,313**	**13,104**	**322,417**
Industry	**100,988**	**13,047r**	**114,036r**	**97,796r**	**11,505r**	**109,302r**	**87,725**	**10,354**	**98,079**
Iron and steel	3,983	941	4,924	3,774r	888r	4,661r	2,713	894	3,606
Non-ferrous metals	4,283r	3,104r	7,386r	4,026r	3,067r	7,094r	4,055	2,319	6,374
Mineral products	7,652r	159r	7,811r	7,488r	142r	7,630r	6,908	85	6,993
Chemicals	17,018	3,179r	20,197r	16,172r	2,821r	18,993r	14,562	2,627	17,189
Mechanical engineering, etc	8,197	433r	8,629r	7,745r	550r	8,295r	7,119	447	7,567
Electrical engineering, etc	7,268	-r	7,268r	6,968	-r	6,968r	6,345	-	6,345
Vehicles	5,572r	-r	5,572r	5,352r	-r	5,352r	4,909	-	4,909
Food, beverages, etc	10,718r	1,364r	12,082r	10,339r	1,316r	11,655r	9,365	1,295	10,659
Textiles, leather, etc	3,344	-r	3,344r	3,183r	-r	3,183r	2,879	-	2,879
Paper, printing, etc	9,475	3,266r	12,741r	9,793r	2,168r	11,961r	8,938	1,884	10,822
Other industries	21,695r	588r	22,283r	21,255	539r	21,794r	18,470	789	19,258
Construction	1,784	15	1,799r	1,702r	15	1,717r	1,463	15	1,478
Transport	**7,515**	**1,090r**	**8,604r**	**7,975**	**1,089r**	**9,064r**	**7,535**	**1,229**	**8,764**
Of which National Rail	2,900	-	2,900	2,900	-	2,900	2,900	-	2,900
Other	**217,976r**	**2,027r**	**220,003r**	**221,393r**	**2,095r**	**223,487r**	**214,052**	**1,521**	**215,574**
Domestic	122,756r	-	122,756r	125,811r	-	125,811r	122,543	-	122,543
Standard	75,938r	-	75,938r	84,798r	-	84,798r	83,771	-	83,771
Economy 7 and other off-peak	28,229r	-	28,229r	22,404r	-	22,404r	20,559	-	20,559
Prepayment (standard)	12,372r	-	12,372r	13,702	-	13,702	13,425	-	13,425
Prepayment (off-peak)	6,112r	-	6,112r	4,808r	-	4,808r	4,669	-	4,669
Sales under any other arrangement	106	-	106r	100r	-	100r	119	-	119
Public administration	18,060r	2,027r	20,087r	17,960r	2,095r	20,055r	17,552	1,521	19,073
Public lighting *(4)*	2,223	-	2,223	2,179	-	2,179	2,166	-	2,166
Other public sector	15,837r	2,027r	17,864r	15,781r	2,095r	17,876r	15,386	1,521	16,907
Commercial	73,035r	-	73,035r	73,554	-	73,554r	70,191	-	70,191
Shops	31,174	-	31,174	31,286	-	31,286	26,949	-	26,949
Offices	23,357r	-	23,357r	23,732	-	23,732r	22,561	-	22,561
Hotels	8,421	-	8,421	8,275	-	8,275	9,331	-	9,331
Combined domestic/ commercial premises	2,196	-	2,196	2,265	-	2,265	3,109	-	3,109
Post and telecommunications	6,086	-	6,086	6,184	-	6,184	6,064	-	6,064
Unclassified	1,800	-	1,800	1,812	-	1,812	2,176	-	2,176
Agriculture	4,125	-	4,125	4,067	-	4,067	3,766	-	3,766

(1) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59
(2) Pumped storage production.
(3) Total supply minus total demand.
(4) Sales for public lighting purposes are increasingly covered by wider contracts that cannot distinguish the public lighting element.

5.4 Fuel used in generation (1)

	Unit	2005	2006	2007	2008	2009
						Original units of measurement
Major power producers *(2)*						
Coal	M tonnes	50.58	55.93	51.03	46.25r	38.26
Oil *(3)*	"	0.79	0.81	0.54	0.84	0.62
Gas	GWh	295,643	278,149	319,836r	344,454r	325,769
Other generators *(2)*						
Transport undertakings:						
Gas	GWh	38	24	21	21	16
Undertakings in industrial and commercial sectors:						
Coal	M tonnes	1.48	1.51	1.48	1.56r	1.42
Oil *(4)*	"	0.48r	0.43r	0.41r	0.43r	0.43
Gas	GWh	35,977r	33,235r	36,021r	32,336r	30,400
						mtoe
Major power producers *(2)*						
Coal		31.654	34.998	31.991r	28.995r	23.822
Oil *(4)*		0.883	1.010	0.750	1.160	1.068
Gas		25.421	23.917	27.501	29.618r	28.011
Nuclear		18.372	17.131	14.037r	11.910	15.230
Hydro (natural flow) *(5)*		0.329	0.318	0.356	0.368	0.368
Wind *(5) (6)*		-	-	0.307	0.458r	0.594
Other renewables *(5)*		0.818	0.731	0.625	0.750	0.695
Net imports		0.715	0.646	0.448	0.948	0.246
Total major power producers *(2)*		**78.191**	**78.751**	**76.015r**	**74.206r**	**70.034**
Of which: conventional thermal and other stations *(7)*		34.641r	38.413r	35.351r	31.786r	26.601
combined cycle gas turbine stations		24.134r	22.243r	25.766r	29.144r	27.710
Other generators *(2)*						
Transport undertakings:						
Gas		0.003	0.002	0.002	0.002	0.001
Undertakings in industrial and commercial sectors:						
Coal		0.921	0.945	0.929r	0.971r	0.872
Oil *(4)*		0.422r	0.475r	0.463r	0.478r	0.485
Gas		3.093r	2.858r	3.097r	2.780r	2.614
Hydro (natural flow) *(5)*		0.094	0.077	0.081	0.081r	0.083
Wind *(5) (6)*		0.250	0.363	0.147r	0.152r	0.206
Other renewables *(5)*		2.535	2.739	2.858r	2.774r	3.322
Other fuels *(8)*		1.881r	1.551r	1.257r	1.124r	0.849
Total other generators *(2)*		**9.199r**	**9.011r**	**8.833r**	**8.363r**	**8.432**
All generating companies						
Coal		32.575	35.943	32.920r	29.967r	24.694
Oil *(3)(4)*		1.305r	1.485r	1.212r	1.638r	1.553
Gas		28.517r	26.776r	30.600r	32.400r	30.626
Nuclear		18.372	17.131	14.037r	11.910	15.230
Hydro (natural flow) *(5)*		0.423	0.395	0.438	0.449	0.451
Wind *(5)*		0.250	0.363	0.453r	0.610r	0.800
Other renewables *(5)*		3.353	3.471	3.483r	3.524r	4.016
Other fuels *(8)*		1.881r	1.551r	1.257r	1.124r	0.849
Net imports		0.715	0.646	0.448	0.948	0.246
Total all generating companies		**87.391r**	**87.762r**	**84.848r**	**82.569r**	**78.466**

(1) For details of where to find monthly updates of fuel used in electricity generation by major power producers and quarterly updates of fuel used in electricity generation by all generating companies see paragraph 5.75.

(2) See paragraphs 5.57 to 5.63 for information on companies covered.

(3) Includes oil used in gas turbine and diesel plants, and oil used for lighting up coal fired boilers. Other fossil fuels such as petcoke are included with oil where the figures shown in million tonnes of oil equivalent.

(4) Includes refinery gas.

(5) Renewable sources, which are included under hydro and other renewables in this table, are shown separately in Table 7.4 of Chapter 7.

(6) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59.

(7) Includes gas turbines, oil engines and plants producing electricity from renewable sources other than hydro.

(8) Main fuels included are coke oven gas, blast furnace gas, colliery methane and waste products from chemical processes.

5.5 Electricity supply, electricity supplied (net), electricity available, electricity consumption and electricity sales

GWh

	2005	2006	2007	2008	2009
Total supply					
(as given in Tables 5.1 and 5.2)	406,681r	404,809	402,046r	399,690r	378,524
less imports of electricity	-11,160	-10,282	-8,613	-12,294	-6,609
plus exports of electricity	+2,839	+2,765	+3,398	+1,272	+3,748
less electricity used in pumped storage	-3,707	-4,918	-5,071	-5,371	-4,843
less electricity used on works	-17,873r	-18,504	-17,692r	-16,266r	-16,474
equals					
Electricity supplied (net)	376,780r	373,870	374,068r	367,031r	354,346
(as given in Tables 5.6, 5.1.2 and 5.1.3)					
Total supply					
(as given in Tables 5.1 and 5.2)	406,681r	404,809	402,046r	399,690r	378,524
less electricity used in pumped storage	-3,707	-4,918	-5,071	-5,371	-4,843
less electricity used on works	-17,873r	-18,504	-17,692r	-16,266r	-16,474
equals					
Electricity available	385,101r	381,387	379,283r	378,053r	357,207
(as given in Table 5.1.2)					
Final consumption					
(as given in Tables 5.2 and 5.3)	348,675r	345,229r	342,643r	341,853r	322,417
plus Iron and steel consumption counted as energy industry use	+675	+637	+607	+566	+603
equals					
Final users	349,350r	345,866r	343,250r	342,419r	323,020
(as given in Table 5.1.2)					
Final consumption					
Public distribution system					
(as given in Table 5.3)	326,430r	324,533r	326,479r	327,164r	309,313
plus Oil and gas extraction use	+505	+546	+560	+598	+605
plus Petroleum refineries use	+1,593	+1,501	+1,461	+1,482	+1,461
plus Coal and coke use	+1,066	+1,037	+983	+979	+916
plus Other fuel industries use	+1,679	+1,614	+1,763	+1,687	+1,524
equals					
UK Electricity sales *(1)*	331,273r	329,231r	331,246r	331,910r	313,819

(1) The renewables obligation percentage is calculated using total renewables generation on an obligation basis from Table 7.5 (x 100) as the numerator, and this figure as the denominator. Separate electricity sales data for public electricity suppliers are given for England and Wales, Scotland and Northern Ireland in Table 5.5 of Energy Trends on the DECC website at www.decc.gov.uk/en/content/cms/statistics/source/electricity/electricity.aspx (scroll to the Monthly Tables section).

5.6 Electricity fuel use, generation and supply

GWh

	Thermal sources							Non-thermal sources			
	Coal	Oil	Gas	Nuclear	Renew-ables (1)	Other (3)	Total	Hydro-natural flow	Hydro-pumped storage	Other (4)	Total All sources
2005											
Major power producers *(2)*											
Fuel used	368,134	10,268	295,643	213,661	9,515	-	897,222	3,826	2,930r	-	903,978r
Generation	130,690	2,921	137,483	81,618	2,744	-	355,456	3,826	2,930r	-	362,212r
Used on works	5,914	530	2,959	6,445	258	-	16,106	5	154r	-	16,265r
Supplied (gross)	124,776	2,391	134,524	75,173	2,486	-	339,350	3,821	2,776r	-	345,947
Used in pumping											3,707
Supplied (net)											342,240
Other generators *(2)*											
Fuel used	10,712	4,903r	36,015r	-	29,475	21,877r	102,982r	1,096	-	2,912	106,990r
Generation	3,947	2,417	15,159	-	6,941	3,676	32,140	1,096	-	2,912	36,148
Used on works	210	157	470	-	472	133	1,442	166	-	-	1,608
Supplied	3,737	2,260	14,689	-	6,468	3,543	30,698	930	-	2,912	34,539
All generating companies											
Fuel used	378,846	15,171r	331,658r	213,661	38,990	21,877r	1,000,204r	4,922	2,930r	2,912	1,010,967r
Generation	134,637	5,338	152,642	81,618	9,685	3,676	387,596	4,922	2,930r	2,912	398,360r
Used on works	6,124	688	3,428	6,445	731	133	17,548	171	154r	-	17,873r
Supplied (gross)	128,513	4,650	149,214	75,173	8,955	3,543	370,048	4,750	2,776	2,912	380,486
Used in pumping											3,707
Supplied (net)											376,780
2006											
Major power producers *(2)*											
Fuel used	407,027	11,751	278,149	199,235	8,504	-	904,666r	3,693	3,853	-	912,212r
Generation	145,311	3,359	126,637	75,451	2,928	-	353,686	3,693	3,853	-	361,232
Used on works	7,164	592	2,634	6,214	285	-	16,888	13	130	-	17,031
Supplied (gross)	138,147	2,767	124,003	69,237	2,643	-	336,798	3,680	3,722	-	344,201
Used in pumping											4,918
Supplied (net)											339,283
Other generators *(2)*											
Fuel used	10,991	5,521r	33,259r	-	31,849	18,038r	99,656r	900	-	4,236	104,792r
Generation	3,903	2,450	14,191	-	7,010	3,371	30,925	900	-	4,236	36,060
Used on works	210	156	440	-	534	119	1,458	14	-	-	1,472
Supplied	3,693	2,295	13,751	-	6,476	3,252	29,467	885	-	4,236	34,588
All generating companies											
Fuel used	418,018	17,272r	311,408r	199,235r	40,352	18,038r	1,004,322r	4,593	3,853	4,236	1,017,004r
Generation	149,214	5,809	140,828	75,451	9,938	3,371	384,611	4,593	3,853	4,236	397,292
Used on works	7,373	748	3,074	6,214	819	119	18,346	27	130	-	18,504
Supplied (gross)	141,840	5,061	137,754	69,237	9,119	3,252	366,265	4,566	3,722	4,236	378,789
Used in pumping											4,918
Supplied (net)											373,871
2007											
Major power producers *(2) (5)*											
Fuel used	372,054	8,718	319,836	163,247r	7,271	-	871,127r	4,144	3,859	3,569	882,699r
Generation	132,675	2,401	149,346	63,028	2,388	-	349,838	4,144	3,859	3,569	361,410
Used on works	6,737	405	2,894	5,779	240	-	16,055	30	13	-	16,099
Supplied (gross)	125,938	1,996	146,452	57,249	2,148	-	333,783	4,114	3,846	3,569	345,311
Used in pumping											5,071
Supplied (net)											340,240
Other generators *(2) (5)*											
Fuel used	10,803r	5,381r	36,042r	-	33,219r	14,613r	100,058r	946	-	1,719	102,723r
Generation	3,870	2,093r	16,447r	-	7,595r	2,753r	32,758r	946	-	1,719	35,422r
Used on works	207	152r	510r	-	615	93r	1,578r	16	-	-	1,594r
Supplied	3,662	1,941r	15,937r	-	6,980r	2,660r	31,180r	930	-	1,719	33,829r
All generating companies											
Fuel used	382,857r	14,099r	355,878r	163,247r	40,490r	14,613r	971,185r	5,089	3,859	5,288	985,421r
Generation	136,545	4,494r	165,793r	63,028	9,983r	2,753r	382,596r	5,089	3,859	5,288	396,832r
Used on works	6,945	557r	3,404r	5,779	855	93r	17,633r	46	13	-	17,692r
Supplied (gross)	129,600	3,937r	162,389r	57,249	9,128r	2,660r	364,963r	5,043	3,846	5,288	379,140r
Used in pumping											5,071
Supplied (net)											374,069r

5.6 Electricity fuel use, generation and supply (continued)

GWh

	Thermal sources							Non-thermal sources			
	Coal	Oil	Gas	Nuclear	Renew-ables (1)	Other (3)	Total	Hydro-natural flow	Hydro-pumped storage	Other (4)	Total All sources
2008											
Major power producers *(2) (5)*											
Fuel used	337,217	13,490r	344,454r	138,508	8,722	-	842,391r	4,224	4,089	5,357	856,061r
Generation	121,299r	3,591r	161,579	52,486	2,659r	-	341,614	4,224	4,089	5,357	355,284
Used on works	6,163r	622r	2,777	4,813	267r	-	14,642	15	14	-	14,671
Supplied (gross)	115,136r	2,970r	158,802	47,673	2,392r	-	326,972	4,209	4,075	5,357	340,613
Used in pumping											5,371
Supplied (net)											335,242
Other generators *(2) (5)*											
Fuel used	11,296r	5,557r	32,357r	-	32,276r	13,074r	94,560r	944	-	1,757	97,261r
Generation	4,077r	2,152r	14,636r	-	7,375r	2,444r	30,683r	944	-	1,757	33,384r
Used on works	216r	155r	453r	-	671r	83r	1,579r	17	-	-	1,595r
Supplied	3,861r	1,997r	14,183r	-	6,703r	2,361r	29,105r	927	-	1,757	31,789r
All generating companies											
Fuel used	348,513r	19,048r	376,810r	138,508	40,998r	13,074r	936,952r	5,168	4,089	7,114	953,323r
Generation	125,376r	5,743r	176,215r	52,486	10,034r	2,444r	372,297r	5,168	4,089	7,114	388,668r
Used on works	6,379r	776r	3,231r	4,813	938r	83r	16,220r	32	14	-	16,266r
Supplied (gross)	118,997r	4,967r	172,984r	47,673	9,096r	2,361r	356,077r	5,136	4,075	7,114	372,402r
Used in pumping											5,371
Supplied (net)											367,031r
2009											
Major power producers *(2) (5)*											
Fuel used	277,051	12,415	325,769	177,129	8,080	-	800,444	4,294	3,685	6,904	815,328
Generation	100,857	2,228	151,665	69,098	2,736	-	326,584	4,294	3,685	6,904	341,467
Used on works	5,111	394	2,596	6,336	275	-	14,711	15	13	-	14,738
Supplied (gross)	95,747	1,834	149,070	62,762	2,461	-	311,873	4,279	3,672	6,904	326,728
Used in pumping											4,843
Supplied (net)											321,885
Other generators *(2) (5)*											
Fuel used	10,136	5,643	30,416	-	38,610	9,875	94,681	968	-	2,420	98,068
Generation	3,751	2,140	13,817	-	8,775	2,327	30,809	968	-	2,420	34,197
Used on works	210	153	428	-	850	78	1,718	18	-	-	1,736
Supplied	3,541	1,987	13,389	-	7,925	2,249	29,091	950	-	2,420	32,461
All generating companies											
Fuel used	287,187	18,058	356,186	177,129	46,690	9,875	895,125	5,262	3,685	9,324	913,396
Generation	104,608	4,368	165,482	69,098	11,510	2,327	357,393	5,262	3,685	9,324	375,663
Used on works	5,321	546	3,024	6,336	1,124	78	16,429	33	13	-	16,474
Supplied (gross)	99,287	3,821	162,458	62,762	10,386	2,249	340,964	5,229	3,672	9,324	359,189
Used in pumping											4,843
Supplied (net)											354,346

	2005		2006		2007		2008		2009	
	Conv-entional thermal (6)	CCGT	Conv-entional thermal (6)	CCGT	Conv-entional thermal (6)	CCGT	Conv-entional thermal (6)	CCGT	Conv-entional thermal (6)	CCGT
Major power producers *(2)*										
Generated	143,149	130,689	159,742r	118,494r	146,881r	139,929r	129,033r	160,095r	107,051	150,435
Supplied (gross)	135,999	128,179	151,163	116,398	138,877r	137,657r	121,883r	157,416r	101,190	147,921
Other generators										
Generated	20,348	11,792	19,495r	11,430r	20,685r	12,073r	19,161r	11,522r	20,259	10,550
Supplied (gross)	19,494	11,204	18,608r	10,859r	19,710r	11,470r	18,157r	10,947r	19,067	10,024
All generating companies										
Generated	163,497	142,481	179,236r	129,924r	167,566r	152,002r	148,194r	171,617r	127,310	160,985
Supplied (gross)	155,492	139,383	169,770r	127,257r	158,587r	149,127r	140,041r	168,363r	120,257	157,945

(1) Thermal renewable sources are those included under biofuels and non-biodegradable wastes in Chapter 7.
(2) See paragraphs 5.57 to 5.63 on companies covered.
(3) Other thermal sources include coke oven gas, blast furnace gas and waste products from chemical processes.
(4) Other non-thermal sources include wind, wave and solar photovoltaics.
(5) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59
(6) Includes gas turbines, oil engines and plants producing electricity from thermal renewable sources; also stations with some CCGT capacity but mainly operate in conventional thermal mode.

5.7 Plant capacity - United Kingdom

MW

	end December				
	2005	2006	2007	2008	2009
Major power producers *(1)*					
Total transmission entry capacity *(2)*	**73,941**	**74,996**	**75,979r**	**76,783r**	**78,255**
Of which:					
Conventional steam stations:	32,292	33,608	33,734	32,423r	32,431
Coal fired	22,627	22,882	23,008	23,069r	23,077
Oil fired	3,262	3,778	3,778	3,778r	3,778
Mixed or dual fired *(3)*	6,403	6,948	6,948	5,576r	5,576
Combined cycle gas turbine stations	24,263	24,859	24,854	26,578r	27,932
Nuclear stations	11,852	10,969	10,979	10,979	10,858
Gas turbines and oil engines	1,356	1,444	1,445	1,456r	1,560
Hydro-electric stations:					
Natural flow	1,273	1,294	1,293	1,392r	1,395
Pumped storage	2,788	2,726	2,744	2,744	2,744
Wind (4)			795	997r	1,121
Renewables other than hydro and wind	117	96	134r	213r	213
Other generators *(1)*					
Total capacity of own generating plant *(6)*	**7,422**	**7,409**	**6,764r**	**6,661r**	**7,083**
Of which:					
Conventional steam stations *(5)*	3,269	3,059	2,924r	2,722r	2,719
Combined cycle gas turbine stations	2,182	2,106	2,076	2,015r	1,946
Hydro-electric stations (natural flow)	120	123	126r	127	131
Wind *(4)*	658	822	246r	435r	739
Renewables other than hydro and wind	1,194	1,299	1,392r	1,361r	1,547
All generating companies					
Total capacity	**81,363**	**82,405**	**82,743r**	**83,443r**	**85,337**
Of which:					
Conventional steam stations *(5)*	35,561	36,667	36,658r	35,145r	35,151
Combined cycle gas turbine stations	26,445	26,965	26,930	28,593r	29,878
Nuclear stations	11,852	10,969	10,979	10,979	10,858
Gas turbines and oil engines	1,356	1,444	1,445	1,456r	1,560
Hydro-electric stations:					
Natural flow	1,393	1,417	1,419r	1,519r	1,526
Pumped storage	2,788	2,726	2,744	2,744	2,744
Wind *(4)*	658	822	1,042	1,432	1,860
Renewables other than hydro and wind	1,311	1,395	1,526r	1,574r	1,760

(1) See paragraphs 5.57 to 5.63 for information on companies covered.
(2) See paragraph 5.69 for definition. Data before 2006 are based on declared net capability.
(3) Includes gas fired stations that are not Combined Cycle Gas Turbines, or have some CCGT capability but mainly operate as conventional thermal stations.
(4) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59
(5) For other generators, conventional steam stations include combined heat and power plants (electrical capacity only) but exclude combined cycle gas turbine plants, hydro-electric stations and plants using renewable sources.
(6) "Other generators" capacities are given in declared net capacity terms, see paragraph 5.70

5.8 Plant capacity - England and Wales, Scotland, and Northern Ireland

MW

	2005	2006	2007	2008	2009
					end December
Major power producers in England and Wales *(1)*					
Total transmission entry capacity *(2)*	**62,343**	**63,390**	**63,875r**	**64,115r**	**64,783**
Of which:					
Conventional steam stations:	26,792	28,132	28,258	28,447r	28,455
Coal fired	19,171	19,426	19,552	19,613r	19,621
Oil fired	3,262	3,778	3,778	3,778r	3,778
Mixed or dual fired *(3)*	4,359	4,928	4,928	5,056r	5,056
Combined cycle gas turbine stations	22,765	23,358	23,353	23,351r	23,955
Nuclear stations	9,412	8,559	8,569	8,569r	8,569
Gas turbines and oil engines	1,038	1,124	1,018	1,018r	1,037
Hydro-electric stations:					
Natural flow	131	136	136	137r	140
Pumped storage	2,088	1,986	2,004	2,004	2,004
Wind *(4)*	-	-	403r	420r	454
Renewables other than hydro and wind	117	96	134r	169r	169
Major power producers in Scotland *(1)*					
Total transmission entry capacity *(2)*	**9,537**	**9,582**	**10,056r**	**10,383r**	**11,104**
Of which:					
Conventional steam and combined cycle gas turbine stations	5,103	5,119	5,119	5,119	5,869
Nuclear stations	2,440	2,410	2,410	2,410	2,289
Gas turbines and oil engines	152	155	263	264	265
Hydro-electric stations:					
Natural flow	1,142	1,158	1,157	1,255r	1,255
Pumped storage	700	740	740	740	740
Wind *(4)*	-	-	367r	552	642
Renewables other than hydro and wind	-	-	-	44	44
Major power producers in Northern Ireland *(1)*					
Total transmission entry capacity *(2)*	**2,061**	**2,023**	**2,048**	**2,284**	**2,369**

(1) See paragraphs 5.57 to 5.63 for information on companies covered.
(2) See paragraph 5.69 for definition. Data before 2006 are based on declared net capability.
(3) Includes gas fired stations that are not Combined Cycle Gas Turbines.
(4) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59

5.9 Capacity of other generators

MW

	2005	2006	2007	2008	2009
					end December
Capacity of own generating plant *(1) (2)*					
Undertakings in industrial and commercial sector:					
Oil and gas terminals and oil refineries	986	983	1,015	1,013	1,012
Iron and steel	314	315	316	316	316
Chemicals	1,269	1,123	1,075r	1,051r	1,040
Engineering and other metal trades	631	622	634r	632r	626
Food, drink and tobacco	411	410	426	406	408
Paper, printing and publishing	779	757	763	569r	522
Other *(3)*	2,929	3,095r	2,433r	2,569r	3,054
Total industrial and commercial sector	7,319	7,305r	6,662r	6,556r	6,978
Undertakings in transport sector	103	103	103	103	103
Total other generators	**7,422**	**7,408r**	**6,765r**	**6,659r**	**7,081**

(1) For combined heat and power plants the electrical capacity only is included. Further CHP capacity is included under major power producers in Table 5.7. A detailed analysis of CHP capacity is given in the tables of Chapter 6. Figures may not sum to 5.7 due to rounding
(2) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59
(3) Includes companies in the commercial sector.

5.10 Plant loads, demand and efficiency

Major power producers [1]

	Unit	2005	2006	2007	2008	2009
Simultaneous maximum load met *(2)*	MW	61,697	59,071	61,527	60,289	60,231
of which England and Wales	MW	..	..	..	..	..
Scotland	MW	..	..	..	..	..
Great Britain	MW	60,100	57,490	59,880	58,590	58,510
Northern Ireland	MW	1,597	1,581	1,647	1,699	1,721
Maximum demand as a percentage of UK capacity	Per cent	83.4	78.8	81.0r	78.5r	77.0
Plant load factor *(3)*						
Combined cycle gas turbine stations	Per cent	60.9	55.1r	64.3r	70.9r	62.8
Nuclear stations	"	72.4	69.3	59.6	49.4	65.4
Hydro-electric stations:						
Natural flow	"	34.2	32.7	36.3	35.7r	35.0
Pumped storage	"	11.4	15.4	16.1	16.9	15.2
Conventional thermal and other stations *(4)*	"	46.1	49.4r	44.3r	39.1r	32.9
of which coal-fired stations	"	63.0	72.9r	66.0r	59.9r	49.8
All plant	"	**53.6**	**52.8**	**52.2**	**50.8r**	**48.0**
System load factor	"	**66.1r**	**68.7**	**66.1r**	**67.6r**	**64.2**
Thermal efficiency (gross calorific value basis)						
Combined cycle gas turbine stations	"	46.6r	45.8r	46.7r	47.2r	46.7
Coal fired stations	"	35.5r	35.7	35.7	36.0	36.4
Nuclear stations	"	38.2	37.9	38.6	37.9	39.0

(1) See paragraphs 5.57 to 5.63 for information on companies covered.
(2) Data cover the 12 months ending March of the following year, e.g. 2009 data are for the year ending March 2010.
(3) Wind load factors can be found in Table 7.4.
(4) Conventional steam plants, gas turbines and oil engines and plants producing electricity from renewable sources other than hydro.

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[1]

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
AES	Kilroot	coal/oil	662	1981	Northern Ireland
Baglan Generation Ltd	Baglan Bay	gas turbine	575	2002	Wales
Barking Power *(2)*	Barking	CCGT	1,000	1994	London
Beaufort Wind Ltd *(3)*	Bears Down	wind	10	2001	South West
	Bein Ghlas	wind	8	1999	Scotland
	Bryn Titli	wind	10	1994	Wales
	Carno	wind	34	1996	Wales
	Causeymire	wind	48	2004	Scotland
	Kirkby Moor	wind	5	1993	North West
	Lambrigg	wind	7	2000	North West
	Llyn Alaw	wind	20	1997	Wales
	Mynydd Gorddu	wind	10	1996	Wales
	Novar	wind	17	1997	Scotland
	Taff Ely	wind	9	1993	Wales
	Tow Law	wind	2	2001	North East
	Trysglwyn	wind	6	1996	Wales
	Windy Standard	wind	22	1996	Scotland
	North Hoyle	wind (offshore)	60	2003	Wales
	Farr	wind	92	2006	Scotland
	Ffynnon Oer	wind	32	2006	Wales
Braes of Doune Windfarm *(12)*	Braes of Doune	wind	72	2007	Scotland
British Energy *(11)*	Dungeness B	nuclear	1,040	1983	South East
	Hartlepool	nuclear	1,190	1984	North East
	Heysham1	nuclear	1,160	1984	North West
	Heysham 2	nuclear	1,230	1988	North West
	Hinkley Point B	nuclear	860	1976	South West
	Sizewell B	nuclear	1,188	1995	East
	Hunterston B	nuclear	860	1976	Scotland
	Torness	nuclear	1,205	1988	Scotland
Cemmaes Windfarm Ltd *(5)*	Cemmaes	wind	15	2002 *(6)*	Wales
Centrica	Barry	CCGT	230	1998	Wales
	Glanford Brigg	CCGT	260	1993	Yorkshire and
	Killingholme	CCGT	665	1994	the Humber
	Kings Lynn	CCGT	340	1996	East
	Peterborough	CCGT	405	1993	East
	Roosecote	CCGT	229	1991	North West
	South Humber Bank	CCGT	1,285	1996	Yorkshire and the Humber
	Langage	CCGT	905	2010	South West
	Glens of Foudland	wind	26	2005	Scotland
	Barrow Offshore Windfarm	wind (offshore)	90	2006	North West
	Lynn Wind Farm	wind (offshore)	97	2009	East Midlands
	Inner Dowsing Wind Farm	wind (offshore)	97	2009	East Midlands
Citigen (London) UK Ltd	Charterhouse St, London	gas/gas oil CHP	31	1995	London
Cold Northcott Windfarm Ltd *(5)*	Cold Northcott	wind	7	1993	South West
Coolkeeragh ESB Ltd	Coolkeeragh	CCGT	408	2005	Northern Ireland
Corby Power Ltd	Corby	CCGT	401	1993	East Midlands

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[1] (continued)

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
Coryton Energy Company Ltd	Coryton	CCGT	800	2001	East
Derwent Cogeneration *(2)*	Derwent	gas CHP	214	1994	East Midlands
Dong Energy	Burbo Bank	Wind	90	2009	North West
	Gunfleet Sands 1	Wind	108	2010	South East
	Gunfleet Sands 2	Wind	65	2010	South East
Drax Power Ltd	Drax	coal	3,870	1974	Yorkshire and
	Drax GT	gas oil	75	1971	the Humber
EDF Energy	Sutton Bridge	CCGT	800	1999	East
	Cottam	coal	2,008	1969	East Midlands
	West Burton	coal	2,012	1967	East Midlands
	West Burton GT	gas oil	40	1967	East Midlands
	Thames Valley Power	Gas/Gas oil CHF	15	1995	London
	London Heat & Power Company (Imperial College)	gas CHP	9	2000	London
	Barkantine Heat & Power Company	Gas CHP	1	2000	London
	Aberdare District Energy	gas	10	2002	Wales
	Bridgewater District Energy	gas	10	2000	South West
	Sevington District Energy	gas	10	2000	South East
	Solutia District Energy	gas	10	2000	Wales
EDF Energy Renewables	Bicker Fen	wind	26	2008	East Midlands
	Walkaway	wind	14	2008	North East
	Longpark	wind	38	2009	Scotland
Eggborough Power Ltd	Eggborough	coal	1,960	1967	Yorkshire and the Humber
EPR Ely Limited	Elean	straw/gas	38	2001	East
EPR Glanford Ltd	Glanford	meat & bone meal	13	1993	East
EPR Eye Ltd	Eye, Suffolk	AWDF *(7)*	13	1992	East
EPR Thetford Ltd	Thetford	poultry litter	39	1998	East
EPR Scotland Ltd	Westfield	poultry litter	12	2000	Scotland
E.On UK	Kingsnorth	coal/oil	1,940	1970	South East
	Ironbridge	coal	970	1970	West Midlands
	Ratcliffe	coal	2,000	1968	East Midlands
	Grain	oil	1,300	1979	South East
	Grain GT	gas oil	55	1978	South East
	Kingsnorth GT	gas oil	34	1967	South East
	Ratcliffe GT	gas oil	34	1966	East Midlands
	Taylor's Lane GT	gas oil	132	1979	London
	Connahs Quay	CCGT	1,380	1996	Wales
	Cottam Development Centre	CCGT	400	1999	East Midlands
	Enfield	CCGT	392	1999	London
	Killingholme	CCGT	900	1993	Yorkshire and the Humber
	Sandbach	CCGT	56	1999	North West
	Castleford	CCGT	56	2002	Yorkshire and the Humber
	Thornhill	CCGT	50	1998	Yorkshire and the Humber
	Steven's Croft	biomass	44	2007	Scotland
	Askam	wind	5	1999	North West

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[1] (continued)

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
	Blood Hill	wind	2	1992	East
	Bowbeat	wind	31	2002	Scotland
	Deucheran Hill	wind	16	2001	Scotland
	Hare Hill	wind	5	2004	North East
	High Volts	wind	8	2004	North East
	Holmside	wind	5	2004	North East
	Lowca	wind	5	2000	North West
	Oldside	wind	5	1996	North West
	Out Newton	wind	9	2002	Yorkshire and
	Rheidol	wind	2	1997	Wales
	Scroby Sands	wind (offshore)	60	2004	East
	Siddick	wind	4	1996	North West
	St Breock	wind	5	1994	South West
	Stags Holt	wind	18	2007	East
	Rhyd-y-Groes	wind	7	1992	Wales
	Blyth Offshore	wind (offshore)	4	2000	North East
	Robin Rigg	wind (offshore)	180	2010	North West
	Great Eppleton	wind	8	2010	North East
Fenland Windfarms Ltd (5)	Deeping	wind	16	2006	East Midlands
	Glass Moor	wind	16	2006	East Midlands
	Red House	wind	12	2006	East Midlands
	Red Tile	wind	24	2007	East Midlands
Fred Olsen	Crystal Rig Windfarm	wind	63	2003	Scotland
	Paul's Hill	wind	64	2005	Scotland
	Rothes	wind	51	2004	Scotland
	Crystal Rig II	wind	138	2010	Scotland
GDF Suez	Shotton	gas CHP	180	2001	Wales
	Teesside Power Station	CCGT	1,875	1992	North East
	Scotia Wind	wind	20	2010	Scotland
Great Orton Windfarm Ltd (5)	Great Orton	wind	4	1999 (6)	North West
HG Capital	Tyr Mostyn & Foel Goch	wind	21	2005	Wales
High Hedley Hope Wind Ltd (5)	High Hedley 1	wind	2	2001	North East
	High Hedley 2	wind	5	2008	North East
	Trimdon Grange	wind	5	2008	North East
	Langley Park	wind	8	2008	North East
	Broomhill	wind	8	2008	North East
Infinis Windfarm (2)	Infinis	wind	24	2004	Scotland
Infinis Windfarm (2)	Infinis Extension	wind	6	2008	Scotland
Immingham CHP LLP	Immingham CHP	gas CHP	1,240	2004	Yorkshire and the Humber
International Power / Mitsui	Indian Queens	gas oil/kerosene	140	1996	South West
	Dinorwig	pumped storage	1,728	1983	Wales
	Ffestiniog	pumped storage	360	1961	Wales
	Rugeley	coal	1,006	1972	West Midlands
	Rugeley GT	gas oil	50	1972	West Midlands
	Deeside	CCGT	500	1994	Wales
	Saltend	CCGT	1,200	2000	Yorkshire and the Humber
Kirkheaton Wind Ltd *(5)*	Kirkheaton	wind	1	2000	North East
K/S Winscales *(5)*	Winscales 1	wind	2	1999	North West

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[1] (continued)

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
	Winscales 2	wind	7	2005	North West
Llangwyryfon Windfarm Ltd *(5)*	Llangwyryfon	wind	9	2003	Wales
Magnox North Ltd *(4)*	Oldbury	nuclear	434	1967	South West
	Wylfa	nuclear	980	1971	Wales
	Maentwrog	hydro	28	1928	Wales
Marchwood Power Limited *(2)*	Marchwood	gas	842	2009	South West
Premier Power Ltd	Ballylumford B	gas/oil	540	1968	Northern Ireland
	Ballylumford C	CCGT	616	2003	Northern Ireland
Px Limited *(10)*	Fellside CHP	gas CHP	180	1995	North West
RES-Gen Ltd	Dyffryn Brodyn	wind	6	1994	Wales
	Four Burrows	wind	5	1995	South West
	Forss	wind	2	2003	Scotland
	Forss2	wind	5	2007	Scotland
	Lendrum's Bridge	wind	13	2000	Northern Ireland
	Altahullion	wind	26	2003	Northern Ireland
	Altahullion2	wind	12	2007	Northern Ireland
	Black Hill	wind	29	2006	Scotland
	Lough Hill	wind	8	2007	Northern Ireland
	Gruig	wind	25	2009	Northern Ireland
RGS Energy Ltd	Knapton	gas	40	1994	Yorkshire and the Humber
Rocksavage Power Co. Ltd	Rocksavage	CCGT	810	1998	North West
RWE Npower Plc	Aberthaw B	coal	1,586	1971	Wales
	Tilbury B	coal	1,063	1968	East
	Didcot A	coal/gas	1,958	1972	South East
	Aberthaw GT	gas oil	51	1971	Wales
	Cowes	gas oil	140	1982	South East
	Didcot GT	gas oil	100	1972	South East
	Fawley GT	gas oil	68	1969	South East
	Littlebrook GT	gas oil	105	1982	South East
	Tilbury GT	gas oil	68	1968	East
	Little Barford GT	gas oil	17	2006	East
	Fawley	oil	968	1969	South East
	Littlebrook D	oil	1,370	1982	South East
	Didcot B	CCGT	1,430	1998	South East
	Great Yarmouth	CCGT	420	2001	East
	Little Barford	CCGT	665	1995	East
Npower Renewables Ltd (Part of RWE Npower)	Braevallich	hydro	2	2005	Scotland
	Cwm Dyli	hydro	10	2002 *(6)*	Wales
	Dolgarrog High Head	hydro	17	2002 *(6)*	Wales
	Dolgarrog Low Head	hydro	15	1926/2002	Wales
	Garrogie	hydro	2	2005	Scotland
	Inverbain	hydro	1	2006	Scotland
	Kielder	hydro	6	2006 *(6)*	North East
	River E	hydro	3	2008	Scotland
	Douglas Water	hydro	3	2008	Scotland
	Inverlael	hydro	3	2009	Scotland
	Carnoch	hydro	1	2009	Scotland
	Burgar Hill	wind	5	2007	Scotland

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[1] (continued)

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
	Hameldon Hill	wind	5	2007	Northwest
	Bilbster	wind	4	2008	Scotland
	Hollies	wind	3	2008	East
	Knabs Ridge	wind	16	2008	North East
	Little Cheyne	wind	60	2008	South East
	Rhyl Flats	wind (offshore)	90	2009	Wales
Scottish and Southern Hydro Schemes:					
Affric/Beauly	Mullardoch Tunnel	hydro	2	1955	Scotland
	Fasnakyle	hydro	69	1951	Scotland
	Fasnakyle Compensation Set	hydro	8	2006	Scotland
	Deanie	hydro	38	1963	Scotland
	Culligran	hydro	17	1962	Scotland
	Culligran Compensation Set	hydro	2	1962	Scotland
	Aigas	hydro	20	1962	Scotland
	Kilmorack	hydro	20	1962	Scotland
Breadalbane	Lubreoch	hydro	4	1958	Scotland
	Cashlie	hydro	11	1959	Scotland
	Lochay	hydro	46	1958	Scotland
	Lochay Compensation Set	hydro	2	1959	Scotland
	Finlarig	hydro	17	1955	Scotland
	Lednock	hydro	3	1961	Scotland
	St. Fillans	hydro	17	1957	Scotland
	Dalchonzie	hydro	4	1958	Scotland
Conon	Achanalt	hydro	3	1956	Scotland
	Grudie Bridge	hydro	19	1950	Scotland
	Mossford	hydro	19	1957	Scotland
	Luichart	hydro	34	1954	Scotland
	Orrin	hydro	18	1959	Scotland
	Torr Achilty	hydro	15	1954	Scotland
Foyers	Foyers	hydro/ pumped storage	300	1974	Scotland
Great Glen	Foyers Falls	hydro	5	1968	Scotland
	Mucomir	hydro	2	1962	Scotland
	Ceannacroc	hydro	20	1956	Scotland
	Livishie	hydro	17	1962	Scotland
	Glenmoriston	hydro	37	1957	Scotland
	Glendoe	hydro	100	2008	Scotland
	Quoich	hydro	18	1955	Scotland
	Invergarry	hydro	20	1956	Scotland
	Kingairloch	hydro	3	2005	Scotland
Shin	Cassley	hydro	10	1959	Scotland
	Lairg	hydro	4	1959	Scotland
	Shin	hydro	19	1958	Scotland
	Loch Dubh	hydro	1	1954	Scotland
Sloy/Awe	Sloy	hydro	153	1950	Scotland
	Sron Mor	hydro	5	1957	Scotland
	Clachan	hydro	40	1955	Scotland
	Allt-na-Lairige	hydro	6	1956	Scotland
	Nant	hydro	15	1963	Scotland
	Inverawe	hydro	25	1963	Scotland
	Kilmelfort	hydro	2	1956	Scotland
	Loch Gair	hydro	6	1961	Scotland
	Lussa	hydro	3	1952	Scotland
	Striven	hydro	8	1951	Scotland

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[1] (continued)

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
Tummel	Gaur	hydro	8	1953	Scotland
	Cuaich	hydro	3	1959	Scotland
	Loch Ericht	hydro	2	1962	Scotland
	Rannoch	hydro	45	1930	Scotland
	Clunie	hydro	61	1950	Scotland
	Tummel	hydro	34	1933	Scotland
	Errochty	hydro	75	1955	Scotland
	Pitlochry	hydro	15	1950	Scotland
Wind	Artfield Fell	wind	20	2005	Scotland
	Bu	wind	3	2002	Scotland
	Hadyard Hill	wind	120	2005	Scotland
	Spurness	wind	8	2004	Scotland
	Tangy	wind	19	2002	Scotland
	Dalswinton	wind	30	2008	Scotland
	Drumderg	wind	32	2008	Scotland
	Minsca	wind	37	2008	Scotland
	Bessy Bell	wind	9	2008	N Ireland
	Bin Mountain	wind	9	2007	N Ireland
	Slieve Divena	wind	30	2009	N Ireland
	Tappaghan	wind	29	2005	N Ireland
Small Hydros:	Chliostair	hydro	1	1960	Scotland
	Cuileig	hydro	3	2002	Scotland
	Kerry Falls	hydro	1	1951	Scotland
	Nostie Bridge	hydro	1	1950	Scotland
	Storr Lochs	hydro	2	1952	Scotland
Thermal:	Peterhead *(8)*	gas/oil	1,180	1980	Scotland
	Fife Power Station	gas	123	2000	Scotland
	Keadby	gas/oil	749	1994	Yorkshire and the Humber
	Medway	CCGT	688	1995	South East
	Ferrybridge C	coal/biomass	1,960	1966	Yorkshire and the Humber
	Fiddler's Ferry	coal/biomass	1,980	1971	North West
	Ferrybridge GT	gas oil	34	1966	Yorkshire and the Humber
	Fiddler's Ferry GT	gas oil	34	1969	North West
	Uskmouth	coal/biomass	363	2000	Wales
Thermal (continued)					
	Chickerell	gas/oil	45	1998	South West
	Burghfield	gas/oil	47	1998	South East
	Thatcham	light oil	10	1994	South East
	Five Oaks	light oil	9	1995	South East
	Chippenham	gas	10	2002	South West
	Wheldale	mines gas	10	2002	Yorkshire and the Humber
Island Generation	Arnish	diesel	3	2001	Scotland
	Barra	diesel	2	1990	Scotland
	Bowmore	diesel	6	1946	Scotland
	Kirkwall	diesel	16	1953	Scotland
	Lerwick	diesel	65	1953	Scotland
	Loch Carnan, South Uist	diesel	10	1971	Scotland
	Stornoway	diesel	24	1950	Scotland
	Tiree	diesel	3	1945	Scotland

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)[11] (continued)

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
Scottish Power					
Hydro schemes:					
Galloway	Carsfad	hydro	12	1936	Scotland
	Drumjohn	hydro	2	1985	Scotland
	Earlstoun	hydro	14	1936	Scotland
	Glenlee	hydro	24	1935	Scotland
	Kendoon	hydro	24	1936	Scotland
	Tongland	hydro	33	1935	Scotland
Lanark	Bonnington	hydro	11	1927	Scotland
	Stonebyres	hydro	6	1927	Scotland
Cruachan	Cruachan	pumped storage	440	1966	Scotland
Thermal:	Cockenzie	coal	1,152	1967	Scotland
	Longannet	coal	2,304	1970	Scotland
	Damhead Creek	CCGT	800	2000	South East
	Pilkington - Greengate	gas	10	1998	North West
	Ravenhead	gas	9	1999	North West
	Rye House	CCGT	715	1993	East
	Shoreham	CCGT	400	2000	South East
Wind:	Barnesmore	wind	15	1997	Northern Ireland
	Beinn an Tuirc	wind	30	2001	Scotland
	Beinn Tharsuinn	wind	30	2007	Scotland
	Black Law	wind	124	2005	Scotland
	Callagheen	wind	17	2006	Northern Ireland
	Carland Cross	wind	6	1992	South West
	Clachan Flats	wind	15	2009	Scotland
	Coal Clough	wind	10	1992	North West
	Coldham	wind	16	2006	East
	Corkey	wind	5	1994	Northern Ireland
	Cruach Mhor	wind	30	2004	Scotland
	Dun Law	wind	17	2000	Scotland
	Dun Law II	wind	30	2009	Scotland
	Elliots Hill	wind	5	1995	Northern Ireland
	Greenknowes	wind	27	2008	Scotland
	Hagshaw Hill	wind	16	1995	Scotland
	Hagshaw Hill II	wind	26	2009	Scotland
	Hare Hill	wind	13	2000	Scotland
	Penryddian & Llidiartywaun	wind	31	1992	Wales
	Rigged Hill	wind	5	1994	Northern Ireland
	Wether Hill	wind	18	2007	Scotland
	Whitelee	wind	322	2007	Scotland
	Wolf Bog	wind	10	2008	Northern Ireland
Seabank Power Limited	Seabank 1	CCGT	812	1998	South West
	Seabank 2	CCGT	410	2000	South West
Sembcorp Utilities (UK) Ltd	Wilton Power Station	Gas/Coal/Oil	280	1952	North East
	Wilton GT2	Gas	42	2005	North East
	Wilton 10	Biomass	38	2007	North East
South East London Combined Heat & Power Ltd	SELCHP ERF	waste	32	1994	London
Spalding Energy Company Ltd	Spalding	CCGT	880	2004	East Midlands

For footnotes see page 150

5.11 Power Stations in the United Kingdom
(operational at the end of May 2010)(1) (continued)

Station type		Fuel	Capacity (MW)	
Statkraft Energy Ltd	Rheidol	hydro	49	1961 Wales
	Alltwalis	wind	23	2009 Wales
Talisman Energy	Beatrice *(2)*	wind (offshore)	10	2007 Scotland
Vattenfall Wind Power	Kentish Flats	wind (offshore)	90	2005 South East
Western Power Generation	Lynton	gas oil	2	1961 South West
	Roseland	kerosene	5	1963 South West
	St Marys	gas oil	6	1958 South West
Yorkshire Windpower Ltd *(13)*	Ovenden Moor	wind	9	1993 Yorkshire and the Humber
	Royd Moor	wind	7	1993 Yorkshire and the Humber
Total			**81,632**	

Other power stations(9)

Renewable sources	wind	785	
and combustible wastes	landfill gas	985	
	sewage gas	158	
	hydro	221	
	waste	360	
	other	268	
CHP schemes listed in Table 5.12	various fuels	2,268	
CHP schemes other than major power producers and renewables and those listed in Table 5.12	mainly gas	1,804	
Other autogenerators	various fuels	491	

Interconnectors

	Capacity (MW)
England - France	2,000
Scotland - Northern Ireland	500
Northern Ireland - Irish Republic	600

Footnotes

(1) This list covers stations of more than 1 MW capacity, but excludes some renewables stations of over 1 MW which are included in the sub table on page 152.

(2) Joint venture with Scottish and Southern Energy

(3) Managed by RWE

(4) Owned by NDA but operated by Magnox North Ltd

(5) Managed by EDF Energy Renewables Ltd

(6) Recommissioning dates.

(7) Animal Waste Derived Fuel, i.e. meat and bone meal, poultry litter, feathers and small quantities of other material such as wood chips

(8) Total capacity is 1,840 MW but because of transmission constraints only 1,180 MW can be used at any one time.

(9) As at end December 2009.

(10) Owned by NDA but operated by Px Limited

(11) Now owned by EDF

(12) Joint venture between E.On and SSE

(13) Owned by E.On and EPR

5.12 Large scale CHP schemes in the United Kingdom (operational at the end of December 2009)(1)

Company Name	Scheme Location	Installed Capacity (MWe) (2)
Airbus UK	Broughton, Cheshire	5
Alta Estate Services Limited	The University of Birmingham	6
Archer Daniels Midland Ltd (ADM Ltd)	Erith, Kent	14
Arjo Wiggins Chartham Ltd	Chartham Paper Mill, Arjo Wiggins Chartham Ltd	6
Arjo Wiggins Ltd	Dartford, Kent	10
Atkins Power	Abbey View Nurseries, Waltham Abbey, Essex	3
Atkins Power	Villa Nurseries, Roydon, Essex	3
Atkins Power	Anchor Nurseries Ltd, Beverley	3
Atkins Power	Glen Avon Growers, Cottingham, North Humberside	3
Atkins Power	Stubbins Marketing, Fen Drayton	3
Atkins Power	Park Lane Nursery, East Yorkshire	2
Atkins Power	Waltham Abbey, Essex	3
Atkins Power	Cleveland Nurseries, Cleveland	5
Atkins Power	Tower Nursery, Roydon, Essex	3
Balcas Ltd	Laragh, Ballycassidy, Enniskillen	3
Barkantine Heat & Power Company	Barkantine, Barkantine Heat & Power Company	1
BHP Billiton	Point of Ayr Terminal	9
Birmingham District Energy Company Limited	Icc Energy Centre	2
Bloomsbury CHP	SOAS, London	1
BP CHP (UK) Ltd	Polimerieuropa, Hythe	53
British Sugar Plc	Cantley Sugar Factory	15
British Sugar plc	Wissington, Norfolk	94
British Sugar plc	Newark, Nottinghamshire	10
British Sugar plc	Bury St Edmunds, Suffolk	90
Cambridge University Hospitals Foundation	Addenbrookes Hospital	4
Carlsberg Uk Limited	Carlsberg Brewery Leeds, Carlsberg Uk Limited	1
CIBA Speciality Chemicals plc	Low Moor, Bradford	16
Cleveland Potash Limited	Boulby Mine, Cleveland Potash Limited	16
Cofely Limited	Mod Main Building, Cofely Limited	5
Cofely Ltd	Kellogg Trafford Park	5
Crisp Maltings Ltd	Fakenham, Norfolk	1
Dalkia Clean Power Ltd	Sonoco, Stainland Board Mills, Halifax	7
Dalkia Clean Power Ltd	Fribo Foods, Wrexham	1
Dalkia Plc	Lincoln County Hospital	1
Dalkia Utilities Services	Southampton General Hospital	2
Dalkia Utilities Services	Kingston Hospital	1
Dalkia Utility Services	Leeds General Infirmary	19
Dalkia Utility Services	Astra-Zeneca, Macclesfield	23
Diageo Distilling Ltd	Port Dundas, Glasgow	6
DSM Nutritional Products UK Ltd	Dalry, Ayrshire	46
E.On UK (CHP) Ltd	Iggesund Paperboard, Workington	48
E.On Uk Chp Limited	Stoke Chp, Michelin Tyre Plc	61
E.On Uk Chp Limited	Humber Chp, Humber Refinery	25
E.On Uk Chp Limited	Brunner Mond (Uk) Limited	146
E.On Uk Chp Ltd	Citigen Chp. Citigen (London) Limited	16
E.On Uk Cogeneration Ltd	Queens Medical Centre Nhs Trust	5
Ed&F Man Ltd (Man Group Plc)	Sugar Quay	1
Elyo Ltd	Hillhouse International, Lancashire	5
Fortum O&M UK Ltd	Sullom Voe	89
Genzyme td	Haverhill, Suffolk	1
Humber Energy	Grimsby, South Humberside	48
Hydro Polymers Ltd	Newton Aycliffe, Durham	12
Imperial College of Science, Medicine and	Kensington, London	9
INBEV UK Ltd	Salmesbury Brewery, Preston	7
INBEV UK Ltd	Magor Brewery, South Wales	7
Ineos Chlor	Runcorn, Cheshire	38

For footnotes see page 153

5.12 Large scale CHP schemes in the United Kingdom
(operational at the end of December 2009)[1] *(continued)*

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
James Cropper Ltd	Kendal, Cumbria	7
John Thompson and Company	Belfast	3
Johnson Matthey	Enfield	3
Johnson Matthey	Royston	6
Kingspan Insulation Limited	Kingspan Insulation Limited	1
Kodak Limited	Harrow Site, Kodak Limited	12
Laporte Industries	Fine Organics Ltd, Seal Sands	4
Met Office	Met Office Hq	2
Norbord Ltd	Cowie, Norbord Ltd	16
North Tees and Hartlepool NHS Trust	North Tees General Hospital, Hartlepool	2
Npower Cogen Ltd	Georgia Pacific, Bridgend Paper Mills, Llangynwyd,	9
Npower Cogen Ltd	Dow Corning, Barry ?	27
Npower Cogen Ltd	Huntsman Tioxide, Grimsby	20
Npower Cogen Ltd	Conoco Phillips Teesside Operations	97
Npower Cogen Ltd	Millenium Organic Chemicals, Stallingborough	16
Npower Cogen Ltd	Bridgewater Paper, Ellesmere Port, South Wirral	58
Npower Cogen Ltd	Basf Chp C/O Basf Plc	98
Npower Cogen Ltd	Aylesford Newsprint, Kent	100
Npower Cogen Trading Ltd	Fawley, Hampshire	316
Portals Ltd	Overton Mill, Hampshire	7
Prime Energy (MK) Ltd	Ordnance Survey, Southampton	2
Prosper De Mulder	Hartshill	3
Ryobi Aluminium Castings (UK) Ltd	Carrickfergus, Co Antrim	1
Scottish and Southern Energy plc	West End Nursery, Woking	2
Scottish and Southern Energy plc	Red Roofs, Cottingham, Yorks	3
Scottish and Southern Energy plc	Western General Hospital, Edinburgh	1
Scottish and Southern Energy plc	Koopers UK Ltd, Port Clarence, Teesside	2
Scottish and Southern Energy plc	Bradon Farm, Taunton, Somerset	10
Severn Trent Water Ltd	Minworth Sewage Treatment Works (Stw)	8
Shell Oil Products Ltd	Stanlow Manufacturing Complex, Cheshire	109
Slough Heat & Power Ltd	Slough Power Station	104
Smithkline Beecham Plc/Glaxo Smith Kline Plc	Glaxo Smith Kline Worthing	2
Smurfit Kappa SSK Ltd	Nechells, Birmingham	9
Southampton Geothermal	Southampton	7
Southern Water Services	Budds Farm Wtw, Southern Water	2
Springfield Fuels Ltd	Springfields, Springfield Fuels Ltd	12
St Georges's Healthcare NHS Trust	St George's Hospital, Tooting, London	4
Sustainable and Renewable Energy	Woking, Surrey	1
Swansea University	Swansea University	2
Tangmere Airfield Nurseries Ltd	Tangmere, Sussex	9
Tate and Lyle Europe	Thames Refinery, Silverton, London	20
Thames Valley Power Ltd	Heathrow Airport	15
Thames Water Utilities	Reading (Island Road) Sewage Treatment Works, Reading	1
Thames Water Utilities	Deephams Sewage Treatment Works, Edmonton, London	3
Thames Water Utilities	Rye Meads Sewage Treatment Works, Hertfordshire	1
Thames Water Utilities	Beddington Lane Sewage Treatment Works, Croydon,	3
Thames Water Utilities	Long Reach Sewage Treatment Works, Kent	3
Thames Water Utilities	Maple Lodge Sewage Treatment Works, Hertfordshire	4
Thames Water Utilities	Mogden Treatment Works, London	8
Thameswey Energy Ltd	Tcmk Phase 1 CHP, Midsummer Boulevard, Milton Keynes	3
The Boots Company plc	Beeston, Nottingham	14

For footnotes see page 153

5.12 Large scale CHP schemes in the United Kingdom
(operational at the end of December 2009)[1] *(continued)*

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
UEA Utilities Ltd	University of East Anglia, Norwich	3
University of Bristol	Bristol	1
University of Edinburgh	George Square Energy Centre, Edinburgh	2
University of Edinburgh	Kings Building, Edinburgh	3
University of Southampton	Southampton	3
University of Surrey	Guildford, Surrey	1
University Of Sussex	University Of Sussex	1
University of Warwick	Warwickshire	4
Upm Kymmene (Uk) Ltd	Caledonian Paper	26
Upm Kymmene (Uk) Ltd	Upm Shotton	22
Utilicom Ltd	University College, London	3
Weetabix Ltd	Burton Latimer, Northants	6
Total *(2)*		2,268
Electrical capacity of good quality CHP for these sites in total		2,036

(1) These are sites of 1 MW installed electrical capacity or more that either have agreed to be listed in the Ofgem register of CHP plants or whose details are publicly available elsewhere, or who have provided the information directly to DECC. It excludes CHP sites that have been listed as major power producers in Table 5.11.

(2) This is the total power capacity from these sites and includes all the capacity at that site, not just that classed as good quality CHP under CHPQA.

Chapter 6
Combined heat and power

Introduction

6.1 This chapter sets out the contribution made by Combined Heat and Power (CHP) to the United Kingdom's energy requirements. The data presented in this chapter have been derived from information submitted to the CHP Quality Assurance programme (CHPQA) or by following the same procedures where no information has been provided directly. The CHPQA programme was introduced by the Government to provide the methods and procedures to assess and certify the quality of the full range of CHP schemes. It is a rigorous system for the Government to ensure that the incentives on offer are targeted fairly and benefit schemes in relation to their environmental performance.

6.2 CHP is the simultaneous generation of usable heat and power (usually electricity) in a single process. The term CHP is synonymous with cogeneration, which is commonly used in other Member States of the European Community and the United States. CHP uses a variety of fuels and technologies across a wide range of sizes and applications. The basic elements of a CHP plant comprise one or more prime movers (a reciprocating engine, gas turbine, or steam turbine) driving electrical generators, with the heat generated in the process captured and put to further productive use, such as for other industrial processes, hot water and space heating or cooling.

6.3 CHP is typically sized to make use of the available heat[1], and connected to the lower voltage distribution system (i.e. embedded). This means that unlike conventional power stations, CHP can provide efficiency gains by avoiding significant transmission and distribution losses. CHP can also provide important network services such as black start, improvements to power quality, and some have the ability to operate in island mode if the grid goes down. There are four principal types of CHP system: steam turbine, gas turbine, combined cycle systems and reciprocating engines. Each of these is defined in paragraph 6.34 later in this chapter.

Government policy towards CHP

6.4 Good Quality CHP denotes schemes that have been certified as being highly efficient through the UK's CHP Quality Assurance (CHPQA) programme. The criteria used are in line with the requirements for high efficiency CHP set down in the EU Cogeneration Directive (2004/8/EC). A Good Quality CHP plant must achieve 10 per cent primary energy savings compared to the separate generation of heat and power i.e. via a boiler and power station. Only Good Quality CHP schemes are eligible for Government support.

6.5 There are a range of support measures to incentivise the growth of Good Quality CHP in the UK. These include:

- Exemption from the Climate Change Levy (CCL) of all fuel inputs to, and electricity outputs from, Good Quality CHP.
- Eligibility to Enhanced Capital Allowances for Good Quality CHP plant and machinery.
- Favourable allocations of carbon allowances under Phase II of the EU Emissions Trading Scheme (EU ETS)
- Business Rates exemption for CHP power generation plant and machinery.
- Reduction of VAT (from 17.5 to 5 per cent) on domestic micro-CHP installations.
- Extension of the eligibility for Renewable Obligation Certificates (ROCs) to energy from waste plants that utilise CHP.
- Increased support under the Renewables Obligation from with two ROCs allocated to the Good Quality electricity output of CHP fuelled by biomass.

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[1] *But not always, see paragraph 6.10. In such cases there is an impact upon the electrical capacity and electrical output classified as CHP.*

- In April 2010 the Carbon Reduction Commitment (CRC) came into force. The CRC is a mandatory emissions trading scheme that will cover large, non-energy intensive business, currently not covered under other policy measures like Climate Change Agreements (CCAs) and the EU ETS. In the CRC, organisations covered will be required to purchase allowances to cover the CO_2 emissions from all fixed-point energy sources. This means that allowances must be purchased to cover the use of electricity, gas and all other fuel types such as Liquified Petroleum Gas (LPG) and diesel. However, under CRC heat is zero-rated, meaning that allowances will not have to be purchased by a site to cover any imported heat. It is expected that this treatment will stimulate a growth in the heat market, and this will in turn incentivise the use of CHP. From 2013, the first capped phase will commence and allowances will be sold to participants by auction.

International context

6.6 The EU-ETS commenced on 1st January 2005 and involves the trading of carbon emissions allowances. The purpose of the EU-ETS is to reduce emissions by a fixed amount at least cost to the regulated sources. Each year participants in the scheme are allocated a set number of allowances. At the end of each trading year allowances equal to the reported emissions must be given up. In the EU-ETS Phase I National Allocation Plan (NAP), the sectoral classification of CHP plant depended on the sector in which it was modelled in DTI's Updated Energy Projections (UEP) and the presence of CHP at an installation was not considered explicitly in their allocation calculations. The sector in which an installation is classified has an effect on the level of its allocation, because allocations are calculated on the basis of sectoral growth projections. It was argued that this method of allocation would have an impact on CHP because its future growth and emissions are different to those of non-CHP installations in Phase I sectors. For this reason the Government decided to create a specific sector for GQCHP in Phase II, to ensure that incumbent CHP plant would not be disincentivised and to ensure that investment in GQCHP would be encouraged by the implementation of Phase II. Phase II runs from January 2008- December 2012.

6.7 All sites wishing to be included in the CHP sector were required to submit to CHPQA in 2006. This was to enable the Qualifying Power Capacity (QPC) to be determined for all schemes, and was necessary to ensure that the correct number of allocations was made to individual sites in the CHP sector. A consequence of this was that a number of sites that had previously not submitted to CHPQA, on the grounds that there were no fiscal benefits to accrue to them from the CHPQA process, submitted to CHPQA for the first time in 2006. This made available for the first time accurate data on capacities and energy inputs and outputs for these schemes. Where corrections were necessary, they were made back in time and revised historical data incorporating these corrections were presented in the 2007 Digest. The details of these corrections were provided in paragraph 6.31 of the 2007 Digest which is available on the DECC Energy web site at
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

6.8 Phase III of EU ETS will run from 2013 until 2027. Under this Phase there will be no allocation made in respect of CO2 emissions associated with the generation of electricity, including electricity generated by CHP. However, there will be an allocation made in respect of CO2 emissions associated with the generation of heat. The allocation will be based upon harmonised benchmarks for heat production, and a heat generating installation will receive 80 per cent of the allocations determined using this benchmark, declining linearly to 30 per cent by 2020 and then to 0 per cent by 2027. At the time of writing the benchmark value(s) for heat have not been determined.

6.9 UK incentives for CHP have influenced developments and operations of CHP in Continental Europe. The value of the CCL exemption on Good Quality CHP electricity outputs can be realised by the sale of Levy Exemption Certificates (LECs) issued against CHP electricity outputs exported to the grid and consumed in the UK. This has encouraged CHP operators in France, Denmark Germany and Republic of Ireland to generate and export low carbon CHP electricity to the UK. In 2009 LECs were issued in respect of 2,424 GWh of Good Quality CHP electricity generated by over 60 overseas CHP schemes. This represents approximately 8 per cent of Good Quality CHP electricity consumed in the UK in 2009. Electricity generated by overseas CHP schemes are not included in figures given in this chapter.

UK energy markets, and their effect on CHP[2]

6.10 Two major factors affecting the economics of CHP are the relative cost of fuel (principally natural gas) and the value that can be realised for electricity. Energy price trends that are applicable to CHP schemes differ depending upon the size and sector of the scheme. During the last few years there has been an improving trend in the viability of CHP due to an increase in the price of electricity relative to that of gas. This is known as the spark gap (i.e. the difference between the price of electricity and the price of the gas required to generate that electricity). Due to the long term nature of CHP investments long term trends in the spark gap need to be taken into account.

Use of CHPQA in producing CHP statistics

6.11 The CHPQA programme is the major source for CHP statistics. The following factors need to be kept in mind when using the statistics produced:

- Through CHPQA, scheme operators have been given guidance on how to determine the boundary of a CHP scheme (what is regarded as part of the CHP installation and what is not). A scheme can include multiple CHP prime movers[3], along with supplementary boilers and generating plant, subject to appropriate metering being installed to support the CHP scheme boundaries proposed, and subject to appropriate metering and threshold criteria. (See CHPQA Guidance Note 11 available at www.chpqa.com). This point is relevant when considering the figures in Table 6D, where the power efficiencies, heat efficiencies and heat to power ratios stated in that table for 2009 are those of the scheme, which may not be just the prime mover.
- The output of a scheme is based on gross power output, ignoring parasitic loads (i.e. ignoring power used in pumps, fans, etc. within the scheme itself).
- The main purpose of a number of CHP schemes is the generation of electricity including export to others. Such schemes may not be sized to use all of the available heat. In such cases, the schemes' total electrical capacity and electrical output have been scaled back using the methodologies outlined in CHPQA. Only the portion of the electrical capacity and electrical output that qualifies as Good Quality is counted in this chapter. The remaining electrical capacity and electrical output are regarded as power only, and these are reported in Chapter 5 as part of 'Other Generators'. The fuel allocated to the power-only portion of the output is calculated from the power efficiency of the prime mover.
- The load factor presented in Table 6A is based on the Good Quality Power Output and Good Quality Power Capacity reported in this Chapter. For schemes that are scaled back, this load factor is likely to be smaller than the actual load factor (hours run) for the prime mover in these schemes. Between 2008 and 2009 there was a small fall in the load factor and a small increase in overall efficiency.

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[2] *Reference source for price trends is DECC's 'Quarterly Energy Prices March 2009. Table 3.1.3', available at www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx*

[3] The CHP prime mover is the heart of a CHP system and is a mechanical machine which drives the electricity generator or develops mechanical power for direct use

Table 6A: A summary of the recent development of CHP[1]

	Unit	2005	2006	2007	2008	2009
Number of schemes		1,365	1,364	1,415	1,437	1,465
Net No. of schemes added during year (2)		29	-1	51	22	28
Electrical capacity (CHP_{QPC})	MWe	5,533	5,432	5,438	5,494	5,569
Net capacity added during year		137	-101	6	56	74
Capacity added in percentage terms	Per cent	2.5	-1.8	0.1	1.0	1.4
Heat capacity	MWth	11,499	11,208	11,068	10,887	10,755
Heat to power ratio *(3)*		1.96	1.86	1.84	1.89	1.83
Fuel input *(4)*	GWh	124,611	122,354	118,643	120,369	116,708
Electricity generation (CHP_{QPO})	GWh	28,830	28,733	27,846	27,901	27,777
Heat generation (CHP_{QHO})	GWh	56,445	53,411	51,314	52,778	50,721
Overall efficiency *(5)*	Per cent	68.4	67.1	66.7	67.0	67.3
Load factor *(4)*	Per cent	59.5	60.4	58.5	58.0	56.9

(1) All data in this table for 2005 to 2009 have been revised since last year's Digest.
(2) Net number of schemes added = New schemes – Decommissioned existing schemes
(3) Heat to power ratios are calculated from the qualifying heat output (QHO) and the qualifying power output (QPO).
(4) The load factor reported in this table is based on the qualifying power generation and capacity and does not correspond exactly to the number of hours run by the prime movers in a year
(5) These are calculated using gross calorific values; overall net efficiencies are some 6 percentage points higher.

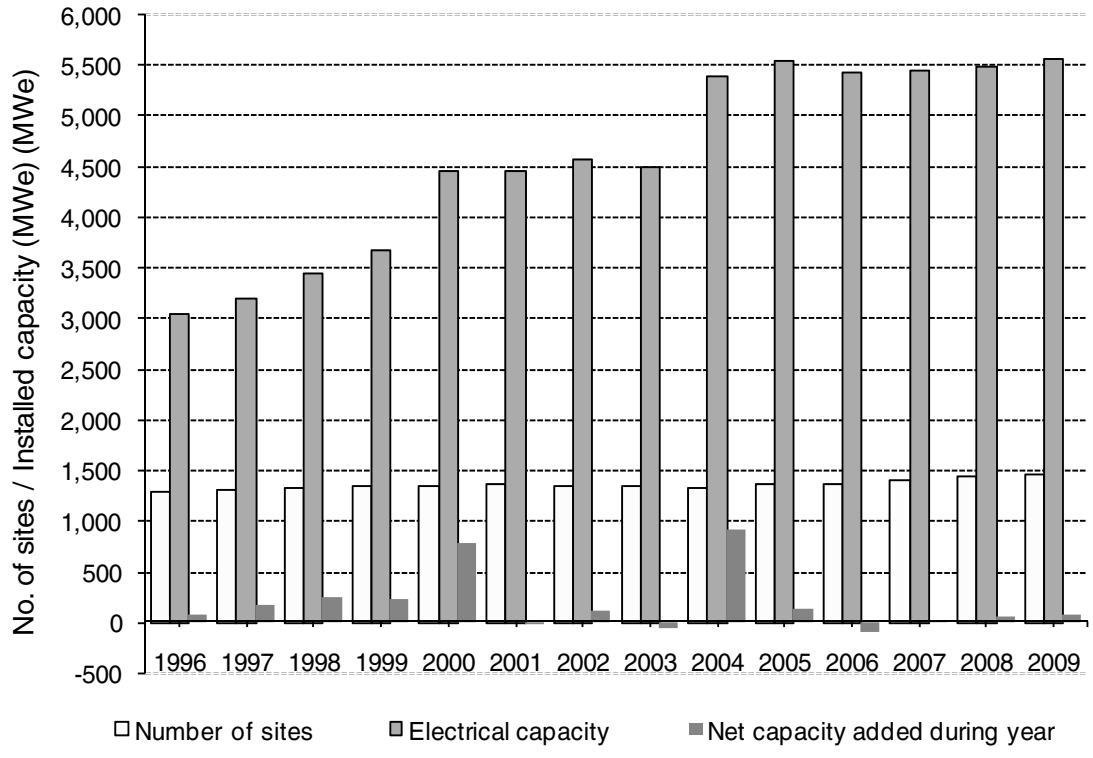
Changes in CHP capacity

6.12 Chart 6.1 shows the change in installed CHP capacity over the last thirteen years. Installed capacity at the end of 2009 stood at 5,569 MWe. There was a net increase of 28 schemes between 2008 and 2009 and a net increase of 74 MWe in installed capacity.

Installed capacity and output in 2009

6.13 During 2009 57 new CHP schemes came into operation. 29 CHP schemes that were operating in 2008 subsequently closed and did not operate in 2009. This resulted in a net increase of 28 schemes between 2008 and 2009.

Chart 6.1: Installed CHP capacity by year



6.14 In the current market conditions, a number of operators have chosen to mothball their CHP schemes rather than continue to operate. As these schemes are still able to operate they have been included in the capacity figures. At the end of 2009, there were 100 mothballed schemes with a Good Quality capacity of 91 MWe.

6.15 Table 6A gives a summary of the overall CHP market. The electricity generated by CHP schemes in 2009 was 27,777 GWh. This represents a little over 7 per cent of the total electricity generated in the UK. Across the commercial and industrial sectors (including the fuel industries other than electricity generation) electrical output from CHP accounted for around 15 per cent of electricity consumption. CHP schemes in total supplied 50,721 GWh of heat in 2009.

6.16 In terms of electrical capacity by size of scheme, schemes larger than 10 MWe represent over 83 per cent of the total electrical capacity of CHP schemes as shown in Table 6B. However, in terms of number of schemes, the largest share (81 per cent) is in schemes less than 1 MWe. Schemes of 1 MWe or larger, make up approximately 19 per cent of the total number of schemes. Table 6.5 provides data on electrical capacity for each type of CHP installation and the map on page 164 shows how these schemes are located around the country.

Table 6B: CHP schemes by capacity size ranges in 2009

Electrical capacity size range	Number of schemes	Share of total (per cent)	Total electricity capacity (MWe)	Share of total (per cent)
Less than 100 kWe	454	31.0	28	0.5
100 kWe - 999 kWe	738	50.4	190	3.4
1 MWe - 9.9 MWe	201	13.7	693	12.4
Greater than 10 MWe	72	4.9	4,657	83.6
Total	**1,465**	**100.0**	**5,569**	**100.0**

6.17 Seventy seven per cent of electrical capacity is now gas turbine based[4], with about 85 per cent of this (66 per cent in total) in combined cycle mode. After combined cycle, reciprocating engines represent the second largest technology in terms of installed electrical capacity, closely followed by open cycle gas turbines, both with very similar individual shares of total installed capacity. Table 6.7 provides data on heat capacity for each type of CHP installation. Over the years there has been a clear downward trend in the capacity of back pressure and pass-out condensing steam turbines.

Fuel used by types of CHP installation

6.18 Table 6.2 shows the fuel used to generate electricity and heat in CHP schemes, (see paragraphs 6.35 to 6.37, below for an explanation of the convention for dividing fuel between electricity and heat production). Table 6.3 gives the overall fuel used by types of CHP installation (which are explained in paragraph 6.34). Total fuel use is summarised in Chart 6.2. In 2009, 71 per cent of the total fuel use was natural gas, which is approximately the same proportion as was used in 2008. CHP schemes accounted for 8 per cent of UK gas demand in 2009 (see Table 4.3). Over the last few years the refineries sector has seen a decrease in the use of heavy fuel oil and an increase in the use of refinery gas and natural gas. This may be a reflection of the rise in the market value of heavy fuel oil over this same time period. A refinery selling rather than burning the heavy fuel oil it produces, and substituting this with lower value refinery gas and natural gas, the latter having increased in value less than fuel oil, would likely increase its revenue.

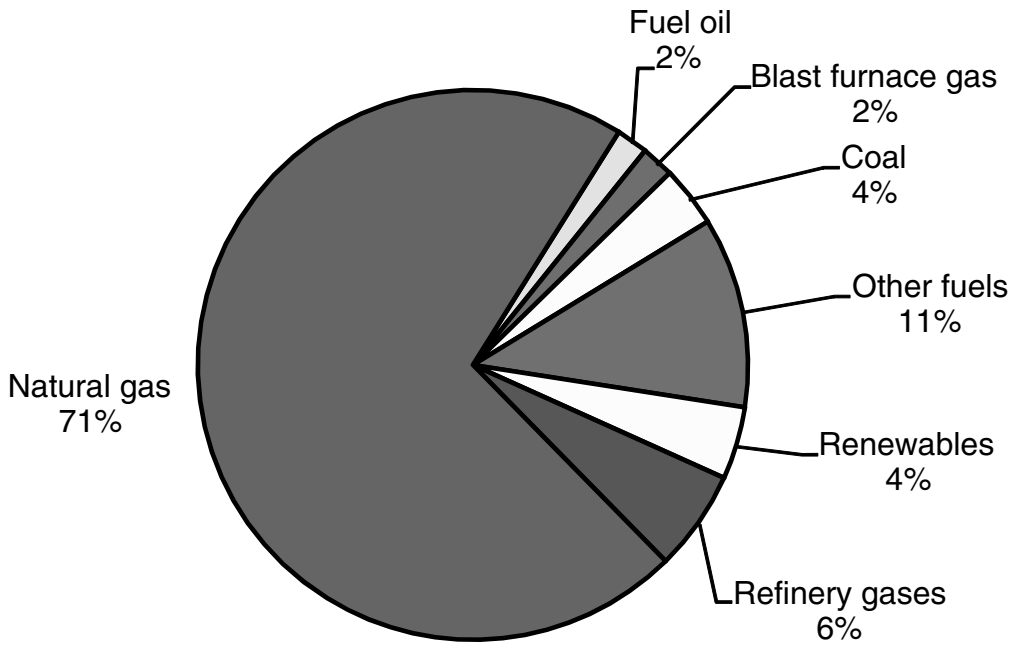
6.19 In 2009, there was a 5 per cent increase in the use of renewable fuels compared to 2008 (see Table 6.2). This increase was mainly due to increases in biomass and sewage gas, which saw an increase of 7 per cent and 20 per cent respectively. Renewable fuels surpassed the use of coal in CHP in 2008.

6.20 Non-conventional fuels (liquids, solids or gases which are by-products or waste products from industrial processes, or are renewable fuels) account for 23 per cent of all fuel used in CHP in 2009. Some of these are fuels that are not commonly used by the mainstream electricity generating industry, and some would otherwise be flared or disposed of by some means. These fuels, with the exception

[4] See table 6.5 Gas turbine and Combined cycle.

of some waste gases, will generally be utilised in steam turbines being fed by boilers. In almost all cases, the technical nature of the combustion process, and the lower fuel quality (lower calorific value of the fuel, high moisture content of the fuel, the need to maintain certain combustion conditions to ensure complete disposal etc.) will generally result in a lower efficiency. However, given that the use of such fuels avoids the use of fossil fuels, and since they need to be disposed of in some way, the use of these fuels in CHP provides environmental benefits.

Chart 6.2: Types of fuel used by CHP schemes in 2009



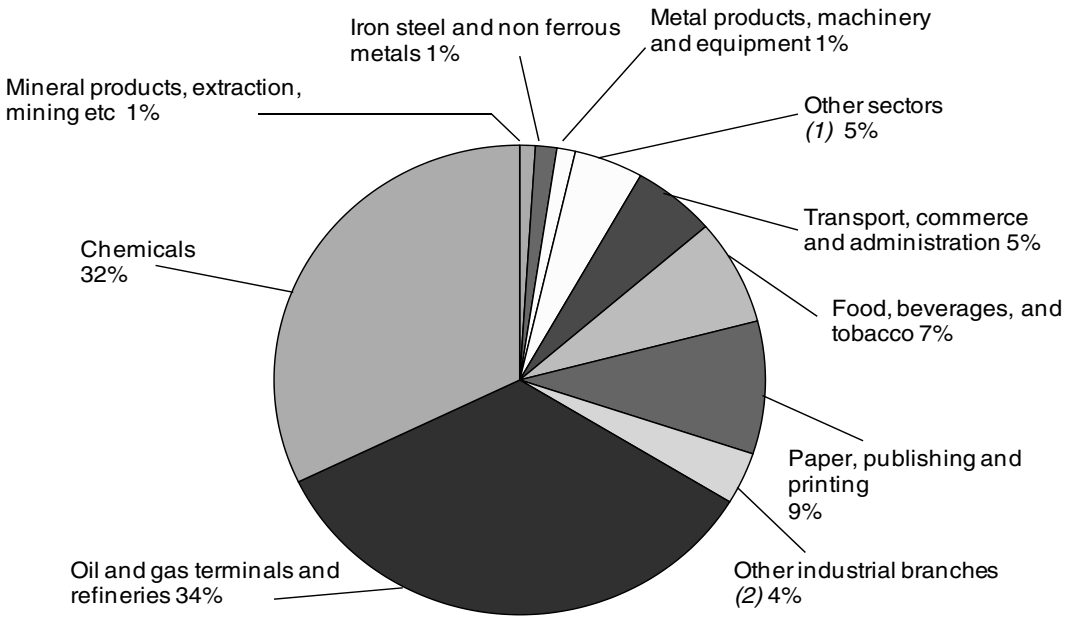
CHP capacity, output and fuel use by sector

6.21 In this chapter of the Digest CHP is allocated to the sector using the heat, or, where the heat is sent to users in more than one sector, to the sector taking the majority of the heat. This method of assigning a CHP scheme to a sector was rigorously applied for the first time in DUKES 2008 and resulted in the movement of CHP schemes between sectors. One consequence of this was the removal of all schemes once allocated to the "electricity supply" sector and their distribution to other sectors. Full details of this reassignment are provided in paragraph 6.33 and Table 6J of DUKES 2008.

6.22 Table 6.8 gives data on all operational schemes by economic sector. A definition of the sectors used in this table can be found in Chapter 1, paragraph 1.58 and Table 1F:

- 343 schemes (90 per cent of electrical capacity) are in the industrial sector and 1,122, schemes (10 per cent of capacity) are in the agricultural, commercial, public administration, residential and transport sectors.
- Three industrial sectors account for about 75 per cent of the CHP electrical capacity – oil refineries (34 per cent), chemicals (32 per cent), and paper and publishing and printing (9 per cent). Capacity by sector is shown in Chart 6.3. In 2008 the chemicals sector had the largest share of CHP electrical capacity.

Chart 6.3: CHP electrical capacity by sector in 2009



(1) Other sectors include agriculture, community heating, leisure, landfill and incineration.
(2) Other industry includes textiles, clothing and footwear, and sewage treatment.

6.23 Table 6C gives a summary of the 1,001 schemes installed in the commercial sector, public sector and residential buildings. These schemes form a major part of the "Transport, commerce and administration" and "Other" sectors in Tables 6.8 and 6.9. The vast majority of these schemes are based on spark ignition reciprocating engines fuelled with natural gas, though the larger schemes use compression ignition reciprocating engines or gas turbines. The largest proportion of the capacity is in

Table 6C: Number and capacity of CHP schemes installed in buildings by sector in 2009

	Number of schemes	Electrical capacity (MWe)	Heat capacity (MWth)
Leisure	395	50.7	52.8
Hotels	244	34.8	40.9
Health	180	121.1	164.6
Residential Group Heating	39	27.8	59.8
Universities	42	50.4	83.8
Offices	20	16.7	12.0
Education	18	10.2	17.7
Government Estate	16	15.8	18.4
Retail	44	10.2	3.4
Other *(1)*	3	10.5	18.7
Total	**1,001**	**348.3**	**472.1**

(1) All schemes under Other are at airports

the health sector, mainly hospitals. Leisure and hotels account for nearly two-thirds of the total number of schemes but only about 25 per cent of the electrical capacity. Table 6.9 gives details of the quantities of fuels used in each sector.

CHP performance by main prime mover

6.24 Table 6D gives a summary of the performance of schemes in 2009 by main prime mover type. Combined cycle gas turbines have the highest average operating hours at 5,348 hours per annum. The average for all schemes of 4,988 hours is nearly 2 per cent lower than in 2008 (5,078 hours - revised).

6.25 The average electrical efficiency is 24 per cent and heat efficiency 43 per cent, giving an overall average of 67 per cent, which is the same as in 2008 - revised (all measured on a gross calorific value (GCV) basis).

Table 6D: A summary of scheme performance in 2009

	Average operating hours per annum (Full load equivalent)	Average electrical efficiency (% GCV)	Average heat efficiency (% GCV)	Average overall efficiency (% GCV)	Average heat to power ratio
Main prime mover in CHP plant					
Back pressure steam turbine	4,763	11	62	73	5.4
Pass out condensing steam turbine	4,261	17	46	63	2.7
Gas turbine	4,920	21	50	71	2.5
Combined cycle	5,348	26	40	66	1.5
Reciprocating engine	3,591	27	42	69	1.5
All schemes	**4,988**	**24**	**43**	**67**	**1.8**

CHP schemes which export and schemes with mechanical power output

6.26 Table 6E shows the electrical exports from CHP schemes between 2007 and 2009. Where a scheme that exports is Good Quality for only a portion of its capacity and output, the exports have been scaled back in the same way as power output has been scaled back (see paragraph 6.11, above). Exports accounted for about 25 per cent of power generation from CHP in 2009, but this may be an underestimate as reporting of exports remains voluntary under CHPQA.

Table 6E: Electrical exports from CHP

GWh

	2007	2008	2009
To part of same qualifying group *(1)*	931r	942r	564
To a firm NOT part of same qualifying group	3,522r	2,609r	1,471
To an electricity supplier	6,118r	5,668r	4,822
Total	**10,571r**	**9,218r**	**6,857**

(1) A qualifying group is a group of two or more corporate consumers that are connected or related to each other, for example, as a subsidiary, or via a parent or holding company, or in terms of share capital.

6.27 In 2009 21 large schemes also exported heat, some larger schemes to more than one customer. As Table 6F shows, together they supplied 8,127 GWh of heat in 2009.

Table 6F: Heat exports from CHP

GWh

	2007	2008	2009
To part of same qualifying group *(1)*	2,551r	3,672r	3,574
To a firm NOT part of same qualifying group	6,947r	8,388r	4,552
Total	**9,498r**	**12,059r**	**8,127**

(1) A qualifying group is a group of two or more corporate consumers that are connected or related to each other, for example, as a subsidiary, or via a parent or holding company, or in terms of share capital.

6.28 There are an estimated 12 schemes with mechanical power output. For those schemes, mechanical power accounts for around 5 per cent of their total power capacity (Table 6G). These schemes are predominantly on petro-chemicals or steel sites, using by-product fuels in boilers to drive steam turbines. The steam turbine is used to provide mechanical rather than electrical power, driving compressors, blowers or fans, rather than an alternator.

Table 6G: CHP schemes with mechanical power output in 2009

	Unit	
Number of schemes		12
Total Power Capacity of these schemes (CHP_{TPC})	MWe	4,221
Mechanical power capacity of these schemes	MWe	231

Emissions savings

6.29 The calculation of carbon emissions savings from CHP is important, given the substantial contribution that CHP can make to the Climate Change Programme. However the derivation of the savings is complex because CHP displaces a variety of fuels, technologies and sizes of plant. The methodology and assumptions used for calculating carbon emission savings are outlined in Energy Trends June 2003 (www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx) and the figures compare CHP with the UK fossil fuel basket carbon intensity and the UK total basket carbon intensity which includes nuclear and renewable generation. The carbon emission savings from CHP in 2009 as compared to the fossil fuel basket were 13.89 $MtCO_2$, which equates to 2.49 Mt CO_2 per 1,000 MWe installed capacity. Against the total basket, in 2009 CHP saved 9.47 Mt CO_2, or 1.70 Mt CO_2 per 1,000 MWe installed capacity. Corresponding figures for 2007 and 2008 are shown in Table 6H. It is worthy of note that from 2007 to 2009 the trend in carbon intensity of conventionally generated electricity for both the full mix and for fossil fuel only has been down, and this was particularly marked in the case of the full mix between 2008 and 2009.

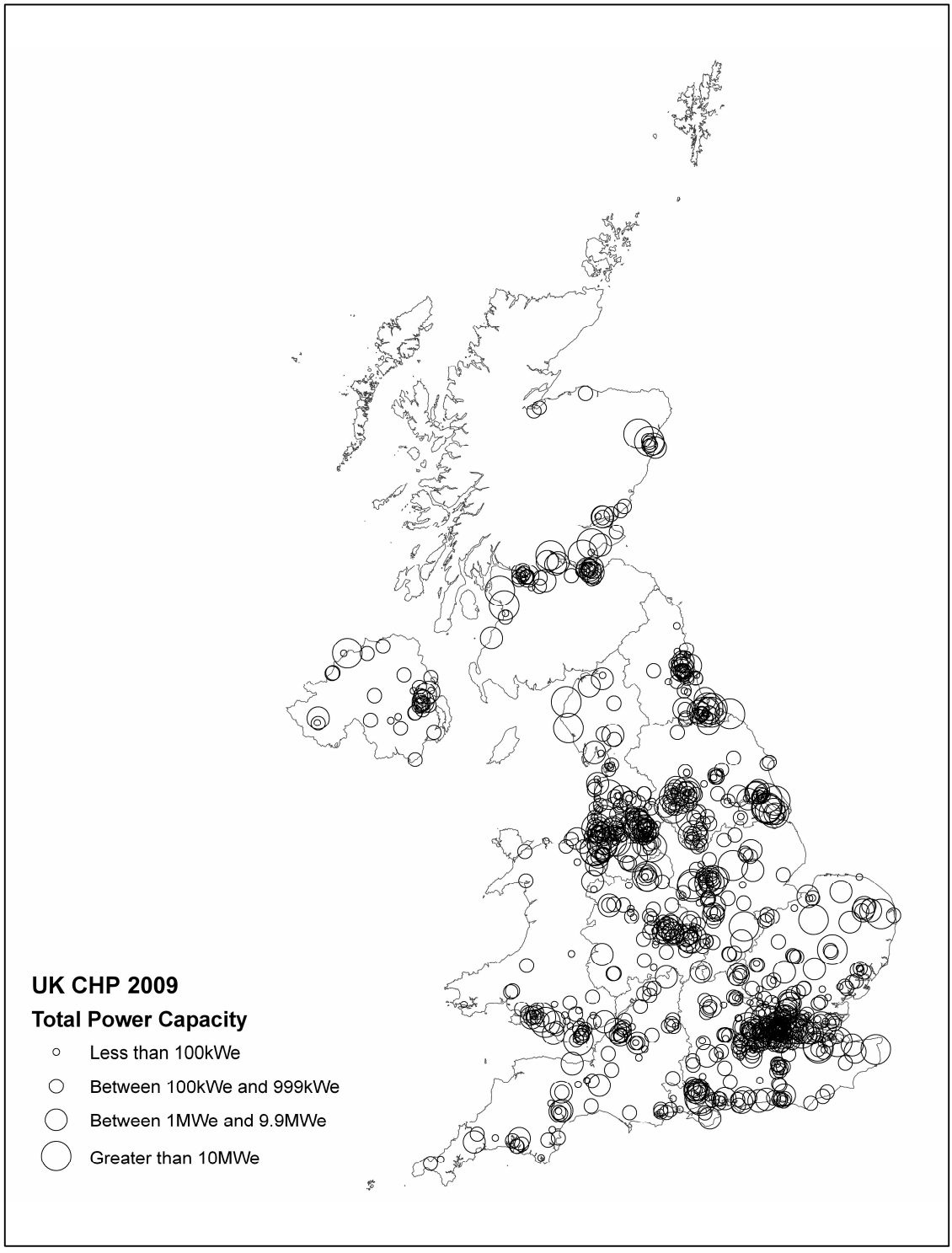
Table 6H: Carbon dioxide savings due to CHP, absolute and per 1,000 MWe of installed good quality CHP capacity

	2007		2008		2009	
	$MtCO_2$	$MtCO_2$/1000 MWe	$MtCO_2$	$MtCO_2$/1000 MWe	$MtCO_2$	$MtCO_2$/1000 MWe
Carbon savings against all fossil fuels	14.63	2.69	14.42	2.62	13.89	2.49
Carbon savings against all fuels (including nuclear and renewables)	10.83	1.99	11.03	2.01	9.47	1.70

Note: (1) The CO_2 savings in Table 6H assume that CHP generated electricity avoids the transmission and distribution losses associated with its conventionally generated equivalent. These losses are assumed to be 1.5% in the case of transmission losses and 6.0% in the case of distribution losses.

(2) The CO_2 savings quoted above for 2009 are based on preliminary CO_2 intensities, for that year, for the fossil fuel basket and the total fuel basket of conventional electricity generation. As such, they are subject to revision at a later date.

CHP schemes in the United Kingdom by power capacity, 2009



Technical notes and definitions

6.30 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy as a whole in Chapter 1, paragraphs 1.26 to 1.61

Data for 2009

6.31 The data are summarised from the results of a long-term project undertaken by AEA on behalf of the Department of Energy & Climate Change (DECC). Data are included for CHP schemes installed in all sectors of the UK economy.

6.32 The project continues to be overseen by a Steering Group that comprises officials from DECC, the Office of Gas and Electricity Markets (Ofgem), the Combined Heat and Power Association (CHPA) and the Office for National Statistics (ONS) all of whom have an interest in either the collection of information on CHP schemes or the promotion of the wider use of CHP in the UK.

6.33 Data for 2009 were based largely on data supplied to the CHPQA programme, by information from the Iron and Steel Statistics Bureau (ISSB) and from Ofgem "Renewables Obligation Certificates" (ROCs) information. Approximately 96 per cent of the total capacity is from schemes certified under the CHPQA programme, while about 1.2 per cent is from schemes covered by ISSB sources. Data for schemes not applying for CHPQA and not available from other sources were interpolated from historical data. These schemes account for about 0.9 per cent of total capacity. Since 2005, Sewage Treatment Works that do not provide returns to CHPQA in a format that can be used within these statistics, have been included based on ROCs information from Ofgem returns. The sewage treatment works data from this source accounts for approximately 2.2 per cent of total electrical capacity.

Definitions of schemes

6.34 There are four principal types of CHP system:

- **Steam turbine,** where steam at high pressure is generated in a boiler. In **back pressure steam turbine systems**, the steam is wholly or partly used in a turbine before being exhausted from the turbine at the required pressure for the site. In **pass-out condensing steam turbine systems**, a proportion of the steam used by the turbine is extracted at an intermediate pressure from the turbine with the remainder being fully condensed before it is exhausted at the exit. (Condensing steam turbines without passout and which do not utilise steam are not included in these statistics as they are not CHP). The boilers used in such schemes can burn a wide variety of fuels including coal, gas, oil, and waste-derived fuels. With the exception of waste-fired schemes, a steam turbine plant has often been in service for several decades. Steam turbine schemes capable of supplying useful steam have electrical efficiencies of between 10 and 20 per cent, depending on size, and thus between 70 per cent and 30 per cent of the fuel input is available as useful heat. Steam turbines used in CHP applications typically range in size from a few MWe to over 100 MWe.

- **Gas turbine systems**, often aero-engine derivatives, where fuel (gas, or gas-oil) is combusted in the gas turbine and the exhaust gases are normally used in a waste heat boiler to produce usable steam, though the exhaust gases may be used directly in some process applications. Gas turbines range from 30 kWe upwards, achieving electrical efficiency of 23 to 30 per cent (depending on size) and with the potential to recover up to 50 per cent of the fuel input as useful heat. They have been common in CHP since the mid 1980s. The waste heat boiler can include supplementary or auxiliary firing using a wide range of fuels, and thus the heat to power ratio of the scheme can vary.

- **Combined cycle systems**, where the plant comprises more than one prime mover. These are usually gas turbines where the exhaust gases are utilised in a steam generator, the steam from which is passed wholly or in part into one or more steam turbines. In rare cases reciprocating engines may be linked with steam turbines. Combined cycle is suited to larger installations of 7 MWe and over. They achieve higher electrical efficiency and a lower heat to power ratio than steam turbines or gas turbines. Recently installed combined cycle gas turbine (CCGT) schemes

have achieved an electrical efficiency approaching 50 per cent, with 20 per cent heat recovery, and a heat to power ratio of less than 1:1.

- **Reciprocating engine systems** range from less than 100 kWe up to around 5 MWe, and are found in applications where production of hot water (rather than steam) is the main requirement, for example, on smaller industrial sites as well as in buildings. They are based on auto engine or marine engine derivatives converted to run on gas. Both compression ignition and spark ignition firing is used. Reciprocating engines operate at around 28 to 33 per cent electrical efficiency with around 50 per cent to 33 per cent of the fuel input available as useful heat. Reciprocating engines produce two grades of waste heat: high grade heat from the engine exhaust and low grade heat from the engine cooling circuits.

Determining fuel consumption for heat and electricity

6.35 In order to provide a comprehensive picture of electricity generation in the United Kingdom and the fuels used to generate that electricity, the energy input to CHP schemes has to be allocated between heat and electricity production. This allocation is notional and is not determinate.

6.36 The convention used to allocate the fuels to heat and electricity relates the split of fuels to the relative efficiency of heat and electricity supply. The efficiency of utility plant varies widely: electricity generation from as little as 25 per cent to more than 50 per cent and boilers from 50 per cent to more than 90 per cent. Thus it is around twice as hard to generate a unit of electricity as it is to generate a unit of heat. Accordingly a simple convention can be implemented whereby twice as many units of fuel are allocated to each unit of electricity generated, as to each unit of heat supplied. This approach is consistent with the Defra Guidelines for Company Reporting on greenhouse gas emissions and for Negotiated Agreements on energy efficiency agreed between Government and industry as part of the Climate Change Levy (CCL) package. It recognises that, in developing a CHP scheme, both the heat customer(s) and the electricity generator share in the savings, reflecting the fact that more than three-quarters of CHP build in the last few years has been supplied under an energy services arrangement.

6.37 The assumption in this convention that it is twice as hard to generate a unit of electricity as heat, is appropriate for the majority of CHP schemes. However, for some types of scheme (for example in the iron and steel sector) this allocation is less appropriate and can result in very high apparent heat efficiencies. These, however, are only notional efficiencies.

The effects on the statistics of using CHPQA

6.38 Paragraph 6.11 described how schemes were scaled back so that only CHP_{QPC} and CHP_{QPO} are included in the CHP statistics presented in this Chapter. This is illustrated in Table 6K. In 2008, 173 schemes have been scaled back. In 2007, 185 (revised) schemes were also scaled back.

6.39 In 2008, the power output from these schemes was scaled back from a total of 32,343 GWh to 8,612 GWh. The total fuel input to these schemes was 93,594 GWh of which 56,035 GWh was regarded as being for power only.

Table 6K: CHP capacity, output and fuel use which has been scaled back in 2009

	Units	
Number of schemes requiring scaling back		180
Total Power Capacity of these schemes (CHP_{TPC})	MWe	6,622
Qualifying Power Capacity of these schemes (CHP_{QPC})	MWe	2,588
Total power output of these schemes (CHP_{TPO})	GWh	38,134
Qualifying Power Output of these schemes (CHP_{QPO})	GWh	13,298
Electricity regarded as "Power only" not from CHP (CHP_{TPO} - CHP_{QPO})	GWh	24,837
Total Fuel Input of these schemes (CHP_{TFI})	GWh	109,987
Fuel input regarded as being for "Power only" use i.e. not for CHP	GWh	58,657

**This figure includes generation from major power producers*

Exports of electricity and heat

6.40 The figures quoted in Tables 6E and 6F for exports of electricity and heat are based mainly on voluntary returns from schemes. As such, there is the potential for these figures to underestimate the

true situation. However, and in respect of exports of electricity, all schemes participating in CHPQA, exporting to the grid and participating in the Levy Exemption Certificate (LEC) scheme are required to identify a meter recording this exported electricity. Where a site meeting these criteria has not volunteered electricity export data this meter reading is used when compiling the data presented in Table 6E. In such cases all electricity read by this meter is assumed to be exported to an electricity supplier, via the grid. If this value exceeds the QPO for the scheme, then the quantity of exported electricity is amended to QPO. For all schemes, where a value of exported electricity is volunteered this figure is used when compiling the data presented in Table 6E.

This is the first time this approach has been adopted and is intended to improve the representative nature of the export data presented in Table 6E. The data presented for 2007 and 2008 in this edition of DUKES have been compiled on the same basis as for 2009.

Exports of heat, quoted in Table 6F, continue to be compiled on the basis of volunteered data only.

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6.1 CHP installations by capacity and size range

	2005	2006	2007	2008	2009
Number of schemes *(1)*	**1,365r**	**1,364r**	**1,415r**	**1,437r**	**1,465**
Less than 100 kWe	463r	462r	456r	457r	454
100 kWe to 999 kWe	639r	644r	687r	706r	738
1 MWe to 9.9 MWe	188	187	202r	202r	201
10.0 MWe and above	75	71	70	72r	72
					MWe
Total capacity	**5,533r**	**5,432r**	**5,438r**	**5,494r**	**5,569**
Less than 100 kWe	29	29	29	28r	28
100 kWe to 999 kWe	165r	166r	179r	182	190
1 MWe to 9.9 MWe	731	705	733r	711r	693
10.0 MWe and above	4,607	4,532	4,497	4,573r	4,657

(1) A site may contain more than one CHP scheme.

6.2 Fuel used to generate electricity and heat in CHP installations

GWh

	2005	2006	2007	2008	2009
Fuel used to generate electricity *(1)*					
Coal *(2)*	1,559	1,797	1,750	1,856r	1,840
Fuel oil	1,617	1,552	892	887r	901
Natural gas	47,506r	46,864r	46,507r	46,130r	45,618
Renewable fuels *(3)*	1,414	1,783	1,742	2,373r	2,525
Other fuels *(4)*	10,411	10,801	10,300	10,100r	9,472
Total all fuels	**62,507r**	**62,796r**	**61,192r**	**61,346r**	**60,356**
Fuel used to generate heat					
Coal *(2)*	2,591	2,559	2,369	2,418r	2,357
Fuel oil	2,150	2,006	1,248	1,178r	1,284
Natural gas	41,145r	39,269r	38,515r	39,509r	37,526
Renewable fuels *(3)*	1,434	1,400	1,477	2,344r	2,456
Other fuels *(4)*	14,784	14,323	13,842	13,574r	12,729
Total all fuels	**62,104r**	**59,558r**	**57,452r**	**59,023r**	**56,352**
Overall fuel use					
Coal *(2)*	4,150	4,356	4,120	4,274r	4,197
Fuel oil	3,767	3,558	2,140	2,065r	2,185
Natural gas	88,651r	86,133r	85,022r	85,639r	83,144
Renewable fuels *(3)*	2,848	3,183	3,219	4,717r	4,982
Other fuels *(4)*	25,196	25,124	24,142	23,675r	22,200
Total all fuels	**124,611r**	**122,354r**	**118,643r**	**120,369r**	**116,708**

(1) See paragraphs 6.35 to 6.37 for an explanation of the method used to allocate fuel use between heat generation and electricity generation.
(2) Includes coke and semi-coke.
(3) Renewable fuels include: Biomass; sewage gas; other biogases; municipal waste and refuse derived fuels.
(4) Other fuels include: process by-products, coke oven gas, blast furnace gas, gas oil and refinery gas.

6.3 Fuel used by types of CHP installation

GWh

	2005	2006	2007	2008	2009
Coal					
Back pressure steam turbine	903	693	592	521	513
Gas turbine	44	-	43	29	-
Combined cycle	41	589	568	834r	832
Reciprocating engine	-	-	-	8	1
Pass out condensing steam turbine	3,162	3,074	2,916	2,881r	2,851
Total coal	**4,150**	**4,356**	**4,120**	**4,274r**	**4,197**
Fuel oil					
Back pressure steam turbine	463	207	138	140	185
Gas turbine	8	12	3	1r	2
Combined cycle	2,953	2,994	1,629	1,474r	1,472
Reciprocating engine	162	140	139	153	163
Pass out condensing steam turbine	182	206	232	297	362
Total fuel oil	**3,767**	**3,558**	**2,140**	**2,065r**	**2,185**
Natural gas					
Back pressure steam turbine	2,938	2,154	1,855	1,694r	1,757
Gas turbine	12,358	11,462	11,763	12,273r	11,386
Combined cycle	65,112	64,979	63,719	63,907r	61,865
Reciprocating engine	6,990r	6,409r	6,719r	6,903r	7,265
Pass out condensing steam turbine	1,254	1,128	966	863r	871
Total natural gas	**88,651r**	**86,133r**	**85,022r**	**85,639r**	**83,144**
Renewable fuels *(1)*					
Back pressure steam turbine	326	535	525	1,521	1,431
Gas turbine	30	26	10	-	-
Combined cycle	634	654	611	520r	562
Reciprocating engine	1,484	1,317	1,462	1,508r	1,820
Pass out condensing steam turbine	374	651	611	1,167r	1,168
Total renewable fuels	**2,848**	**3,183**	**3,219**	**4,717r**	**4,982**
Other fuels *(2)*					
Back pressure steam turbine	5,930	5,829	5,090	5,089	4,932
Gas turbine	4,040	4,125	4,024	3,514r	3,625
Combined cycle	11,436	10,516	10,837	11,274r	9,905
Reciprocating engine	58	57	51	36r	34
Pass out condensing steam turbine	3,731	4,597	4,141	3,761	3,705
Total other fuels	**25,196**	**25,124**	**24,142**	**23,675r**	**22,200**
Total - all fuels					
Back pressure steam turbine	10,559	9,418	8,199	8,966r	8,818
Gas turbine	16,480	15,625	15,843	15,817r	15,014
Combined cycle	80,176	79,733	77,363	78,009r	74,637
Reciprocating engine	8,695r	7,923r	8,371r	8,608r	9,283
Pass out condensing steam turbine	8,702	9,655	8,867	8,969r	8,957
Total all fuels	**124,611r**	**122,354r**	**118,643r**	**120,369r**	**116,708**

(1) Renewable fuels include: Biomass; sewage gas, other biogases, municipal solid waste and refuse derived fuel
(2) Other fuels include: process by-products, coke oven gas, blast furnace gas, gas oil and refinery gas.

6.4 CHP - electricity generated by fuel and type of installation

GWh

	2005	2006	2007	2008	2009
Coal					
Back pressure steam turbine	99	77	63	57	52
Gas turbine	7	-	7	5	-
Combined cycle	3	136	120	172r	172
Reciprocating engine	-	-	-	1	0
Pass out condensing steam turbine	541	517	514	501r	503
Total coal	**650**	**730**	**704**	**736r**	**728**
Fuel oil					
Back pressure steam turbine	53	25	16	16	20
Gas turbine	2	3	1	0r	0
Combined cycle	636	618	316	303r	286
Reciprocating engine	50	47	47	51	53
Pass out condensing steam turbine	29	34	36	44	58
Total fuel oil	**769**	**727**	**417**	**413r**	**418**
Natural gas					
Back pressure steam turbine	235	172	142	122r	125
Gas turbine	2,697	2,464	2,701	2,704r	2,524
Combined cycle	17,381	17,600	16,952	16,715r	16,625
Reciprocating engine	1,778r	1,617r	1,688r	1,724r	1,907
Pass out condensing steam turbine	155	135	144	131r	273
Total natural gas	**22,246r**	**21,987r**	**21,626r**	**21,396r**	**21,455**
Renewable fuels *(1)*					
Back pressure steam turbine	36	70	71	215	196
Gas turbine	5	4	1	-	-
Combined cycle	43	60	21	10r	16
Reciprocating engine	416	387	445	460r	534
Pass out condensing steam turbine	34	109	115	212r	212
Total renewable fuels	**534**	**631**	**653**	**898r**	**959**
Other fuels *(2)*					
Back pressure steam turbine	684	641	593	628	604
Gas turbine	642	571	608	540r	555
Combined cycle	2,975	2,860	2,800	2,899r	2,567
Reciprocating engine	12	14	12	9r	8
Pass out condensing steam turbine	316	573	432	383	484
Total other fuels	**4,631**	**4,659**	**4,445**	**4,458r**	**4,218**
Total - all fuels					
Back pressure steam turbine	1,107	987	884	1,037	999
Gas turbine	3,354	3,041	3,318	3,249r	3,079
Combined cycle	21,037	21,274	20,209	20,098r	19,666
Reciprocating engine	2,256r	2,064r	2,193r	2,245r	2,503
Pass out condensing steam turbine	1,075	1,367	1,241	1,271r	1,530
Total all fuels	**28,830r**	**28,733r**	**27,846r**	**27,901r**	**27,777**

(1) Renewable fuels include: Biomass; sewage gas, other biogases, municipal solid waste and refuse derived fue
(2) Other fuels include: process by-products, coke oven gas, blast furnace gas, gas oil and refinery gas.

6.5 CHP - electrical capacity by fuel and type of installation

MWe

	2005	2006	2007	2008	2009
Coal					
Back pressure steam turbine	32	26	28	20	19
Gas turbine	1	-	1	1	-
Combined cycle	0	18	20	26r	26
Reciprocating engine	-	-	-	1	0
Pass out condensing steam turbine	159	150	145	145r	144
Total coal	**193**	**195**	**194**	**193r**	**190**
Fuel oil					
Back pressure steam turbine	14	9	7	7	7
Gas turbine	0	0	0	0	0
Combined cycle	116	131	68	60	64
Reciprocating engine	16	16	16	16	16
Pass out condensing steam turbine	8	8	10	12	12
Total fuel oil	**154**	**165**	**102**	**94r**	**99**
Natural gas					
Back pressure steam turbine	74	61	47	37	39
Gas turbine	494	479	502r	531r	508
Combined cycle	3,045	3,015	3,029	3,002r	3,092
Reciprocating engine	506r	496r	522r	542r	547
Pass out condensing steam turbine	61	43	39	39r	65
Total natural gas	**4,180**	**4,095r**	**4,140r**	**4,150r**	**4,251**
Renewable fuels *(1)*					
Back pressure steam turbine	12	16	16	37	35
Gas turbine	1	1	0	-	-
Combined cycle	6	10	8	3r	3
Reciprocating engine	100	100	116	119r	130
Pass out condensing steam turbine	10	23	23	45r	45
Total renewable fuels	**129**	**149**	**163**	**203r**	**213**
Other fuels *(2)*					
Back pressure steam turbine	137	112	109	109	109
Gas turbine	111	113	119	114	118
Combined cycle	522	494	509	535	493
Reciprocating engine	4	4	4	3r	3
Pass out condensing steam turbine	103	105	99	93	93
Total other fuels	**877**	**828**	**840**	**854r**	**816**
Total - all fuels					
Back pressure steam turbine	270	225	207	210	210
Gas turbine	607	593	623r	646r	626
Combined cycle	3,688	3,668	3,635	3,625r	3,677
Reciprocating engine	626r	616	658r	681r	697
Pass out condensing steam turbine	342	330	315	333r	359
Total all fuels	**5,533r**	**5,432r**	**5,438r**	**5,494r**	**5,569**

(1) Renewable fuels include: Biomass; sewage gas, other biogases, municipal solid waste and refuse derived fuels.
(2) Other fuels include: process by-products, coke oven gas, blast furnace gas, gas oil and refinery gas.

6.6 CHP - heat generated by fuel and type of installation

GWh

	2005	2006	2007	2008	2009
Coal					
Back pressure steam turbine	713	504	442	373	367
Gas turbine	24	-	24	19	-
Combined cycle	7	170	155	237r	236
Reciprocating engine	-	-	-	4	0
Pass out condensing steam turbine	1,526	1,503	1,380	1,396r	1,363
Total coal	**2,270**	**2,177**	**2,002**	**2,028r**	**1,966**
Fuel oil					
Back pressure steam turbine	336	181	122	117	136
Gas turbine	4	5	2	1r	1
Combined cycle	1,560	1,568	901	789r	824
Reciprocating engine	55	43	44	49r	54
Pass out condensing steam turbine	85	90	101	131	162
Total fuel oil	**2,040**	**1,886**	**1,169**	**1,086r**	**1,177**
Natural gas					
Back pressure steam turbine	2,271	1,672	1,444	1,278r	1,304
Gas turbine	6,143	5,648	5,679	6,236r	5,763
Combined cycle	26,435	25,976	25,396	25,751r	24,341
Reciprocating engine	3,083r	2,842r	2,941r	3,094r	3,150
Pass out condensing steam turbine	696	611	507	402r	641
Total natural gas	**38,627r**	**36,750r**	**35,967r**	**36,761r**	**35,200**
Renewable fuels *(1)*					
Back pressure steam turbine	144	242	176	755	744
Gas turbine	16	14	5	-	-
Combined cycle	108	107	85	82r	77
Reciprocating engine	554	444	518	493r	639
Pass out condensing steam turbine	146	143	141	256r	256
Total renewable fuels	**968**	**949**	**924**	**1,586r**	**1,716**
Other fuels *(2)*					
Back pressure steam turbine	3,558	3,314	2,911	3,079	2,879
Gas turbine	1,973	1,962	1,891	1,734r	1,801
Combined cycle	4,841	4,209	4,562	4,811r	4,311
Reciprocating engine	24	23	22	11r	13
Pass out condensing steam turbine	2,145	2,141	1,867	1,681	1,658
Total other fuels	**12,541**	**11,649**	**11,253**	**11,317r**	**10,662**
Total - all fuels					
Back pressure steam turbine	7,022	5,912	5,094	5,602r	5,430
Gas turbine	8,160	7,630	7,601	7,990r	7,565
Combined cycle	32,950	32,030	31,100	31,669r	29,789
Reciprocating engine	3,715r	3,351r	3,525r	3,652r	3,857
Pass out condensing steam turbine	4,598	4,488	3,995	3,865r	4,080
Total all fuels	**56,445r**	**53,411r**	**51,314r**	**52,778r**	**50,721**

(1) Renewable fuels include: Biomass; sewage gas, other biogases, municipal solid waste and refuse derived fuels.
(2) Other fuels include: process by-products, coke oven gas, blast furnace gas, gas oil and refinery gas.

6.7 CHP - heat capacity by fuel and type of installation

MWth

	2005	2006	2007	2008	2009
Coal					
Back pressure steam turbine	200	152	160	127	122
Gas turbine	4	-	3	4	-
Combined cycle	1	14	16	19r	19
Reciprocating engine	-	-	-	1	0
Pass out condensing steam turbine	445	453	424	444r	432
Total coal	**649**	**619**	**604**	**595r**	**574**
Fuel oil					
Back pressure steam turbine	94	51	42	39	41
Gas turbine	1	1	0	0	0
Combined cycle	247	275	119	102r	111
Reciprocating engine	17	18	18	18	18
Pass out condensing steam turbine	23	23	28	36	39
Total fuel oil	**382**	**367**	**207**	**195**	**209**
Natural gas					
Back pressure steam turbine	457	364	348	289	295
Gas turbine	1,496	1,424	1,402r	1,381r	1,260
Combined cycle	4,267	4,252	4,431	4,391r	4,435
Reciprocating engine	690r	667r	661r	647r	643
Pass out condensing steam turbine	183	176	159	130r	140
Total natural gas	**7,091r**	**6,884r**	**7,001r**	**6,838r**	**6,774**
Renewable fuels *(1)*					
Back pressure steam turbine	44	47	45	45	40
Gas turbine	2	2	2	-	-
Combined cycle	16	17	16	16	17
Reciprocating engine	114	113	111	110r	110
Pass out condensing steam turbine	43	43	43	43	43
Total renewable fuels	**220**	**222**	**218**	**215r**	**210**
Other fuels *(2)*					
Back pressure steam turbine	437	397	380	380	381
Gas turbine	1,517	1,586	1,572	1,536r	1,577
Combined cycle	813	746	740	795	698
Reciprocating engine	5	4	4	4	4
Pass out condensing steam turbine	385	383	342	329	328
Total other fuels	**3,157r**	**3,116**	**3,039**	**3,044**	**2,988**
Total - all fuels					
Back pressure steam turbine	1,231	1,011	975	879	879
Gas turbine	3,020	3,013	2,980r	2,921r	2,837
Combined cycle	5,343	5,304	5,323	5,323	5,280
Reciprocating engine	826r	801r	794r	781r	775
Pass out condensing steam turbine	1,079	1,079	996	983	983
Total all fuels	**11,499r**	**11,208r**	**11,068r**	**10,887r**	**10,755**

(1) Renewable fuels include: Biomass; sewage gas, other biogases, municipal solid waste and refuse derived fuels.
(2) Other fuels include: process by-products, coke oven gas, blast furnace gas, gas oil and refinery gas.

6.8 CHP capacity, output and total fuel use[1] by sector

	2005	2006	2007	2008	2009
Iron and steel and non ferrous metals					
Number of sites	7	7	8	8	8
Electrical capacity	67	81	80	78	78
Heat capacity	285	285	285	285	285
Electrical output	238	520	367	349r	467
Heat output	1,765	1,812	1,718	1,592r	1,589
Fuel use	3,045	3,984	3,812	3,593r	3,569
of which : for electricity	609	1,426	1,096	1,024r	1,232
for heat	2,436	2,558	2,716	2,569r	2,337
Chemicals					
Number of sites	52	50	49r	47r	46
Electrical capacity	1,862	1,819	1,789r	1,814r	1,790
Heat capacity	3,994	3,920	3,818r	3,779r	3,756
Electrical output	9,832	10,082	9,398	9,619r	8,710
Heat output	18,282	18,311	17,111	17,926r	16,679
Fuel use	42,650	43,041	40,522	42,465r	39,716
of which : for electricity	22,193	22,548	21,343	22,128r	20,546
for heat	20,457	20,492	19,178	20,338r	19,170
Oil and gas terminals and oil refineries					
Number of sites	9	9	9	9	9
Electrical capacity	1,735	1,731	1,765	1,763	1,902
Heat capacity	3,677	3,677	3,677	3,677	3,677
Electrical output	9,957	10,040	9,940	9,823	10,649
Heat output	17,803	16,779	16,894	17,244	16,687
Fuel use	40,713	40,426	40,068	39,543r	39,700
of which : for electricity	21,306	21,679	21,429	20,884r	21,868
for heat	19,407	18,747	18,639	18,659r	17,832
Paper, publishing and printing					
Number of sites	30	26	26	26	24
Electrical capacity	655	619	535	556r	509
Heat capacity	1,350	1,217	1,182	1,169	1,106
Electrical output	3,840	3,394	3,062	3,074r	2,718
Heat output	7,977	6,770	6,137	6,386r	6,061
Fuel use	16,116	14,028	12,865	13,126r	11,694
of which : for electricity	7,795	6,927	6,388	6,374r	5,438
for heat	8,321	7,100	6,477	6,752r	6,256
Food, beverages and tobacco					
Number of sites	42	40	40	38r	41
Electrical capacity	408	408	424	404	406
Heat capacity	968	923	911	814	814
Electrical output	2,091	1,952	2,102	1,964r	1,968
Heat output	5,148	4,576	4,216	4,354r	4,356
Fuel use	9,381	8,604	8,542	8,368r	8,436
of which : for electricity	4,223	3,945	4,254	3,980r	3,979
for heat	5,158	4,659	4,288	4,388r	4,458

For footnotes see page 176

6.8 CHP capacity, output and total fuel use[1] by sector (continued)

	2005	2006	2007	2008	2009
Metal products, machinery and equipment					
Number of sites	18	17	18	17	17
Electrical capacity	75	37	69	68	68
Heat capacity	57	38	57	56	56
Electrical output	175	146	174	206	182
Heat output	221	214	211	221	200
Fuel use	686	633	609	619	546
of which : for electricity	407	346	370	389	339
for heat	279	286	239	229	207
Mineral products, extraction, mining and agglomeration of solid fuels					
Number of sites	10	9	9	9	8
Electrical capacity	72	53	54	65	57
Heat capacity	216	215	215	205	178
Electrical output	223	175	182	156	139
Heat output	902	746	714	602	529
Fuel use	1,500	1,235	1,188	1,059	935
of which : for electricity	498	382	403	369	326
for heat	1,001	854	785	690	609
Sewage treatment					
Number of sites	124	124	160	161	182
Electrical capacity	125	129	146	147	159
Heat capacity	138	138	138	137	137
Electrical output	466	447	502	547	638
Heat output	615	519	589	610	790
Fuel use	1,662	1,548	1,676	1,915	2,258
of which : for electricity	999	983	1,056	1,227	1,399
for heat	663	565	620	688	859
Other industrial branches *(2)*					
Number of sites	7	7	7	8	8
Electrical capacity	44	44	41	41	41
Heat capacity	74	74	74	74	74
Electrical output	196	236	259	247	248
Heat output	330	392	387	348	342
Fuel use	712	866	936	884	865
of which : for electricity	390	481	545	527	519
for heat	322	385	390	357	346
Total industry					
Number of sites	299	289	326	323	343
Electrical capacity	5,041	4,921	4,902	4,937	5,011
Heat capacity	10,759	10,487	10,357	10,197	10,083
Electrical output	27,019	26,994	25,986	25,985	25,718
Heat output	53,044	50,118	47,977	49,284	47,233
Fuel use	116,465	114,365	110,217	111,572	107,721
of which : for electricity	58,419	58,718	56,884	56,903	55,647
for heat	58,047	55,647	53,333	54,669	52,074

For footnotes see page 176

6.8 CHP capacity, output and total fuel use[1] by sector (continued)

	2005	2006	2007	2008	2009
Transport, commerce and administration					
Number of sites	593r	589r	597r	622r	633
Electrical capacity	260r	262r	281r	305r	305
Heat capacity	417r	409r	403r	384r	367
Electrical output	1,050r	972r	1,099r	1,192r	1,246
Heat output	2,022r	2,077r	2,121r	2,253r	2,190
Fuel use	4,455r	4,373r	4,702r	5,183r	5,181
of which : for electricity	2,261r	2,082r	2,376r	2,669r	2,743
for heat	2,194r	2,291r	2,326r	2,513r	2,438
Other *(3)*					
Number of sites	473r	486r	492r	492r	489
Electrical capacity	232	249	255r	252r	253
Heat capacity	323	311r	308r	305r	305
Electrical output	761	768	761r	724r	813
Heat output	1,380r	1,216	1,216r	1,242r	1,297
Fuel use	3,691r	3,617r	3,725r	3,614r	3,807
of which : for electricity	1,827	1,997	1,932r	1,774r	1,966
for heat	1,864	1,620	1,793r	1,840r	1,840
Total CHP usage by all sectors					
Number of sites	1,365r	1,364r	1,415r	1,437r	1,465
Electrical capacity	5,533r	5,432r	5,438r	5,494r	5,569
Heat capacity	11,499r	11,208r	11,068r	10,887r	10,755
Electrical output	28,830r	28,733r	27,846r	27,901r	27,777
Heat output	56,445r	53,411r	51,314r	52,778r	50,721
Fuel use	124,611r	122,354r	118,643r	120,369r	116,708
of which : for electricity	62,507r	62,796r	61,192r	61,346r	60,356
for heat	62,104r	59,558r	57,452r	59,023r	56,352

(1) The allocation of fuel use between electricity and heat is largely notional and the methodology is outlined in paragraphs 6.35 to 6.37.

(2) Other industry includes Textiles, clothing and footwear sector.

(3) Sectors included under Other are agriculture, community heating, leisure, landfill and incineration.

6.9 CHP - use of fuels by sector

GWh

	2005	2006	2007	2008	2009
Iron and steel and non ferrous metals					
Coal	-	-	-	-	-
Fuel oil	55	79	105	170	235
Natural gas	202	181	195	313r	277
Blast furnace gas	2,313	3,083	2,885	2,490	2,232
Coke oven gas	475	641	628	621	826
Other fuels *(1)*	-	-	-	-	-
Total iron and steel and non ferrous metals	**3,045**	**3,984**	**3,812**	**3,593r**	**3,569**
Chemicals					
Coal	2,804	3,395	3,372	3,653r	3,608
Fuel oil	145	292	153	137r	138
Gas oil	545	98	28	21r	11
Natural gas	34,987	35,330	33,359	35,056r	32,290
Refinery gas	1,132	1,181	1,181	1,181	1,181
Renewable fuels *(2)*	30	26	10	-	3
Other fuels *(1)*	3,006	2,719	2,420	2,417r	2,485
Total chemical industry	**42,650**	**43,041**	**40,522**	**42,465r**	**39,716**
Oil and gas terminals and oil refineries					
Fuel oil	2,910	2,844	1,606	1,466	1,464
Gas oil	111	80	122	112r	159
Natural gas	20,818	21,041	22,045	21,618	23,243
Refinery gas	4,011	4,651	5,583	5,703r	5,723
Other fuels *(1)*	12,863	11,810	10,711	10,644r	9,112
Total oil refineries	**40,713**	**40,426**	**40,068**	**39,543r**	**39,700**
Paper, publishing and printing					
Coal	683	595	437	402r	372
Fuel oil	308	3	0	12	-
Gas oil	73	188	22	20r	24
Natural gas	14,905	13,092	12,255	11,552r	10,182
Renewable fuels *(2)*	0	-	-	1,032	1,032
Other fuels *(1)*	147	150	151	108	83
Total paper, publishing and printing	**16,116**	**14,028**	**12,865**	**13,126r**	**11,694**
Food, beverages and tobacco					
Coal	578	338	238	156	194
Fuel oil	192	199	137	127	184
Gas oil	97	81	59	26r	36
Natural gas	8,473	7,965	8,100	8,052r	8,006
Renewable fuels *(2)*	-	1	2	7	18
Other fuels *(1)*	42	20	5	-r	-
Total food, beverages and tobacco	**9,381**	**8,604**	**8,542**	**8,368r**	**8,436**
Metal products, machinery and equipment					
Fuel oil	89	89	89	89	89
Gas oil	0	0	0	0	0
Natural gas	492	439	455	504r	431
Renewable fuels *(2)*	105	104	65	26r	26
Total metal products, machinery and equipment	**686**	**633**	**609**	**619r**	**546**

For footnotes see page 178

6.9 CHP - use of fuels by sector (continued)

GWh

	2005	2006	2007	2008	2009
Mineral products, extraction, mining and agglomeration of solid fuels					
Coal	-	-	-	-	-
Fuel oil	-	-	-	-	-
Gas oil	-	1	0	0	3
Natural gas	1,231	964	919	767r	644
Coke oven gas	269	271	269	291	288
Total mineral products, extraction, mining and agglomeration of solid fuels	**1,500**	**1,235**	**1,188**	**1,059r**	**935**
Sewage treatment					
Fuel oil	53	41	48	62r	73
Gas oil	15	20	23	17r	18
Natural gas	112	145	118	181r	215
Renewable fuels *(2)*	1,483	1,341	1,487	1,654r	1,952
Total sewage treatment	**1,662**	**1,548**	**1,676**	**1,915r**	**2,258**
Other industrial branches					
Fuel oil	-	-	-	-	-
Gas oil	9	1	13	3	0
Natural gas	703	866	923	881r	865
Total other industrial branches	**712**	**866**	**936**	**884r**	**865**
Transport, commerce and administration					
Coal	44	-	43	29	-
Fuel oil	6	1	0	0	0
Gas oil	21	116	32	6r	10
Natural gas	4,382r	4,093r	4,451r	4,542r	4,527
Refinery gas	-	-	-	-	-
Renewable fuels *(2)*	2	162	176	605r	643
Other fuels *(1)*	-	-	-	-	-
Total transport, commerce and administration	**4,455r**	**4,373r**	**4,702r**	**5,183r**	**5,181**
Other *(3)*					
Coal	41	28	29	33r	24
Fuel oil	9	10	1	1	1
Gas oil	65	14	12	13	9
Natural gas	2,347	2,015r	2,203r	2,172r	2,464
Renewable fuels *(2)*	1,228	1,548	1,479	1,393r	1,307
Other fuels *(1)*	1	1	1	1	1
Total other	**3,691r**	**3,617r**	**3,725r**	**3,614r**	**3,807**
Total - all sectors					
Coal	4,150	4,356	4,120	4,274r	4,197
Fuel oil	3,767	3,558	2,140	2,065r	2,185
Gas oil	934	599	309	219r	270
Natural gas	88,651r	86,133r	85,022r	85,639r	83,144
Blast furnace gas	2,313	3,083	2,885	2,490	2,232
Coke oven gas	744	911	897	912	1,114
Refinery gas	5,143	5,832	6,764	6,884r	6,903
Renewable fuels *(2)*	2,848	3,183	3,219	4,717r	4,982
Other fuels *(1)*	16,060	14,699	13,287	13,170r	11,681
Total CHP fuel use	**124,611r**	**122,354r**	**118,643r**	**120,369r**	**116,708**

(1) Other fuels include: process by-products.
(2) Renewable fuels include: sewage gas, other biogases, municipal solid waste and refuse derived fuels.
(3) Sectors included under Other are agriculture, community heating, leisure, landfill and incineration.

Chapter 7
Renewable sources of energy

Introduction

7.1 This chapter provides information on the contribution of renewable energy sources to the United Kingdom's energy requirements. It covers the use of renewables to generate electricity, the burning of renewable fuels to produce heat either in boilers (or cookers) or in combined heat and power (CHP) plants, and the use of liquid biofuels for transport. The chapter includes some sources that under international definitions are not counted as renewable sources or are counted only in part. This is to ensure that this Digest covers all sources of energy available in the United Kingdom. However, within this chapter the international definition of total renewables is used and this excludes non-biodegradable wastes. The energy uses of these wastes are still shown in the tables of this chapter but as "below the line" items.

7.2 The data summarise the results of DECC surveys of electricity generators, information from CHP schemes, and an ongoing study undertaken by the AEA on behalf of DECC to update a database containing information on all relevant renewable energy sources in the United Kingdom. This database is called RESTATS, the Renewable Energy STATisticS database.

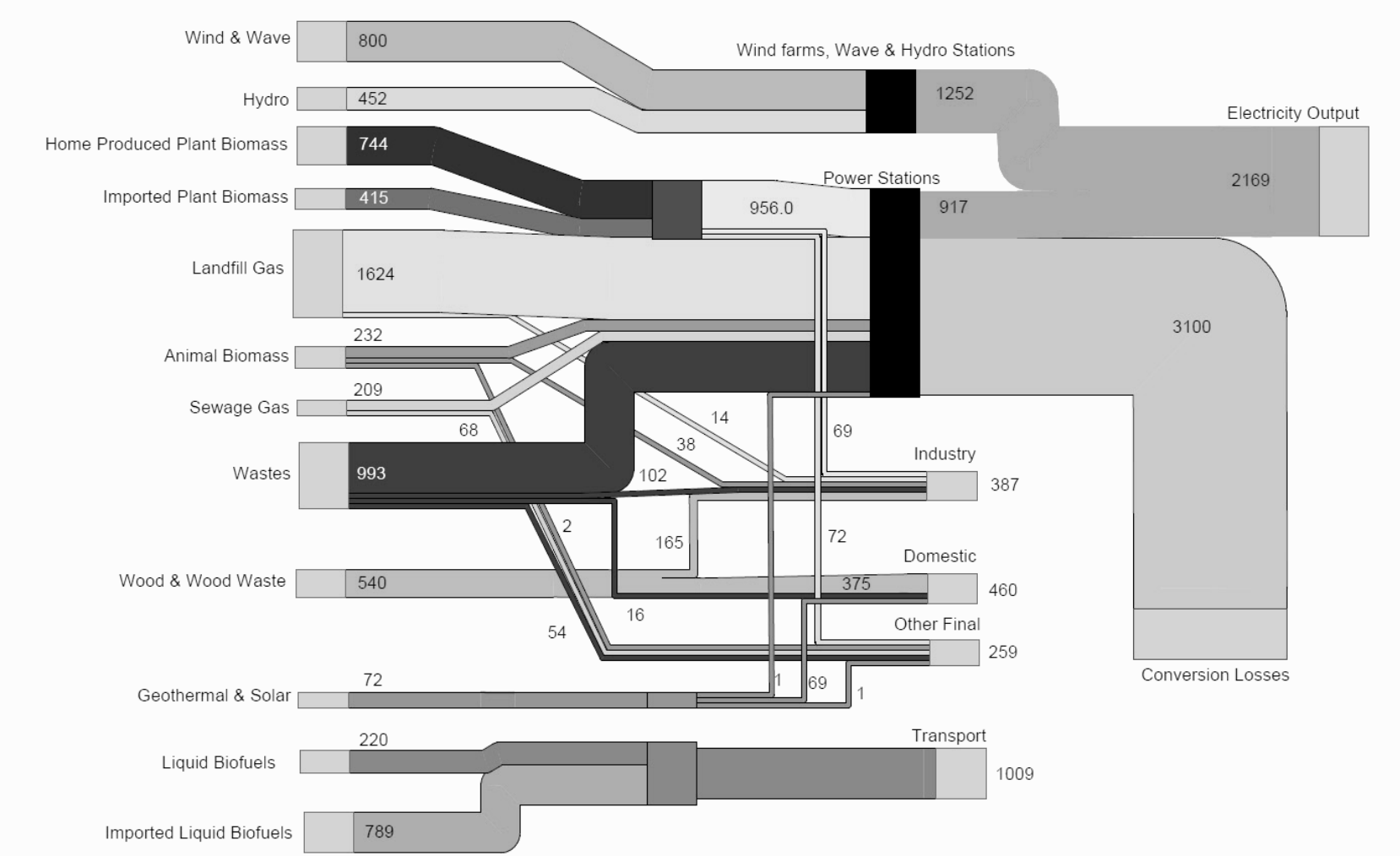
7.3 The AEA study started in 1989, when all relevant renewable energy sources were identified and, where possible, information was collected on the amounts of energy derived from each source. The renewable energy sources identified were the following: active solar heating; photovoltaics; onshore and offshore wind power; wave power; large and small scale hydro; biomass (both plant and animal based); geothermal aquifers. The technical notes at the end of this chapter define each of these renewable energy sources. The database now contains 21 years of data from 1989 to 2009. Information on RESTATS has recently been combined with data obtained from monitoring the planning process for new renewable installations to ensure it is comprehensive.

7.4 The information contained in the database is collected by a number of methods. For larger projects, an annual survey is carried out in which questionnaires are sent to project managers. For technologies in which there are large numbers of small projects, the values given in this chapter are estimates based on information collected from a sub-sample of the projects. Further details about the data collection methodologies used in RESTATS, including the quality and completeness of the information, are given in the technical notes at the end of this chapter, and in a guidance note on the DECC website at: www.decc.gov.uk/en/content/cms/statistics/source/renewables/renewables.aspx

7.5 A renewable energy flow chart for 2009, showing the flows of renewables from fuel inputs through to consumption, is included overleaf. This is a way of simplifying the figures that can be found in the commodity balance for renewables energy sources in Table 7.1. It illustrates the flow of primary fuels from the point at which they become available from home production or imports (on the left) to their eventual final uses (on the right) as well as the energy lost in conversion.

7.6 Commodity balances for renewable energy sources covering each of the last three years form the first three tables in this chapter (Tables 7.1 to 7.3). Unlike in the commodity balance tables in other chapters of the Digest, Tables 7.1 to 7.3 have zero statistical differences. This is because the data for each category of fuel are, in the main, taken from a single source where there is less likelihood of differences due to timing, measurement, or differences between supply and demand. These balance tables are followed by 5-year tables showing capacity of, and electricity generation from, renewable sources (Table 7.4), and electricity generation only from sources eligible for the Renewables Obligation (RO) (Table 7.5). Table 7.6 shows renewable sources used to generate electricity, to generate heat, and for transport purposes in each of the last five years. Table 7.7 shows the UK's progress against the 2008 EU Renewable Energy Directive target; the layout of this table has been amended compared with the version in the 2009 edition of the Digest; it now contains more detail on the separate components of the target . A long-term trends commentary and table (Table 7.1.1) covering the use of renewables to generate electricity, to generate heat, and as a transport fuel is available on DECC's energy statistics web site and accessible from the Digest of UK Energy

Renewables flow chart 2009 (thousand tonnes of oil equivalent)



Note: This flow chart is based on data that appear in Tables 7.1 and 7.4

Statistics home page: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx
Also available on the web site is Table 7.1.2 summarising all the renewable orders made under the Non Fossil Fuels Obligation (NFFO), Northern Ireland Non Fossil Fuels Obligation, and Scottish Renewables Orders (SRO) along with descriptive text.

Renewables Obligation

7.7 In April 2002 the Renewables Obligation (RO) (and the analogous Renewables Obligation (Scotland)) came into effect[1]. It is an obligation on all electricity suppliers to supply a specific proportion of electricity from eligible renewable sources; the proportion is measured against total electricity sales (as shown in Table 5.5 contained in the electricity chapter of this Digest). Eligible sources include all those covered by this chapter but with specific exclusions. These are: existing hydro plant of over 20 MW; all plant using renewable sources built before 1990 (unless re-furbished and less than 20 MW); and energy from mixed waste combustion unless the waste is first converted to fuel using advanced conversion technology. Only the biodegradable fraction of any waste is eligible (in line with the EU Renewables Directive, see paragraph 7.9, below). All stations outside the United Kingdom (the UK includes its territorial waters and the continental shelf) are also excluded. Table 7.5 shows all the components of total electricity generation on an RO basis. Strictly speaking until 2005, the RO covers only Great Britain, but in these UK based statistics Northern Ireland renewable sources have been treated as if they were also part of the RO.

7.8 Prior to 2002 the main instruments for pursuing the development of renewables capacity were the NFFO Orders for England and Wales and for Northern Ireland, and the Scottish Renewable Orders. In this chapter the term "NFFO Orders" is used to refer to these instruments collectively. For projects contracted under NFFO Orders in England and Wales, the Non Fossil Purchasing Agency (NFPA) provided details of capacity and generation. The Scottish Executive and Northern Ireland Electricity provided information on the Scottish and Northern Ireland NFFO Orders, respectively. Statistics of these Orders can now be found in Table 7.1.2 on the DECC energy web site (see paragraph 7.6, above).

Renewables Directives

7.9 The European Union's Renewables Directive (Directive 2001/77/EC) ('RD') came into force in October 2001. It proposed that Member States adopt national targets for renewables that were consistent with reaching the overall EU target of 12 per cent of energy (22.1 per cent of electricity) from renewables by 2010. The UK "share" of this target was that renewables sources eligible under the RD should account for 10 per cent of UK electricity **consumption** by 2010; the denominator for this target is shown as "total demand" in Table 5.1 contained in the electricity chapter of this Digest. In March 2007 the European Council agreed to a common strategy for energy security and tackling climate change. An element of this was establishing a target of 20 per cent of EU's energy to come from renewable sources. During 2008 a new Renewable Energy Directive (Directive 2009/29/EC) ('RED') was negotiated on this basis and resulted in agreement of country "shares" of this target. For the UK, its share is that 15 per cent of **final energy consumption** - calculated on a net calorific value basis, and with a cap on fuel used for air transport - should be accounted for by energy from renewable sources by 2020 (see paragraphs 7.30 to 7.33, below). The Government published, as part of its Low Carbon Transition Plan, a UK Renewable Energy Strategy in July 2009, setting out policy measures and scenario based analysis showing how the UK aimed to meet the 15 per cent target.

UK Renewables Policy

7.10 The United Kingdom has a number of measures to increase renewables deployment. These include:

- Putting in place appropriate financial incentives to bring forward and support the take-up of renewable energy, including "banding" the Renewables Obligation and the introduction of feed in tariffs for small scale electricity generation from April 2010;

- Identifying and removing the most significant non-financial barriers to renewables deployment, including measures to improve existing grid connection arrangements; and

[1] *Parliamentary approval of the Renewables Obligation Orders under The Utilities Act 2000 was given in March 2002.*

- Overcoming supply chain blockages and promoting business opportunities in the renewables sector in the UK.

The Renewables Obligation

7.11 The Renewables Obligation (RO)[2] is an obligation on electricity suppliers to supply a specific and growing proportion of electricity from eligible renewable sources in order to increase the level of renewable generating capacity and so contribute to our climate change targets. Examples of RO eligible sources are listed in Table 7A. The Office for Gas and Electricity Markets (Ofgem), which administers the RO, issues Renewables Obligation Certificates (ROCs) to qualifying renewables generators as evidence that the electricity has been generated and supplied or used in a permitted way in the United Kingdom. These certificates may be sold by generators directly to licensed electricity suppliers or traders. ROCs can be traded separately from the electricity to which they relate.

Table 7A: Examples of eligible Renewables Obligation sources of energy

Wind energy (offshore and onshore)	Geothermal (hot dry rock and aquifers)
Tidal and tidal stream	All biodegradable material
Wave energy	Landfill gas and sewage gas
Photovoltaics	Co-firing of biomass with fossil fuel
Hydro power [excluding hydro power from plants exceeding 20 MW DNC]	Agriculture and forestry wastes, and energy crops

7.12 The Renewables Obligation Order (ROO) 2009[3] introduced a number of changes including the introduction of "banding". This provides increased support to technologies that are less well-developed or further from the market, such as offshore wind (1.5 ROCs/MWh), wave and tidal (2 ROCs/MWh), and dedicated energy crops (2 ROCs/MWh). Advanced gasification and pyrolysis, as well as anaerobic digestion, also now receive 2 ROCs/MWh. Following an early review of the banding for offshore wind, the level of support for this technology further increased from 1.5 ROCs/MWh to 2 ROCs/MWh for stations or capacity accredited between 1 April 2010 and 31 March 2014[4]. Onshore wind continues to receive 1 ROC/MWh. New developments in the more established renewable technologies now receive less support; for example, sewage gas receives 0.5 ROCs/MWh and landfill gas receives 0.25 ROCs/MWh.

Feed-in Tariffs

7.13 Feed in tariffs (FITs)[5] are a financial support scheme for eligible low-carbon electricity technologies, aimed at small-scale installations up to a maximum capacity of 5 Megawatts (MW). FITs support new anaerobic digestion, hydro, solar photovoltaic and wind projects up to that 5MW limit, by requiring electricity suppliers to make payments (generation tariffs) to generators based on the number of kilowatt hours (kWh) they generate. An additional guaranteed export tariff of 3p per kWh is paid for electricity generated that is not used on site and exported to the grid. The scheme will also support the first 30,000 micro combined heat and power installations with an electrical capacity of 2kW or less, as a pilot programme.

Commodity balances for renewables in 2009 (Table 7.1), 2008 (Table 7.2) and 2007 (Table 7.3)

7.14 Eleven different categories of renewable fuels are identified in the commodity balances. Some of these categories are themselves groups of renewables because a more detailed

[2] The Renewables Obligation covering England and Wales and the analogous Renewables (Scotland) Obligation came into effect in April 2002. Northern Ireland introduced a similar Renewables Obligation in April 2005.

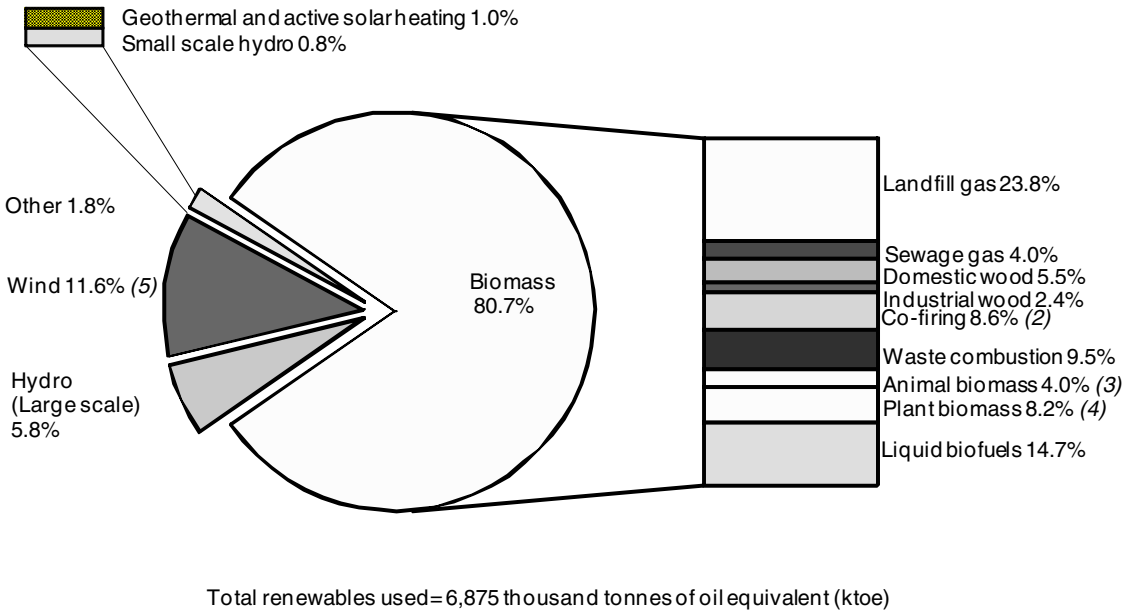
[3] The Renewables Obligation Order (ROO) 2009 came into effect on 1 April 2009.

[4] This increased level of support will apply to the whole station accredited within the period or to all of the additional capacity accredited in the period. It therefore includes any turbines that form part of the station or the additional capacity, even if some of those turbines are yet to be installed.

[5] The Feed-in Tariff scheme (FITs), introduced on 1 April 2010 provides a guaranteed payment, made directly by electricity suppliers, for each unit of low-carbon electricity generated by small-scale projects up to 5MW capacity and for each unit of electricity generated that is not used on site and exported to the grid.

disaggregation could disclose data for individual companies. In the commodity balance tables the distinction between biodegradable and non-biodegradable wastes cannot be maintained for this reason. The largest contribution to renewables in **input** terms (81 per cent) is from biomass, with wind generation and large-scale hydro electricity production contributing the majority of the remainder as Chart 7.1 shows. Only 2 per cent of renewable energy comes from renewable sources other than biomass, wind and large-scale hydro. These include solar, small-scale hydro and geothermal aquifers.

Chart 7.1: Renewable energy utilisation 2009 *(1)*



(1) Excludes all passive use of solar energy and all (509 ktoe) non-biodegradable wastes. In this chart renewables are measured in primary input terms.
(2) Biomass co-fired with fossil fuels in power stations; imported 6.0 per cent of total renewables, home produced 2.6 per cent
(3) 'Animal biomass` includes farm waste, poultry litter, and meat and bone combustion.
(4) 'Plant biomass' includes straw and energy crops.
(5) 'Wind' includes energy from shoreline wave and tidal generation, but this accounted for less than 0.1ktoe

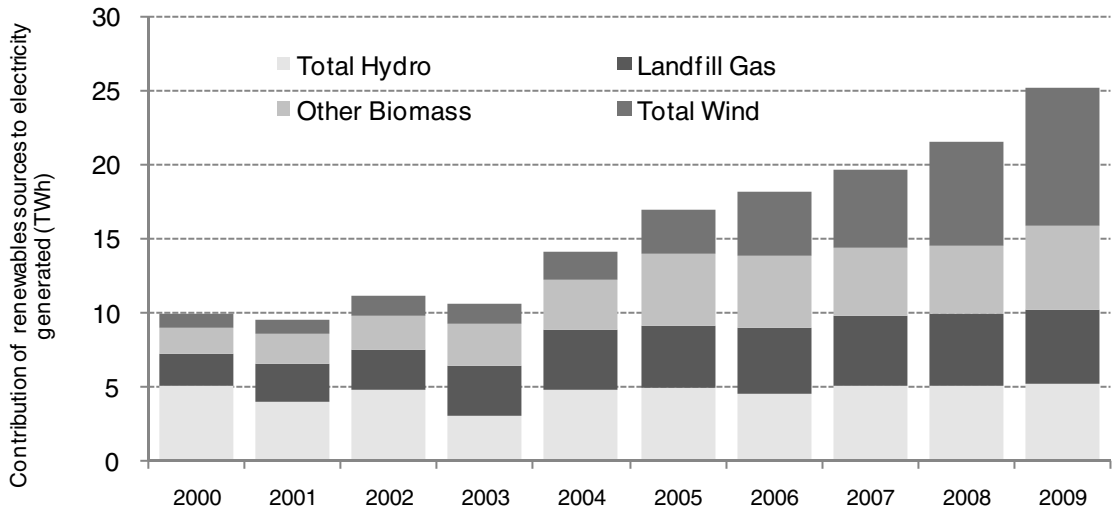
7.15 Nearly three-quarters (71 per cent) of the renewable energy (excluding non-biodegradable wastes) produced in 2009 was transformed into electricity. This is a similar proportion to that recorded in 2008, but a decrease from 79 per cent in 2007 and 83 per cent in 2006, because the use of biofuels for transport use has grown at a faster rate than the use of renewables for electricity generation. While biomass appears to dominate the picture when fuel inputs are being measured, hydro electricity and wind power together provide a larger contribution when the **output** of electricity is being measured as Table 7.4 shows. This is because on an energy supplied basis the inputs are deemed to be equal to the electricity produced for hydro, wind, wave and solar (see Chapter 5, paragraph 5.66). However for landfill gas, sewage sludge, municipal solid waste and other renewables a substantial proportion of the energy content of the input is lost in the process of conversion to electricity as the flow chart (page 180, illustrates).

Capacity of, and electricity generated from, renewable sources (Table 7.4)

7.16 Table 7.4 shows the capacity of, and the amounts of electricity generated from, each renewable source. Total electricity generation from renewables in 2009 amounted to 25,222 GWh, an increase of 3,642 GWh (+17 per cent) on 2008. The main contributors to this substantial increase were 1,772 GWh from onshore wind (+31 per cent), 435 GWh (+33 per cent) from offshore wind, 541

GWh (+95 per cent) from plant biomass, 285 GWh (+23 per cent) from combustion of biodegradable municipal solid waste, 195 GWh (+4 per cent) from landfill gas, and 193 GWh from the co-firing of biomass with fossil fuels. Generation from wind (both onshore and offshore) was the largest renewables technology in output terms in 2009, with 37 per cent of the electricity generated by renewable sources being from wind, 21 per cent was from hydro sources, 20 per cent from landfill gas, 7 per cent from co-firing, and 15 per cent from other biomass. Chart 7.2 shows the amount of electricity generated, split into four renewable source categories, since 2000.

Chart 7.2: Electricity generation by main renewable sources since 2000



7.17 Renewable sources provided 6.7 per cent of the electricity generated in the United Kingdom in 2009, 1.2 percentage points higher than in 2008. Table 7B and Chart 7.2 show the growth in the proportion of electricity produced from renewable sources. The table also includes the progress towards the electricity renewables target set under the RO (see paragraph 7.7 above and paragraph 7.23, below), and progress towards the 2001 RD and 2008 RED (see paragraph 7.9 above); the growth path for the RD and RED follows a very similar trend to the international definition basis.

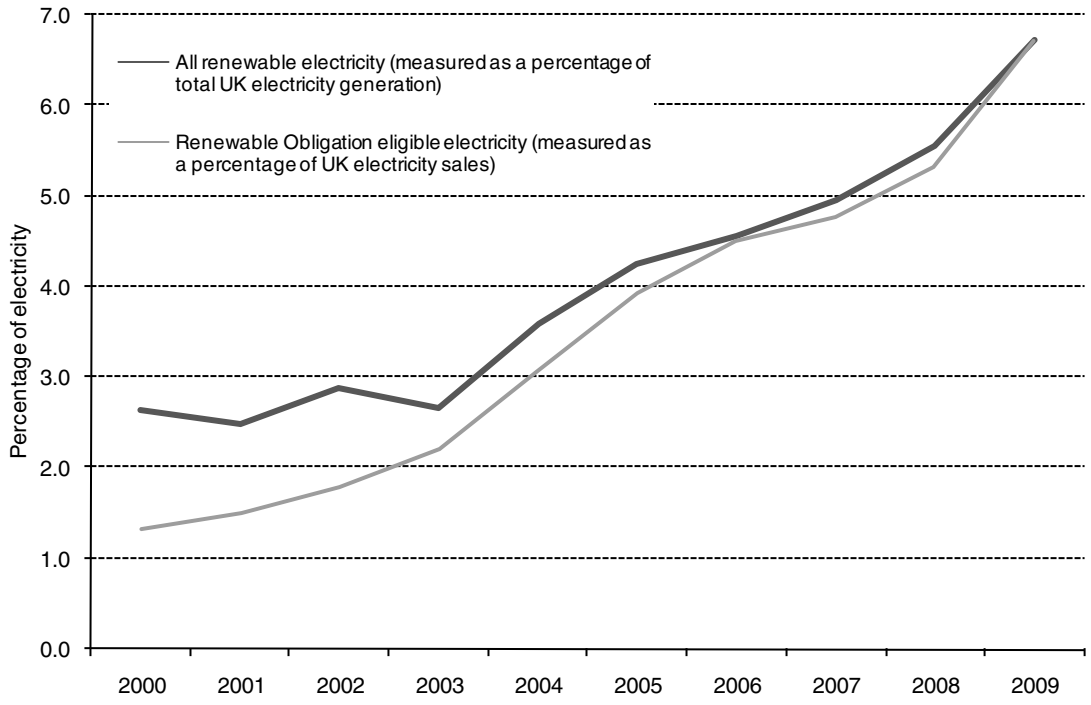
Table 7B: Percentages of electricity derived from renewable sources

	2005	2006	2007	2008	2009
Overall renewables percentage (international basis)	4.3	4.6	5.0	5.6	6.7
Percentage on a Renewables Obligation basis	3.9	4.5	4.8	5.3	6.7
Percentage on a 2001 Renewables Directive basis	4.2	4.5	4.9	5.4	6.7
Percentage on a 2008 Renewable Energy Directive basis	4.1	4.5	4.8	5.4	6.7

7.18 As shown in Table 7B, during 2009 renewable generation measured using the RO basis also increased to 6.7 per cent, as a proportion of electricity sales by licensed suppliers. The increases in the percentages shown in Table 7B are mainly due to growth in the numerators (ie the renewables element). However reduced electricity generation, sales and consumption have also helped increase the percentages by reducing the denominators in the calculations: between 2008 and 2009 electricity generation (used as the denominator in the international basis calculation) fell by 3.3 per cent; similarly electricity sales by licensed suppliers (for the RO basis) fell by 5.5 per cent; electricity demand (for the RD basis) was 5.2 per cent lower; and gross electricity consumption (for the RED measure) fell by 5.2 per cent. Since the introduction of the RO in 2002 generation from wind has increased on average by one third each year.

7.19 Installed generation capacity reached 8,031 MWe at the end of 2009, an increase of 1,127 MWe (+18 per cent) during the year. The main contributors to this increase were 663 MWe (+24 per cent) from onshore wind, 355 MWe (+61 per cent) from offshore wind, 81 MWe (+41 per cent) from plant biomass and 77 MWe (+8 per cent) from landfill gas.

Chart 7.3: Growth in electricity generation from renewable sources since 2000

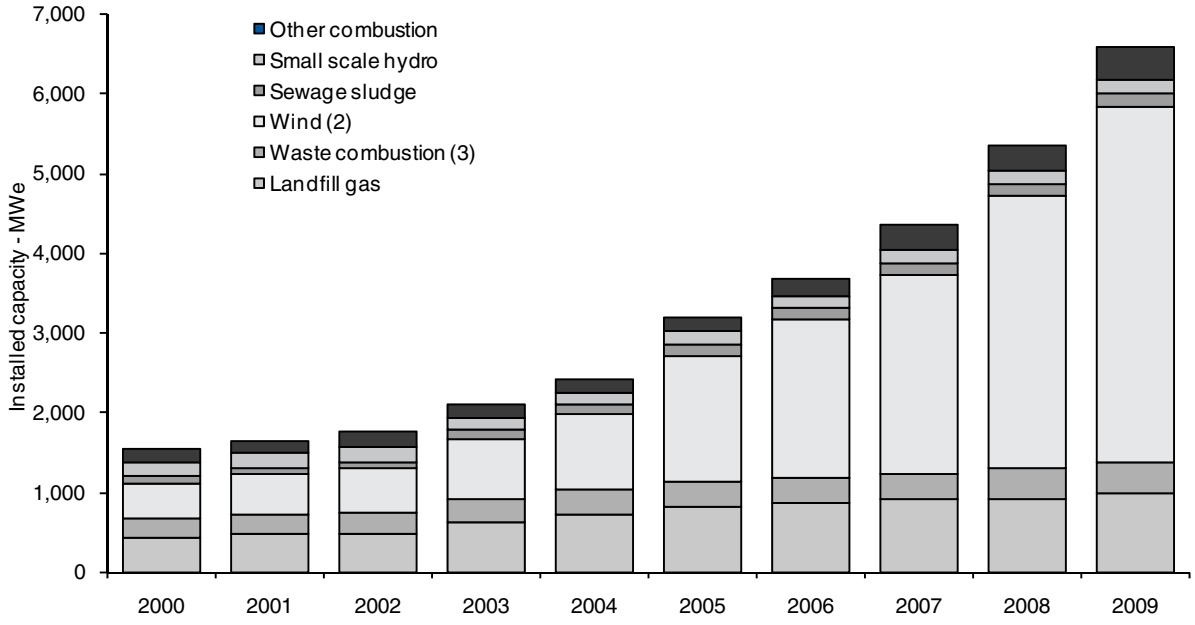


7.20 Chart 7.4 (which covers all renewables capacity except large scale hydro) illustrates the continuing increase in the electricity generation capacity from all significant renewable sources. This upward trend in the capacity of renewable sources will continue as recently consented onshore and offshore windfarms and other projects come on stream. The map, shown on page 189, shows the location of wind farms in operation at the end of December 2009, together with an indication of the capacity.

7.21 Plant load factors in Table 7.4 have been calculated in terms of installed capacity and express the average hourly quantity of electricity generated as a percentage of the average capacity at the beginning and end of the year. In the past the overall figure has been heavily influenced by the availability of hydro capacity during the year, which in turn has been influenced by the amount of rainfall during the preceding period. For instance, the dry weather in 2006 resulted in a reduced hydro load factor, and the lowest average wind speeds since 2005 had an adverse impact on wind load factors during 2009. Plant load factors for all generating plant in the UK are shown in Chapter 5, Table 5.10.

7.22 To overcome the biasing of load factors for wind caused by new turbines coming on stream either early or late in a calendar year, Table 7.4 also contains a second statistic to describe the load factor of wind turbines. This statistic is calculated in the same way as the other load factors but includes only those wind farms that have operated throughout the calendar year with an unchanged configuration. See paragraphs 7.81 to 7.83 for the full definitions. In 2009, this “unchanged configuration” load factor for onshore wind farms was slightly lower than the all-onshore factor, whilst the opposite was true for offshore wind farms. The off-shore capacity at Rhyl Flats (90MW) which came on line on 28 December 2009, had the impact of reducing the all-offshore factor by 1½ percentage points.

Chart 7.4: Electrical generating capacity of renewable energy plant (excluding large-scale hydro)[1]



(1) Large scale hydro capacity was 1,459 MWe in 2009.

(2) Wind includes both onshore and offshore and also includes an estimate for solar photovoltaics (26.5 MWe in 2009) and shoreline wave (2.5 MWe in 2009).

(3) All waste combustion plant is included because both biodegradable and non-biodegradable wastes are burned together in the same plant.

Electricity generated from renewable sources: Renewables Obligation basis (Table 7.5)

7.23 Electricity generated in the UK from renewable sources eligible under the RO in 2009 was 19 per cent greater than in 2008. This compares with growth of 12 per cent and 6 per cent in 2008 and 2007 respectively. Chart 7.3 shows the growth in the proportion of electricity produced from renewable sources under the Renewables Obligation and international definitions. Table 7B shows electricity eligible under the RO as a percentage of electricity sales. RO eligible generation has increased by more than 15 TWh since its introduction in 2002, an increase of 266 per cent, although some of this is due to existing hydro stations being refurbished and thus becoming within the scope of the RO definition, as opposed to new capacity being installed. This compares with an all-renewable electricity generation figure that has increased by 127 per cent over the same period, but from a higher starting level.

Renewable sources used to generate electricity and heat (Table 7.6)

7.24 Between 2008 and 2009 there was an increase of 14.6 per cent in the **input** of renewable sources into electricity generation. Wind grew by 31.1 per cent, hydro by 1.8 per cent; biomass use increased by 13.2 per cent.

7.25 Table 7.6 also shows the contribution from renewables to heat generation. Around 14 per cent of renewable sources were used to generate heat in 2009. Renewables used to generate heat declined to a low point in 2005 but since then increased by 62 per cent to 966 ktoe. The decline was mainly due to tighter emissions controls discouraging on-site burning of biomass, especially wood waste by industry. Domestic use of wood accounts for 39 per cent of all renewables used for heat; plant biomass is the second largest component, at 21 per cent.

Liquid Biofuels

7.26 It is estimated that 223 million litres of biodiesel were produced in the UK in 2009, under half the amount produced in 2007 (485 million litres). Biodiesel consumption figures can be obtained from figures published by HM Revenue and Customs (HMRC) derived from road fuel taxation statistics. The most usual way for biodiesel to be sold is for it to be blended with ultra-low sulphur diesel fuel; further information on this is given in Chapter 3 (see page 61). However, it was estimated that around 1 per cent was used in 2008 to generate electricity. Until 31 March 2010, the duty payable on biodiesel (and bioethanol) was 20 pence per litre less than the duty payable on road diesel and petrol; in blended fuels the duty payable is proportionate to the duty payable on the constituent fuels. The duty differential was removed on 1 April 2010, except for biodiesel production from waste cooking oil. The HMRC figures show that 1,044 million litres of biodiesel were consumed in 2009, up from 886 million litres in 2008, and 347 million litres in 2007. Therefore around 821 million litres of biodiesel were imported in 2009. The total annual capacity for biodiesel production in the UK in 2010 is estimated to be 463 million litres. This reduced capacity, compared to that reported in last year's Digest, is due to continuing adverse market conditions with a number of significant producers going out of business in 2009 and other plant operating at reduced output.

7.27 HMRC data show that 317 million litres of bioethanol was consumed in the UK in 2009; this continues a trend of increasing bioethanol use that started with 85 million litres in 2005, and is 54 per cent higher than 2008. Only one large scale UK plant was in production in 2009, and so the majority of the bioethanol was imported.

7.28 The HMRC data have been converted from litres to tonnes of oil equivalent and the data are now shown in both the commodity balances (Tables 7.1 to 7.3) and in Table 7.6. In addition these data are also included in the aggregate energy balances (Tables 1.1 to 1.3). The tables show the increasing contribution that liquid biofuels are making towards total renewable sourced energy. In 2009 15 per cent of the renewable sources used in the UK in primary input terms were liquid biofuels for transport, up from 14 per cent in 2008, 7 per cent in 2007, and less than half a per cent in 2003.

7.29 A further source of statistical information on liquid biofuels is from the Renewable Fuels Agency (RFA). The RFA were set up to implement the Renewable Transport Fuel Obligation (RTFO), which came into force on 15 April 2008. The RFA administers the monthly reporting process required of fuel companies under the RTFO, issuing Renewable Transport Fuel certificates in proportion to the quantity of biofuels registered. AEA are working closely with the RFA in relation to the provision of data on the sustainability of biofuels – a key aspect of the data required for the Renewable Energy Directive, and DECC hope to use this data in future years.

Renewable sources data used to indicate progress under the EU Renewable Energy Directive 2008 (Table 7.7)

7.30 As discussed in paragraph 7.9, the Renewable Energy Directive has a target for the UK to obtain 15 per cent of its energy from renewable sources by 2020. The target uses a slightly different definition of renewable and total energy than is used in the rest of the Digest. It includes the use of electricity and heat (and other fuels used for heating) by final consumers, and the use of energy for transport purposes. Gross final energy consumption (which is calculated on a net calorific value basis) also includes consumption of electricity by electricity generators, consumption of heat by heat generators, transmission and distribution losses for electricity, and transmission and distribution losses for distributed heat. Additionally, the Directive includes a cap on the proportion that air transport can contribute to the total; this cap is currently 6.18 percent; certain fuels also receive a higher weighting in the calculation, with full details being set out in the Directive, which is available at:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF.

7.31 In the UK, energy balances are usually published on a gross calorific value basis, but in order to facilitate comparisons with EU statistics the balances for 2004 to 2009 have been calculated on a net calorific value basis and are available in Table I.1 at:
www.decc.gov.uk/en/content/cms/statistics/source/total/total.aspx

7.32 The layout of Table 7.7 has been altered since it was introduced for the first time in the 2009 edition of the Digest. It brings together the relevant renewable energy and final energy consumption data to show progress towards the target of 15 per cent of UK energy consumption to be sourced from

renewables by 2020, and also shows the proportions of electricity, heat and transport energy coming from renewables sources.

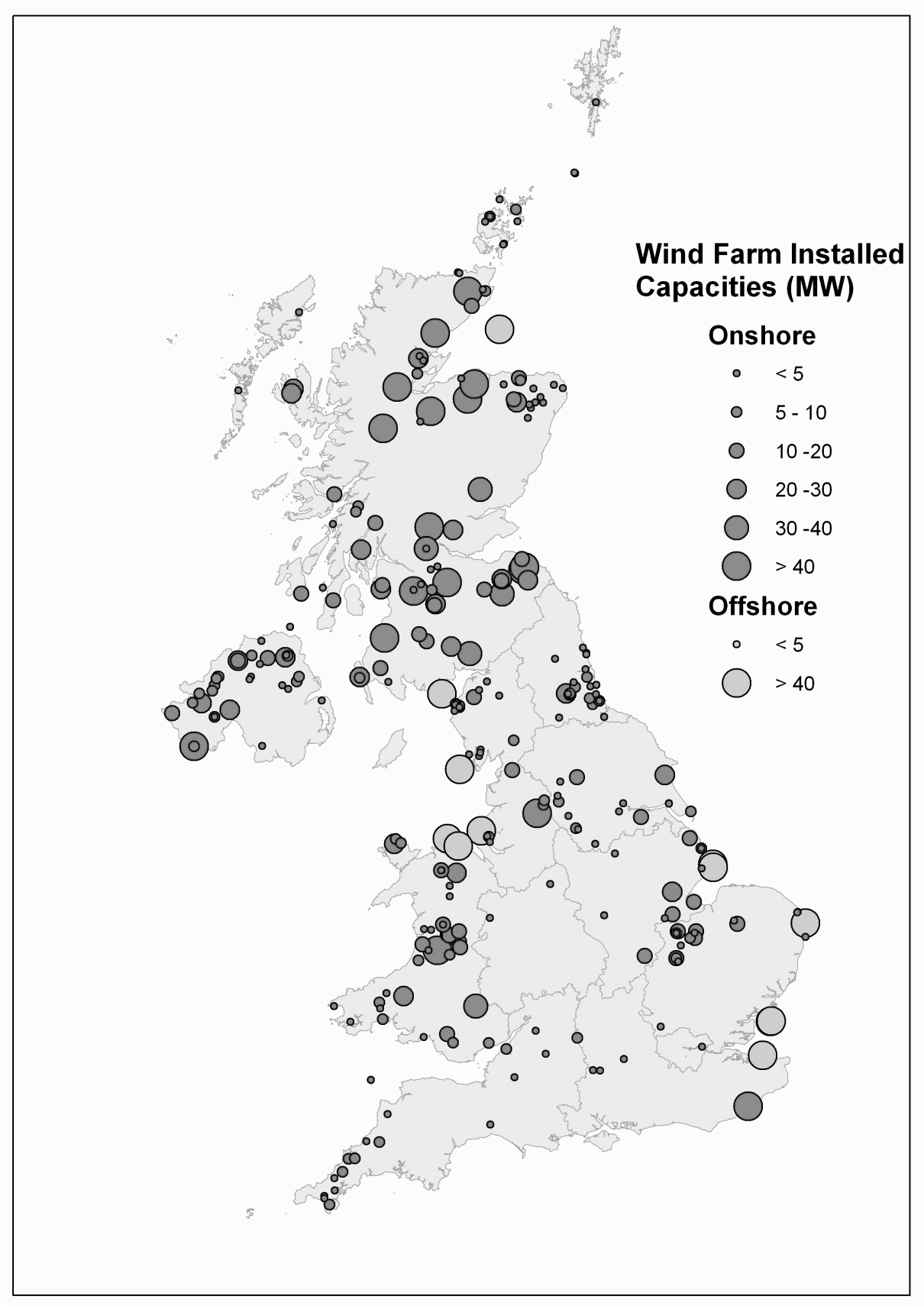
Table 7C: Percentages of energy derived from renewable sources

	2005	2006	2007	2008	2009
Percentage of capped gross final energy consumption (ie the basis proposed by Eurostat for the Renewable Energy Directive)	1.4	1.6	1.8	2.4	3.0
Percentage of primary energy demand (ie the basis previously quoted in this Digest)	1.8	2.0	2.2	2.6	3.1

7.33 Table 7C shows that overall, renewable sources, excluding non-biodegradable wastes and passive solar design (see paragraph 7.37), continues to increase and provided 3.1 per cent of the United Kingdom's total primary energy requirements in 2009. On the basis used to monitor the Renewable Energy Directive, the UK percentage rose by 0.6 percentage points in 2009 to 3.0 per cent. The primary energy demand basis produces higher percentages because thermal renewables are measured including the energy that is lost in transformation. The thermal renewables used in the UK are less efficient in transformation than fossil fuels and as non-thermal renewables such as wind (which by convention are 100 per cent efficient in transformation) grow as a proportion of UK renewables use, the gross final energy consumption percentage will overtake the primary energy demand percentage. A proportion of the increase in both these percentages can be attributed to a reduced energy consumption / demand; for instance the "capped gross final energy consumption" used as the denominator in the Renewable Energy Directive measure was 6.7 per cent lower in 2009 compared to 2008, whilst the renewable component increased by 15.6 per cent – if the denominator in 2009 had remained the same as it was in 2008, the contribution of renewable energy would have been around 0.2 percentage points lower.

7.34 A proportion of the electricity imported into the United Kingdom is certified as being exempt from the Climate Change Levy (CCL) because it has been produced from renewable sources. The UK cannot count this electricity as contributing towards its EU renewables target because its origin is other EU Member States and it is already being counted in their own electricity generation figures. It is estimated by the Office of the Gas and Electricity Markets (Ofgem) that imports of electricity counted as CCL exempt amounted to 6,817GWh in 2009; this compares to 7,589 GWh in 2008, and 2,173 GWh in 2007.

The Location of Wind Farms in the United Kingdom, as at 31 December 2009.



Technical notes and definitions

7.35 Energy derived from renewable sources is included in the aggregate energy tables in Chapter 1 of this Digest. The main commodity balance tables (Tables 7.1 to 7.3) present figures in the common unit of energy, the tonne of oil equivalent, which is defined in Chapter 1 paragraph 1.26. The gross calorific values and conversion factors used to convert the data from original units are given on page 223 of Annex A and inside the back cover flap. The statistical methodologies and conversion factors are in line with those used by the International Energy Agency and the Statistical Office of the European Communities (Eurostat). Primary electricity contributions from hydro and wind are expressed in terms of an electricity supplied model (see Chapter 5, paragraph 5.66). Electrical capacities in this chapter are quoted as Installed capacities. However, in Chapter 5, Declared Net Capacity (DNC) or Transmission Entry Capacity of renewables are used when calculating the overall UK generating capacity. These measures take into account the intermittent nature of the power output from some renewable sources (see paragraph 7.80, below).

7.36 The various renewable energy sources are described in the following paragraphs. This section also provides details of the quality of information provided within each renewables area, and the progress made to improve the quality of this information. While the data in the printed and bound copy of this Digest cover only the most recent five years, these notes also cover data for earlier years that are available on the DECC energy web site.

Use of existing solar energy

7.37 Nearly all buildings make use of some passive solar energy because they have windows or roof lights, which allow in natural light and provide a view of the surroundings. This existing use of passive solar energy is making a substantial contribution to the energy demand in the UK building stock. Passive solar design (PSD), in which buildings are designed to enhance solar energy use, results in additional savings in energy. The installed capacity of PSD in the UK and other countries can only be estimated and is dependent on how the resource is defined. The unplanned benefit of solar energy for heating and lighting in UK buildings is estimated to be 145 TWh/year. The figure is very approximate and, as in previous years, has therefore not been included in the tables in this chapter. Only a few thousand buildings have been deliberately designed to exploit solar energy – a very small proportion of the total UK building stock. It has been estimated that the benefit of deploying PSD in these buildings is equivalent to a saving of about 10 GWh/year.

Active solar heating

7.38 Active solar heating employs solar collectors to heat water mainly for domestic hot water systems but also for swimming pools and other applications. Updated figures have been obtained by AEA (on behalf of DECC). For 2009, an estimated 113 GWh for domestic hot water generation replaces gas and electricity heating; for swimming pools, an estimated 493 GWh generation replaces gas (45 per cent), oil (45 per cent) or electricity (10 per cent).

Photovoltaics

7.39 Photovoltaics (PV) is the direct conversion of solar radiation into direct current electricity by the interaction of light with the electrons in a semiconductor device or cell. The PV installed capacity in the UK increased from 10.9 MW in 2005 to 14.3 MW in 2006, 18.1 MW in 2007, 22.5 MW in 2008 and an estimated 26.5 MW in 2009. There have been significant increases in capacity and generation of PV in recent years due to increased support from policy incentives; firstly through the Major Photovoltaic Demonstration Programme between 2002 and 2006 and then the Low Carbon Buildings Programme (LCBP) between April 2006 and May 2010. The LCPB provided grants for photovoltaic installations, alongside other microgeneration technologies and was divided into two streams; Phase 1 for private households and Phase 2 for public-sector buildings and charitable bodies – Phases 1 and 2 closed to new PV applications on 24th May and 3rd February 2010 respectively. Support for PV, and other microgeneration technologies, is now provided through a system of Feed-In Tariffs (also known as the Clean Energy Cashback scheme) introduced in April 2010. This provides householders and communities who generate their own electricity with regular payments through their energy supplier. Payments consist of a tariff for each unit of electricity generated together with a second tariff for each unit of electricity that is then exported to grid. Tariffs are to be linked to the Retail Price Index and support for individual PV schemes will last for 25 years. Specific tariff levels are dependant on size and type of installation (i.e. retro-fit, new build or standalone).

Onshore wind power

7.40 Onshore wind is one of the most mature renewable energy technologies. The UK has an excellent onshore wind resource with wind speeds particularly good in Scotland, Northern Ireland and Wales, (less so in England, particularly the South East). A wind turbine extracts energy from the wind by means of a rotor (usually a three-bladed horizontal-axis rotor) that can be pitched to control the rotational speed of a shaft linked via a gearbox to a generator.

7.41 The UK's first commercial wind farm, the Delabole wind farm in Cornwall, began generating electricity in November 1991. Installed capacity has increased every year since, although installation rates vary year on year; the maximum installed in one year of 737MW (in 2008). The introduction of the Renewables Obligation (RO) has proved a more attractive incentive to developers than the NFFO it replaced and the rate of installation of new wind farms has increased since its introduction in April 2002. As at end December 2009, the UK has about 3.5 GW of installed capacity, from more than 500 wind schemes in the UK. Turbine size has steadily increased over the years and the average new turbine size is around 2.5MW. The increased tower height associated with the increased turbine size has increased wind capture (wind speed generally increases with height above ground level) and turbine design has improved and become more sophisticated – both of these leading to improvements in efficiency over the early models, prompting many of the early projects to re-power (replacing ageing turbines with more efficient ones). The figures included for generation from wind turbines are based on actual metered exports from the turbines and, where these data are unavailable, are based on estimates using regional load factors (see paragraphs 7.82 and 7.83 regarding load factors) and the wind farm installed capacity

7.42 The Energy Act 2008 established enabling powers for the introduction of Feed-in Tariffs (FITs) to supplement the RO and incentivise small-scale low-carbon electricity generation (including wind), up to a maximum limit of 5 megawatts (MW) capacity. A consultation process commenced in 2009 on how Government intended the FITs scheme to work, including the proposed tariff levels. FITs are predicted to stimulate fast growth in the small-medium wind market (15–100kW), in which generated energy is predominantly used to satisfy on-site demand[6]. Small wind system technology can be subdivided into three categories: micro wind turbines (0–1.5kW), small wind turbines (1.5–15kW) and small–medium wind turbines (15–100kW). The two main designs are the horizontal axis wind turbines (HAWT) and vertical axis wind turbines (VAWT).

7.43 In terms of operational characteristics, siting considerations and the value and nature of the market, small-scale wind systems vary markedly from large-scale units. They can be off-grid or on-grid, mobile or fixed, free-standing or building-mounted, and can form part of combined installations, most commonly with photovoltaic systems. As a result, they have a greater range of applications compared to large-scale wind turbines and can be sited on board boats, in commercial, public and domestic settings or as single or multiple installations providing power to communities. With the arrival of new financial incentives it is anticipated that the main growth market will be for those applications connecting to the grid, with free-standing turbines continuing to make up the greatest share of installations. It is estimated there were around 14,280 small wind system units (up to 100kW) deployed in the UK up to the end of 2008.[7], with an installed generating capacity of around 26 MW. Approximately 80 per cent of all small-scale turbine units are micro-wind turbines that provide around 9 MW of generating capacity. Electricity generated from small-scale wind has been estimated to have reached between 16 to 33 GWh.

Offshore wind power

7.44 The UK has the largest offshore wind resource in the world, with relatively shallow waters and strong winds extending far into the North Sea. Offshore wind is expected to make the single biggest contribution towards the Government's target of 15 per cent of energy from renewable sources by 2020.

7.45 Offshore winds tend to flow at higher speeds and are more consistent than on land, thus allowing turbines to produce more electricity (because the potential energy produced from the wind is directly proportional to the cube of the wind speed, increased wind speeds of only a few miles per hour can produce a significantly larger amount of electricity). Due to economies of scale, offshore turbines

[6] Renewable-UK, "Small Wind Systems – UK Market Report" (April 2010)
[7] UK Small-Scale Wind Survey: Installed Capacity, Annual Generation & Market Growth (AEA 2009)

are also larger than their onshore counterparts. Today's operational offshore wind turbines are essentially marinised versions of land-based turbines. The current commercially available turbines have a rated capacity of between 3 MW and 5 MW. Design variations currently being pursued include increasing turbine capacities (up to 10 MW), direct drive generators (removing the need for transmission gearboxes and offering the prospect of simplicity and high reliability) and floating concepts are also being developed as they are considered by many to be more viable (both economically and environmentally) in deeper waters. In addition, onshore constraints such as planning, noise effects and visual impact are reduced offshore.

7.46 The UK offshore wind industry is now the largest in the world. As at the end of 2009, 12 offshore wind farms have been built around the UK coastline, equating to 941 MW of installed capacity. The operational projects are Barrow (90MW), Blyth (4MW), Burbo Bank (90MW), Gunfleet Sands I&II (173MW), Kentish Flats (90MW) Lynn and Inner Dowsing (194MW), North Hoyle (60MW), Rhyl Flats (90MW), Robin Rigg I&II (180MW) and Scroby Sands (60MW). In addition, Beatrice (10 MW) provides electricity to the neighbouring offshore oil platform although its capacity and generation are not included in the UK figures.

7.47 In January 2010, The Crown Estate announced the successful bidders for each of the nine new Round 3 offshore wind zones, potentially totalling 32GW in capacity. This is considered sufficient to ensure that the 25GW that has been enabled by the Government's SEA for offshore renewable energy can be achieved. This is in addition to the 8GW already enabled across Rounds 1 and 2. The combined total of all leasing rounds is over 49GW (including sites in Scottish Territorial Waters and Round 1/2 extensions).

Wave and Tidal Stream Power

7.48 Ocean waves are created by the interaction of winds with the surface of the sea. Because of the UK's position on the north eastern rim of the Atlantic it has some of the highest wave power levels in the world. Tidal currents are created by the movement of the tides, often magnified by local topographical features such as headlands, and channels. Tidal current energy is the extraction of energy from this flow, analogous to the extraction of energy from moving air by wind turbines. A recent study estimated that the available UK resource could be up to 22 TWh per year.

7.49 The UK is currently seen as the world leader in wave and tidal stream energy. Many of the leading device concepts were developed in the UK, including the Limpet, the Pelamis, the Aquamarine Oyster, the Seagen tidal turbine and several others. A number of developments in support for wave and tidal stream have occurred in the past year. These include:

- In March 2010 the Crown Estate announced the results of its Pentland Firth and Orkney Waters wave and tidal commercial leasing round. They have granted leases for six wave and four tidal sites in the waters off the north of Scotland. If fully developed, these sites could have a nameplate capacity totalling 1.2 GW.
- The Scottish Government's enhanced ROC bands (5 ROCs/MWh for wave and 3 for tidal stream) came into force in July 2009.
- The South West Regional Development Agency's (SWRDA's) proposed Wave Hub off the north coast of Cornwall is now under construction, managed by subsea and pipeline engineering company J P Kenny.
- In September 2009 DECC's Marine Renewables Proving Fund, with a value of £22M, was introduced, and in December 2009 the award of grants to Atlantis Resources Corporation, Aquamarine Power, Hammerfest Strøm UK, Marine Current Turbines, Pelamis Wave Power and Voith Hydro were announced.
- In March 2010 Scottish Enterprise launched a £12M Wave and Tidal Energy: Research, Development and Demonstration Support fund (WATERS).
- A full scale device deployment also occurred during the last year - a 315 kW nameplate capacity Aquamarine Oyster device – a nearshore bottom mounted hinged flap device designed to operate in around 10m of water – was installed at EMEC in the 2nd half of 2009.

Large scale hydro

7.50 In hydro schemes the turbines that drive the electricity generators are powered by the direct action of water either from a reservoir or from the run of the river. Large-scale hydro covers plants with a capacity of 5 MW and over. Most of the plants are located in Scotland and Wales and mainly

draw their water from high-level reservoirs with their own natural catchment areas. Major Power Producers (MPPs) report their output to DECC in regular electricity surveys. Prior to 2004 these data were submitted in aggregate form and not split down by size of scheme. This meant that some small-scale schemes were hidden within the generation data for the large-scale schemes. Since 2004 MPPs have provided a more detailed breakdown of their data and some smaller sites included under "large scale" before 2004 are now under "small scale". There is some 1,459 MW of installed capacity for large-scale hydroelectric schemes in the UK. In 2008, the Glendoe project, the largest hydro scheme built for many years, went operational but is currently experiencing difficulties. The coverage of these large-scale hydro figures is the same as that used in the tables in the Chapter 5 of this Digest. The data in this Chapter exclude pumped storage stations (see paragraph 5.64).

Small scale hydro

7.51 Electricity generation schemes with a hydro capacity below 5 MW are classified as small scale. These are schemes being used for either domestic/farm purposes or for local sale to electricity supply companies. The results from this exercise were supplemented with a survey of small-scale schemes undertaken in 2008 which essentially helped to 'clean up' the data. Currently there is 186 MW of installed small-scale hydro schemes. Of this, 58 per cent is owned by small-scale energy producers with the remainder owned by major power producers. Of the 344 schemes in existence, around three quarters (77 per cent) claim ROCs, with 45 schemes having current NFFO contracts. There was a small increase in installed capacity during 2009 of 13 MW.

Geothermal aquifers

7.52 Aquifers containing water at elevated temperatures occur in some parts of the United Kingdom at between 1,500 and 3,000 metres below the surface. This water can be pumped to the surface and used, for example, in community heating schemes. There is currently only one scheme operating in the UK at Southampton.

Biomass

(a) Landfill gas

7.53 Landfill gas is a methane-rich biogas formed from the decomposition of organic material in landfill. The gas can be used to fuel reciprocating engines or turbines to generate electricity or used directly in kilns and boilers. In other countries, the gas is cleaned to pipeline quality or used as a vehicle fuel. Landfill gas exploitation benefited considerably from NFFO and this can be seen from the large rise in the amount of electricity generated since 1992. Ofgem's ROCs database provides details of landfill gas sites claiming ROCs. Information on landfill gas was supplemented by a RESTATS survey carried out by AEA in 2008 on behalf of DECC, and covered the period up to the end of 2007, as part of data cleansing activities. In 2009 the number of operating landfill gas sites increased by 16, with a corresponding increase in installed capacity of 77 MW.

(b) Sewage sludge digestion

7.54 In all sewage sludge digestion projects, some of the gas produced is used to maintain the optimum temperature for digestion. In addition, many use combined heat and power (CHP) systems. The electricity generated is either used on site or sold under the NFFO. Information from these projects was provided from the CHAPSTATS Database, which is compiled and maintained by AEA on behalf of DECC (see Chapter 6). Within the CHAPSTATS database the majority of the data are gathered through the CHP Quality Assurance (CHPQA) Programme. However, many sewage treatment works are not part of the CHPQA Programme, and to allow these CHP schemes to be included in the statistics data provided to Ofgem, via the ROC registers, is used. In respect of these schemes, estimates of electrical efficiencies and heat to power ratios typical of the technology and capacity are used to determine fuel inputs and heat outputs. In this year's statistics, data for 11 percent of the schemes (22 per cent of the capacity) were from CHPQA and data for 89 per cent of the schemes (78 per cent by capacity) were from RESTATS (i.e. ROCs registers).

(c) Domestic wood combustion

7.55 Domestic wood use includes the use of logs in open fires, "AGA"-type cooker boilers and other wood burning stoves. Up to 2002 the figure given for each year is an approximate estimate based on a survey carried out in 1989. The Forestry Commission carried out a survey of domestic wood fuel use in 1997 but the results from this were inconclusive. As an upper limit, about 600,000 oven-dried tonnes (ODTs) were estimated to be available for domestic heating. In 2001, AEA undertook a study of UK domestic wood use. A methodology was devised for surveying the three major sectors involved

in wood use – the stove or boiler supplier, the wood supplier and the end user. Questionnaires were devised for all these parties and then attempts were made to contact representative samples in the various regions of the UK. From the evidence obtained via the questionnaires and telephone interviews, we believe that the domestic wood burning market is growing, but not in the area of wood as the primary heat source. This still remains a relatively small market and a small percentage of the wood burnt. Unfortunately, the survey was unable to provide statistically sound evidence as to the amount of wood used in the domestic sector and although it was felt that there has been a small increase in the domestic use of wood as a fuel, on the basis of the results of the approach, at the time AEA could not justify modifying the current estimate for the UK.

7.56 In view of the importance attached to finding out about domestic wood use, the Forestry Commission decided to undertake another study guided by the lessons learnt from the previous work. In particular they would approach the newly emerging wood cooperatives, as they are likely to be a good source if information now that they should be more well established, the National House-Building Council (NHBC) to examine new build and treating equipment suppliers, fuel suppliers and users under separate surveys. This work is on-going. In 2005, as part of an omnibus survey, a pilot study was undertaken in Scotland by the Forestry Commission to assist in developing the correct methodology prior to a national survey, but unfortunately the response rate was poor. A review of a different approach to calculating domestic wood use has suggested that we have been underestimating the use of this resource in recent years and, following peer review, are now confident enough to remain with the historic changes to these data, made in 2008, the first time since the survey began in 1989. This was based a 50 per cent growth rate over a 2 to 3 year period based on anecdotal information and subsequently supported from other sources (HETAS, National Association of Chimney Sweeps and discussions with a risk assessor acting on behalf of insurance companies). In 2008, the Forestry Commission undertook a wood fuel study but figures for end use were not gathered. As such, DECC have decided to remain with our current approach, which may be revised at a later date when we have better information. Discussions are currently underway with the Forestry Commission with the view to making further improvements.

(d) Industrial wood combustion

7.57 In 1997, the industrial wood figure (which includes sawmill residues, furniture manufacturing waste etc.) was included as a separate category for the first time. This was due to the availability of better data as a result of a survey carried out in 1996 on wood fired combustion plants above 400 kW thermal input. Follow-up surveys in 2000 and 2006 highlighted that the in-house use of wood was in decline than in 1996 due to the imposition of more stringent emissions control. There is, however, increased interest in off-site use of untreated wood for space heating in schools, hospitals, nursing homes, government buildings, etc. In 2009, a follow up survey of industrial wood use was undertaken, together with an an analysis of schemes receiving funding under the Bio-Energy Capital Grants Scheme (BECGS) which has seen significant growth in the biomass heating sector over the last 5 years. The analysis was repeated in 2010 to include data from Rounds 1-5 with many installations between 50 kW - 500 kW. Improved data on large industrial sites was provided by the Wood Panel Industries Federation (WPIF). They represent the majority of wood combustion for heating (consuming 395 thousand tonnes of wood) and in 2008-09 generated 1,639 GWh. The results from the BECGS data highlighted strong generating 175 GWh (consuming 65 thousand tonnes of wood); it is anticipated that this installed figure will more than double by March 2011.

(e) Energy crops and forestry residues

7.58 Short rotation willow coppice plantations (SRC) have become well established but the rate of uptake of the technology has been very slow. Interest has also been shown in Miscanthus. Over 500 hectares of SRC have been have been planted in the south of Scotland and northern England to supply the Steven's Croft, Lockerbie 44 MWe project. Further plantings are planned to increase the supply in the coming years both for Lockerbie and Sembcorp (see below) but progress is slow. Some SRC from the plantings made for the ARBRE project (see below), have been used for co-firing in coal-fired power stations. Approximately 1,000 hectares of Miscanthus are being grown in the Staffordshire area to supply the Eccleshall 2.6 MWe power station supported by the Bioenergy Capital Grant scheme. Support for the growing of energy crops continues as part of the Rural Development Programme for England (RDPE) 2007-2013 administered by Natural England.

7.59 In England, Project ARBRE in South Yorkshire was contracted under NFFO 3 to generate 10 MW of electricity of which 8 MW were to be exported to the local grid. This project ran into difficulties

and is believed to have been abandoned. However, SembCorp Utilities UK has completed a 32 MW wood-burning power station, burning a mix of SRC, recovered wood, forestry residues and sawmill co-product at the Wilton facility on Teesside. It entered commercial operation in summer 2007. The 44 MW plant at Steven's Croft near Lockerbie has also entered commercial service, fuelled mainly by forestry, sawmill co-product, and recovered wood. There is an intention to replace 25 per cent of this fuel by SRC. The Port Talbot Bioenergy Plant, a 14 MW electric scheme firing mostly forestry residues and saw mill co-product entered service in June 2008.

(f) Straw combustion

7.60 Straw can be burnt in high temperature boilers, designed for the efficient and controlled combustion of solid fuels and biomass to supply heat, hot water and hot air systems. There are large numbers of these small-scale batch-fed whole bale boilers. The figures given are estimates based partly on 1990 information and partly on a survey of straw-fired boilers carried out in 1993-94. A 40 MW straw fired power station near Ely, Cambridgeshire is currently the only electricity generation scheme in operation.

(g) Waste combustion

7.61 Domestic, industrial and commercial wastes represent a significant resource for materials and energy recovery. Wastes may be combusted, as received, in purpose built incinerators or processed into a range of refuse derived fuels for both on-site and off-site utilisation. Only the non-biodegradable portion of waste is counted in renewables statistics although non-biodegradable wastes are included in this chapter as "below the line" items. The paragraphs below describe various categories of waste combustion in greater detail.

7.62 In 2009, 22 waste-to-energy plants were in operation, burning municipal solid waste (MSW), refuse derived fuel (RDF) and general industrial waste (GIW).

7.63 **Municipal solid waste combustion** (MSW): Information was provided from the refuse incinerator operators in the United Kingdom that practice energy recovery using the RESTATS questionnaire. This included both direct combustion of unprocessed MSW and the combustion of RDF. In the latter, process waste can be partially processed to produce coarse RDF that can then be burnt in a variety of ways. By further processing the refuse, including separating off the fuel fraction, compacting, drying and densifying, it is possible to produce an RDF pellet. This pellet has around 60 per cent of the gross calorific value of British coal. The generation from MSW has been split between biodegradable sources and non-biodegradable sources using information outlined in paragraph 7.64 below. Non-biodegradable municipal solid waste is not included in the overall renewables percentage under the international definition of renewables (see paragraph 7.1). However, such wastes are still shown in the tables accompanying this chapter as 'below the line' items.

7.64 There has been an ongoing programme of waste analysis in the UK for many years; such analyses may be carried out to an accuracy of $\pm$ 1 per cent. Such studies are guided by the use of ACORN (which stands for A Classification Of Residential Neighbourhoods) socio-economic profiles which are used to select sample areas for the analysis of household collected waste and is based on the premise that households of similar socio-economic characteristics are likely to have similar behavioural, purchasing and lifestyle characteristics; this will be reflected in the quantity and composition of waste that those households produce. MSW comprises domestic waste plus other feedstocks, such as, general industrial waste, building demolition waste and tree clippings from civil amenities. A large scale study in Wales showed that the only category in domestic waste to show a statistically significant seasonal variation was garden waste; as garden waste is a small percentage (certainly when compared to food and kitchen waste), the effect on the operation of biomass-to-energy plants should be almost unnoticed. As there is now virtually no regional variation to be seen within the UK; these data became the UK standard for the last several years. The UK domestic waste has had a biodegradable content of 67.5 per cent $\pm$ 1 per cent and this accounts for about 62.5 per cent of the energy generated from its combustion. Following the result of recent work, it has been calculated that 63.5 per cent of MSW is now formed of biodegradable material (average of Wales and Scotland using English EA guidance method), one percentage point above previous years. We have therefore used this figure for this years' survey but we will continue to review on an annual basis.

7.65 **General industrial waste combustion** (GIW): Certain wastes produced by industry and commerce can be used as a source of energy for industrial processes or space heating. These wastes include general waste from factories such as paper, cardboard, wood and plastics.

7.66 A survey conducted in 2001 noted that GIW is now burnt in MSW waste-to-energy facilities. As no sites are solely burning GIW for heat or electricity generation, this feedstock is being handled under the MSW category.

7.67 **Specialised waste combustion:** Specialised wastes arise as a result of a particular activity or process. Materials in this category include scrap tyres, hospital wastes, poultry litter, meal and bone and farm waste digestion. Although the large tyre incineration plant with energy recovery has not generated since 2000, the cement industry has burned some waste tyres in its cement and lime kilns. Although part of waste tyre combustion is of biodegradable waste, because there is no agreed method of calculating the small biodegradable content, all of the generation from waste tyres has been included under non-biodegradable wastes in this chapter (see paragraph 7.64, above).

7.68 Information on hospital waste incineration has continued to be based on a RESTATS survey, carried out by AEA in 2007, and updated in 2010, which aimed to establish if there were any changes and developments in the market. A list of sites that reclaim energy was obtained from the Environment Agency clinical waste incineration database; this was integrated in to the findings of the previous RESTATS survey, the combined list was then cleaned to ensure the contact information is both up-to-date and still relevant. Relevant sites were contacted to confirm their operational status and verify the electrical installed capacity and generation. The results revealed an ongoing process of centralisation and consolidation, as the industry responds to changes in pollution emissions and clinical waste regulations. It also documented the closure of many smaller incineration facilities with energy recovery, for which the costs of compliance with regulations were no longer viable. Despite this, the survey established that energy recovery in this field does have a future, with three new sites for power generation being developed.

7.69 One poultry litter combustion project started generating electricity in 1992; a second began in 1993. Both of these are NFFO projects. In addition, a small-scale CHP scheme began generating towards the end of 1990. However, this has now closed due to new emissions regulations. A further NFFO scheme started generating in 1998, and during 2000 an SRO scheme began to generate. A further poultry litter scheme became fully operational in 2001. One of the earlier poultry litter projects was modified to be fuelled mainly by meat and bone; two additional schemes fuelled primarily by meat and bone have also been built.

7.70 Anaerobic Digestion (AD) produces energy from wet wastes (e.g., animal slurries) in the form of biogas; this gas can be used for process heat and electricity generation. AD fermentation only occurs very slowly at the ambient temperatures found in nature and so commercially it is carried out in large heated prefabricated digestion tanks, either under mesophilic (35^{o}C) or thermophilic (55^{o}C) conditions. Different bacteria predominate at each operating temperature. These facilities would be fed primarily with farm wastes together with non-toxic, industrial organic wastes from food processing and preparation activities. The liquid digestate fertiliser may be returned to the farms when the timing for land application was right, thereby ensuring that its nutrients are better utilised.

7.71 Information on farm waste digestion in the United Kingdom is based on a survey carried out during 1991-1992 with follow-up studies in 1996 and 2005; data are also gathered via Ofgem's ROCs Register. The 2005 survey showed that number of sites using farm waste digestion fell significantly since 1996, which was mainly attributed to tightening waste regulations and lack of maintenance. However, this has not prevented new digesters being built and commissioned. There are currently 10 power generation schemes in operation, the largest of these being the centralised anaerobic digestion scheme at Holsworthy supported under NFFO 5. A new survey will be undertaken in 2011.

(h) Co-firing of biomass with fossil fuels

7.72 Co-firing of biomass fuel in fossil fuel power stations is not a new idea. Technically it has been proven in power stations worldwide, although, until 2002, it was not practised in the UK. The biomass fuel is usually fed by means of the existing stoking mechanism as a partial substitute for the fossil fuel. The combustion system may cope with up to a 25 per cent substitution without any major

changes to the boiler design and airflows, but fuel preparation and transport systems may be the limiting feature at percentages much lower than this.

7.73 Since 2002, co-firing of biomass with fossil fuels has been eligible under the RO, the first time that any renewable energy initiative has included co-firing. Compared with other renewables, co-firing is relatively low cost and quick to implement. As such, the following limits were originally placed on co-firing to prevent a high volume of co-firing reducing the value in the RO for other renewables whilst enabling markets and supply chains for biomass to develop:

- Only electricity generated before 1 April 2011 would be eligible;
- From 1 April 2006 at least 25 per cent of the biomass used must consist of energy crops.

7.74 The scheme was later extended to allow longer for an energy crop market to develop and to recognise the need to reduce CO2 emissions from coal-fired generation as the role that coal will play in the UK's generation has increased. The current position is that there is no cap on co-firing with energy crops. However, to reduce the risk of flooding the ROC market with co-fired ROCs, thereby affecting ROC prices and investor confidence adversely, there is a limit on the number of co-fired ROCs using non-energy crop biomass a supplier can present to Ofgem when demonstrating that it has met its obligation. From 2010/11 the cap has been set at 12.5 per cent; prior to this it was set at 10 per cent.

7.75 In May 2007 the Government published the Energy White Paper, "Meeting the Energy Challenge". This proposed banding the RO, where different levels of support are given to different renewable technologies which came into effect in 'Renewables Obligation 2009' on 1 April 2009. Co-firing with non-energy crops has been moved into a band receiving 0.5 ROC per MWh. This will allow more co-firing to come forward but at an appropriate support level, minimising the risk of co-firing impacting negatively on other renewables.

(i) Biodiesel and bioethanol (liquid biofuels)

7.76 In the UK biodiesel is defined for taxation purposes as diesel quality liquid fuel produced from biomass or waste vegetable and animal oils and fats, the ester content of which is not less than 96.5 per cent by weight and the sulphur content of which does not exceed 0.005 per cent by weight or is nil. Diesel fuel currently sold at a number of outlets is a blend with 5 per cent biodiesel. Bioethanol is defined for taxation purposes as a liquid fuel consisting of ethanol produced from biomass and capable of being used for the same purposes as light oil. For further information, see HMRC Notice 179E: Biofuels and other fuel substitutes, October 2009, available at http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageVAT_ShowContent&id=HMCE_CL_000205&propertyType=document#P22_1468

7.77 The Renewable Transport Fuel Obligation (RTFO), introduced in April 2008, placed a legal requirement on transport fuel suppliers (who supply more than 450,000 litres of fossil fuel per annum to the UK market) to ensure that 5 per cent (by volume) of their overall fuel sales are from a renewable source by 2013/14, with incremental levels of 2.5 per cent (by volume) for 2008/09, 3.25 per cent (by volume) in 2009/10, and 3.5 per cent (by volume) in 2010/11. Figures from HM Revenue and Customs based on road fuel taxation statistics show that 1,044 million litres of biodiesel and 317 million litres of bioethanol were consumed in 2009, up from 886 million litres and 206 million litres, respectively, in 2008 and from 347 million litres and 153 million litres, respectively, in 2007. During 2009 biodiesel accounted for 4.2 per cent of diesel, and bioethanol 1.4 per cent of motor spirit; the combined contribution of biodiesel and bioethanol was 2.9 per cent. Once the 5 per cent level is reached it is estimated that it will save around a million tonnes of carbon per annum.

Combined Heat and Power

7.78 A CHP plant is an installation where there is a simultaneous generation of usable heat and power (usually electricity) in a single process. Some CHP installations are fuelled either wholly or partially by renewable fuels. The main renewable fuel used in CHP is sewage gas, closely followed by other biomass.

7.79 Chapter 6 of this Digest summarises information on the contribution made by CHP to the United Kingdom's energy requirements in 2005 to 2009 using the results of annual studies undertaken to identify all CHP schemes (CHAPSTATS). Included in Tables 6.1 to 6.9 of that chapter is information on the contribution of renewable sources to CHP generation in each year from 2005 to

2009. Corresponding data for 1996 to 2004 are available on the DECC energy web site. The information contained in those tables is therefore a subset of the data contained within the tables presented in this chapter. There are occasionally differences in the numbers reported by CHAPSTATS compared with RESTATS that are primarily attributed to whether the electricity is considered to be 'good quality'; further details on 'good quality' CHP are to be found in Chapter 6. In addition, there are oddities with some CHP facilities where biomass and fossil fuels are both burnt (though not always as co-firing). The total installed capacity recorded for the site under CHAPSTATS can cover multiple generators, some of which only handle fossil fuels (eg. gas turbines). As it would be misleading to record the entire capacity reported in RESTATS as being potentially available for renewables generation, only the appropriate capacity figures are recorded.

Generating capacity and load factor

7.80 The electrical capacities are given in Table 7.4 as installed capacities ie the maximum continuous rating of the generating sets in the stations. In Chapter 5 Declared Net Capacity (DNC) is used, i.e. the maximum continuous rating of the generating sets in the stations, less the power consumed by the plant itself, and reduced by a specified factor to take into account the intermittent nature of the energy source e.g. 0.43 for wind, 0.365 for small hydro and 0.33 for shoreline wave. DNC represents the nominal maximum capability of a generating set to supply electricity to consumers. For electrical capacities of generation using renewables in DNC terms see Table 7.1.1 on the DECC energy web site.

7.81 Plant load factors in this chapter have been calculated in terms of installed capacity (ie the maximum continuous rating of the generating sets in the stations) and express the average hourly quantity of electricity generated as a percentage of the average of the capacities at the beginning and end of the year.

7.82 In the 2006 Digest a new term was introduced to describe the amount of electricity generated from wind farms compared with the amount that such turbines would have generated had they been available for the whole of the calendar year and running continually and at maximum output throughout the calendar year. This term is "load factor on an unchanged configuration basis". A full account of the exercise to derive these factors can be found in *Energy Trends*, March 2006 pages 28 to 32. *Energy Trends* is available on the DECC energy web site at www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx, although here the term "capacity factor" was used.

7.83 To compare the two calculations, the **load factor** for a calendar year (as historically reported in this Digest) is:

$$\frac{\text{Electricity generated during the year (kWh)}}{\text{(Installed capacity at the beginning of the year + Installed capacity at the end of the year (kW))} \times 0.5 \times 8760 \text{ hours}}$$

whilst the **load factor on an unchanged configuration basis** for a calendar year is:

$$\frac{\text{Electricity generated during the year (kWh)}}{\text{(Installed capacity of wind farms operating throughout the year with an unchanged configuration (kW))} \times 8760 \text{ hours}}$$

7.84 In addition, because load factors on an unchanged configuration basis are mainly of interest for commercial scale wind power rather than small/micro generation, turbines under 100 kW are excluded and any single turbine of 100 kW or above is considered to be a wind farm.

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7.1 Commodity balances 2009

Renewables and waste

Thousand tonnes of oil equivalent

	Wood waste	Wood	Poultry litter, meat and bone, and farm waste	Straw, SRC, and other plant-based biomass (3)	Sewage gas	Landfill gas
Supply						
Production	165	375	272	744	277	1,638
Other sources	-	-	-	-	-	-
Imports	-	-	-	415	-	-
Exports	-	-	-	-	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**165**	**375**	**272**	**1,159**	**277**	**1,638**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**165**	**375**	**272**	**1,159**	**277**	**1,638**
Transformation	**-**	**-**	**232**	**956**	**209**	**1,624**
Electricity generation	-	-	232	956	209	1,624
Major power producers	-	-	168	475	-	-
Autogenerators	-	-	64	481	209	1,624
Heat generation	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Other	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-
Other	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**165**	**375**	**40**	**203**	**68**	**14**
Industry	**165**	**-**	**38**	**69**	**-**	**14**
Unclassified	165	-	38	69	-	14
Iron and steel	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-
Other industries	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**-**
Air	-	-	-	-	-	-
Rail	-	-	-	-	-	-
Road	-	-	-	-	-	-
National navigation	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-
Other	**-**	**375**	**2**	**134**	**68**	**-**
Domestic	-	375	-	-	-	-
Public administration	-	-	-	-	68	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	2	134	-	-
Miscellaneous	-	-	-	-	-	-
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).

(2) Total supply minus total demand.

(3) SRC is short rotation coppice.

(4) Municipal solid waste, general industrial waste and hospital waste.

(5) The amount of shoreline wave and tidal included is less than 0.1 ktoe.

7.1 Commodity balances 2009 (continued)

Renewables and waste

Thousand tonnes of oil equivalent

Waste *(4)* and tyres	Geothermal and active solar heat	Hydro	Wind wave and tidal *(5)*	Liquid biofuels	Total renewables	
						Supply
1,165	72	452	800	220	6,181	Production
-	-	-	-	-	-	Other sources
-	-	-	-	789	1,203	Imports
-	-	-	-	-	-	Exports
-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	Transfers
1,165	**72**	**452**	**800**	**1,009**	**7,384**	**Total supply**
-	-	-	-	-	-	**Statistical difference** *(2)*
1,165	**72**	**452**	**800**	**1,009**	**7,384**	**Total demand**
993	**2**	**452**	**800**	**-**	**5,269**	**Transformation**
993	2	452	800	-	5,269	Electricity generation
52	-	369	594	-	1,658	Major power producers
941	2	83	206	-	3,611	Autogenerators
-	-	-	-	-	-	Heat generation
-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	Other
-	-	-	-	-	-	**Energy industry use**
-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	Oil and gas extraction
-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	Other
-	-	-	-	-	-	**Losses**
172	**70**	**-**	**-**	**1,009**	**2,115**	**Final consumption**
102	**-**	**-**	**-**	**-**	**387**	**Industry**
102	-	-	-	-	387	Unclassified
-	-	-	-	-	-	Iron and steel
-	-	-	-	-	-	Non-ferrous metals
-	-	-	-	-	-	Mineral products
-	-	-	-	-	-	Chemicals
-	-	-	-	-	-	Mechanical engineering, etc
-	-	-	-	-	-	Electrical engineering, etc
-	-	-	-	-	-	Vehicles
-	-	-	-	-	-	Food, beverages, etc
-	-	-	-	-	-	Textiles, leather, etc
-	-	-	-	-	-	Paper, printing, etc
-	-	-	-	-	-	Other industries
-	-	-	-	-	-	Construction
-	-	-	-	**1,009**	**1,009**	**Transport**
-	-	-	-	-	-	Air
-	-	-	-	-	-	Rail
-	-	-	-	1,009	1,009	Road
-	-	-	-	-	-	National navigation
-	-	-	-	-	-	Pipelines
70	**70**	**-**	**-**	**-**	**719**	**Other**
16	69	-	-	-	460	Domestic
45	0	-	-	-	114	Public administration
9	0	-	-	-	9	Commercial
-	-	-	-	-	136	Agriculture
-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	**Non energy use**

7.2 Commodity balances 2008

Renewables and waste

Thousand tonnes of oil equivalent

	Wood waste	Wood	Poultry litter, meat and bone, and farm waste	Straw, SRC, and other plant-based biomass (3)	Sewage gas	Landfill gas
Supply						
Production	162r	359	296	487r	232r	1,574
Other sources	-	-	-	-	-	-
Imports	-	-	-	416	-	-
Exports	-	-	-	-	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**162r**	**359**	**296**	**903r**	**232r**	**1,574**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**162r**	**359**	**296**	**903r**	**232r**	**1,574**
Transformation	**-**	**-**	**253**	**715**	**179r**	**1,560**
Electricity generation	-	-	253	715	179r	1,560
Major power producers	-	-	170	524	-	-
Autogenerators	-	-	83	191	179r	1,560
Heat generation	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Other	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-
Other	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**162r**	**359**	**42**	**188r**	**52r**	**14**
Industry	**162r**	**-**	**40**	**56**	**-**	**14**
Unclassified	162r	-	40	56	-	14
Iron and steel	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-
Other industries	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**-**
Air	-	-	-	-	-	-
Rail	-	-	-	-	-	-
Road	-	-	-	-	-	-
National navigation	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-
Other	**-**	**359**	**2**	**132r**	**52r**	**-**
Domestic	-	359	-	-	-	-
Public administration	-	-	-	-	52r	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	2	132r	-	-
Miscellaneous	-	-	-	-	-	-
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).

(2) Total supply minus total demand.

(3) SRC is short rotation coppice.

(4) Municipal solid waste, general industrial waste and hospital waste.

(5) The amount of shoreline wave included is less than 0.05 ktoe.

7.2 Commodity balances 2008 (continued)

Renewables and waste

Thousand tonnes of oil equivalent

Waste *(4)* and tyres	Geothermal and active solar heat	Hydro	Wind and wave *(5)*	Liquid biofuels	Total renewables	
						Supply
1,002	58	444	610	294	5,518r	Production
-	-	-	-	-	-	Other sources
-	-	-	-	532	948	Imports
-	-	-	-	-	-	Exports
-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	Transfers
1,002	**58**	**444**	**610**	**825**	**6,466r**	**Total supply**
-	-	-	-	-	-	**Statistical difference** *(2)*
1,002	**58**	**444**	**610**	**825**	**6,466r**	**Total demand**
817	**1**	**444**	**610**	**5**	**4,586r**	**Transformation**
817	1	444	610	5	4,586r	Electricity generation
56	-	363	461	-	1,574	Major power producers
761	1	81	150	5	3,012r	Autogenerators
-	-	-	-	-	-	Heat generation
-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	Other
-	-	-	-	-	-	**Energy industry use**
-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	Oil and gas extraction
-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	Other
-	-	-	-	-	-	**Losses**
185	**57**	**-**	**-**	**821**	**1,880r**	**Final consumption**
119	**-**	**-**	**-**	**-**	**391r**	**Industry**
119	-	-	-	-	391r	Unclassified
-	-	-	-	-	-	Iron and steel
-	-	-	-	-	-	Non-ferrous metals
-	-	-	-	-	-	Mineral products
-	-	-	-	-	-	Chemicals
-	-	-	-	-	-	Mechanical engineering, etc
-	-	-	-	-	-	Electrical engineering, etc
-	-	-	-	-	-	Vehicles
-	-	-	-	-	-	Food, beverages, etc
-	-	-	-	-	-	Textiles, leather, etc
-	-	-	-	-	-	Paper, printing, etc
-	-	-	-	-	-	Other industries
-	-	-	-	-	-	Construction
-	-	-	-	**821**	**821**	**Transport**
-	-	-	-	-	-	Air
-	-	-	-	-	-	Rail
-	-	-	-	821	821	Road
-	-	-	-	-	-	National navigation
-	-	-	-	-	-	Pipelines
66	**57**	**-**	**-**	**-**	**668r**	**Other**
16	56	-	-	-	430	Domestic
39	0	-	-	-	92r	Public administration
11	0	-	-	-	12	Commercial
-	-	-	-	-	134r	Agriculture
-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	**Non energy use**

7.3 Commodity balances 2007

Renewables and waste

Thousand tonnes of oil equivalent

	Wood waste	Wood	Poultry litter, meat and bone, and farm waste	Straw, SRC, and other plant-based biomass (3)	Sewage gas	Landfill gas
Supply						
Production	101	332	270	506r	215r	1,547
Other sources	-	-	-	-	-	-
Imports	-	-	-	378	-	-
Exports	-	-	-	-	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**101**	**332**	**270**	**884r**	**215r**	**1,547**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**101**	**332**	**270**	**884r**	**215r**	**1,547**
Transformation	**-**	**-**	**223**	**776**	**165r**	**1,534**
Electricity generation	-	-	223	776	165r	1,534
Major power producers	-	-	146	422	-	-
Autogenerators	-	-	77	354	165r	1,534
Heat generation	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Other	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-
Other	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**101**	**332**	**48**	**109r**	**51r**	**14**
Industry	**101**	**-**	**46**	**25**	**-**	**14**
Unclassified	101	-	46	25	-	14
Iron and steel	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-
Other industries	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**-**
Air	-	-	-	-	-	-
Rail	-	-	-	-	-	-
Road	-	-	-	-	-	-
National navigation	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-
Other	**-**	**332**	**2**	**83r**	**51r**	**-**
Domestic	-	332	-	-	-	-
Public administration	-	-	-	-	51r	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	2	83r	-	-
Miscellaneous	-	-	-	-	-	-
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).

(2) Total supply minus total demand.

(3) SRC is short rotation coppice.

(4) Municipal solid waste, general industrial waste and hospital waste.

(5) The amount of shoreline wave included is less than 0.05 ktoe.

7.3 Commodity balances 2007 (continued)

Renewables and waste

Thousand tonnes of oil equivalent

Waste *(4)* and tyres	Geothermal and active solar heat	Hydro	Wind and wave *(5)*	Liquid biofuels	Total renewables	
						Supply
956	47	438	453	396	5,262r	Production
-	-	-	-	-	-	Other sources
-	-	-	-	-	378	Imports
-	-	-	-	-34	-34	Exports
-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	Transfers
956	**47**	**438**	**453**	**362**	**5,606r**	**Total supply**
-	-	-	-	-	-	**Statistical difference** *(2)*
956	**47**	**438**	**453**	**362**	**5,606r**	**Total demand**
785	**1**	**438**	**453**	**-**	**4,374r**	**Transformation**
785	1	438	453	-	4,374r	Electricity generation
58	-	356	307	-	1,288	Major power producers
727	1	81	147	-	3,085r	Autogenerators
-	-	-	-	-	-	Heat generation
-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	Other
-	-	-	-	-	-	**Energy industry use**
-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	Oil and gas extraction
-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	Other
-	-	-	-	-	-	**Losses**
171	**46**	**-**	**-**	**362**	**1,233r**	**Final consumption**
90	**-**	**-**	**-**	**-**	**276**	**Industry**
90	-	-	-	-	276	Unclassified
-	-	-	-	-	-	Iron and steel
-	-	-	-	-	-	Non-ferrous metals
-	-	-	-	-	-	Mineral products
-	-	-	-	-	-	Chemicals
-	-	-	-	-	-	Mechanical engineering, etc
-	-	-	-	-	-	Electrical engineering, etc
-	-	-	-	-	-	Vehicles
-	-	-	-	-	-	Food, beverages, etc
-	-	-	-	-	-	Textiles, leather, etc
-	-	-	-	-	-	Paper, printing, etc
-	-	-	-	-	-	Other industries
-	-	-	-	-	-	Construction
-	-	-	-	**362**	**362**	**Transport**
-	-	-	-	-	-	Air
-	-	-	-	-	-	Rail
-	-	-	-	362	362	Road
-	-	-	-	-	-	National navigation
-	-	-	-	-	-	Pipelines
81	**46**	**-**	**-**	**-**	**594r**	**Other**
23	45	-	-	-	400	Domestic
39	0	-	-	-	90r	Public administration
19	0	-	-	-	20	Commercial
-	-	-	-	-	85r	Agriculture
	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	**Non energy use**

7.4 Capacity of, and electricity generated from, renewable sources

	2005	2006	2007	2008	2009
Installed Capacity (MWe) (1)					
Wind:					
Onshore	1,351.2	1,650.7	2,083.4	2,820.2	3,483.2
Offshore (2)	213.8	303.8	393.8	586.0	941.2
Shoreline wave / tidal	0.5	0.5	0.5	0.5	2.5
Solar photovoltaics	10.9	14.3	18.1	22.5	26.5
Hydro:					
Small scale	157.9	153.4	166.2	173.3	186.3
Large scale (3)	1,343.2	1,361.4	1,358.7	1,456.5	1,458.5
Biomass:					
Landfill gas	817.8	856.2	900.6	908.3	984.9
Sewage sludge digestion	137.8r	144.6r	151.0r	148.5r	157.7
Municipal solid waste combustion	314.6	326.5	326.4	375.9	392.0
Animal Biomass (4)	86.6	88.9	114.4	114.4	119.3
Plant Biomass (5)	99.5	132.4	189.5	197.7r	278.5
Total biomass and wastes	1,456.4	1,548.6r	1,681.9r	1,744.7r	1,932.4
Total	**4,533.8r**	**5,032.6r**	**5,702.6r**	**6,803.7r**	**8,030.6**
Co-firing (6)	308.8	310.2	247.6	226.9	254.7
Generation (GWh)					
Wind:					
Onshore (7)	2,501	3,574	4,491	5,792	7,564
Offshore (8)	403	651	783	1,305	1,740
Solar photovoltaics	8	11	14	17	20
Hydro:					
Small scale	444	478	534	568	598
Large scale (3)	4,478	4,115	4,554	4,600	4,664
Biomass:					
Landfill gas	4,290	4,424	4,677	4,757	4,952
Sewage sludge digestion	466r	447r	502r	547r	638
Municipal solid waste combustion (9)	964	1,083	1,177	1,226	1,511
Co-firing with fossil fuels	2,533	2,528	1,956	1,613	1,806
Animal Biomass (10)	468	434	555	587	620
Plant Biomass (11)	382	363	409	568	1,109
Total biomass	9,102r	9,279r	9,276r	9,298r	10,636
Total generation	**16,936**	**18,108r**	**19,652r**	**21,580r**	**25,222**
Non-biodegradable wastes (12)	578	651	707	736	874
Load factors (per cent) (13)					
Onshore wind	26.4	27.2	27.5	27.0	27.4
Offshore wind	27.2	28.7	25.6	30.4	26.0
Hydro	37.5	34.8	38.2	37.4	36.7
Biomass (excluding co-firing)	58.5	56.2	56.7	56.1r	60.3
Total (including wastes)	41.2	38.7	39.1	37.8	37.4
Load factors on an unchanged configuration basis (per cent) (14)					
Onshore wind	28.1	26.7	27.3	29.4	26.9
Offshore wind (from 2006 only)	..	27.5	28.3	34.9	33.7

(1) Capacity on a DNC basis is shown in Long Term Trends Table 7.1.1 available on the DECC web site - see paragraph 7.80.
(2) From 2007 onwards excludes Beatrice (10 MW) which was only supplying an offshore oil platform.
(3) Excluding pumped storage stations. Capacities are as at the end of December.
(4) Includes the use of farm waste digestion, poultry litter and meat and bone.
(5) Includes the use of waste tyres, straw combustion, short rotation coppice and hospital waste.
(6) This is the amount of fossil fuelled capacity used for co-firing of renewables based on the proportion of generation accounted for by the renewable source.
(7) Actual generation figures are given where available, but otherwise are estimated using a typical load factor or the design load factor, where known.
(8) Latest years include electricity from shoreline wave and tidal, but this amounts to less than 1 GWh. Generation by Beatrice excluded (see note 2).
(9) Biodegradable part only.
(10) Includes the use of farm waste digestion, poultry litter combustion and meat and bone combustion.
(11) Includes the use of straw and energy crops.
(12) Non-biodegradable part of municipal solid waste plus waste tyres, hosptal waste and general industrial waste.
(13) Load factors are calculated based on installed capacity at the beginning and the end of the year - see paragraph 7.81.
(14) For a definition see paragraphs 7.82 and 7.83.

7.5 Electricity generated from renewable sources - Renewables Obligation basis

GWh

	2005	2006	2007	2008	2009
Generation : Renewables Obligation basis					
Wind:					
Onshore (1)	2,501	3,574	4,491	5,792	7,564
Offshore (2)	403	651	783	1,305	1,740
Solar photovoltaics	8	11	14	17	20
Hydro:					
Small scale (1)	444	478	534	568	598
Other hydro including refurbished large scale	1,542	1,969	1,912	1,926r	2,016
Biomass:					
Landfill gas	4,290	4,424	4,677	4,757	4,952
Sewage sludge digestion	466r	447r	502r	547r	638
Co-firing with fossil fuels	2,533	2,528	1,956	1,613	1,806
Animal Biomass (3)	468	434	555	587	620
Plant Biomass (4)	382	363	409	568	1,109
Total biomass	8,138r	8,196r	8,098r	8,072r	9,126
Total renewables generation on an obligation basis (5)	**13,036r**	**14,879r**	**15,833r**	**17,680r**	**21,063**

(1) Actual generation figures are given where available, but otherwise are estimated using a typical load factor or the design load factor, where known.
(2) Includes electricity from shoreline wave and tidal, but this amounts to less than 1 GWh.
(3) Includes the use of farm waste digestion, poultry litter combustion and meat and bone combustion.
(4) Includes the use of straw and energy crops.
(5) See paragraph 7.7 for definitions.

7.6 Renewable sources used to generate electricity and heat and for transport fuels[1][2]

Thousand tonnes of oil equivalent

	2005	2006	2007	2008	2009
Used to generate electricity (3)					
Wind:					
Onshore	215.1	307.3	386.2	498.0	650.4
Offshore (4)	34.6	56.0	67.3	112.2	149.6
Solar photovoltaics	0.7	0.9	1.2	1.5	1.7
Hydro:					
Small scale	38.2	41.1	46.0	48.8	51.4
Large scale (5)	385.0	353.9	391.6	395.5	401.0
Biomass:					
Landfill gas	1,407.2	1,451.1	1,533.9	1,560.3	1,624.2
Sewage sludge digestion	152.8r	146.7r	164.6r	179.3r	209.4
Municipal solid waste combustion (6)	426.3	479.0	486.8	506.8	624.5
Co-firing with fossil fuels	830.7	829.0	641.4	528.9	592.3
Animal Biomass (7)	161.5	148.5	222.5	253.3	231.9
Plant Biomass (8)	125.2	119.0	134.1	186.3	363.8
Liquid biofuels	-	-	-	4.8	-
Total biomass	3,103.6r	3,173.3r	3,183.2r	3,219.6r	3,646.0
Total	**3,777.2r**	**3,932.5**	**4,075.4r**	**4,275.7r**	**4,900.2**
Non-biodegradable wastes (9)	262.0	293.7	298.3	310.3	368.6
Used to generate heat					
Active solar heating	29.4	36.3	44.9	55.7	69.5
Biomass:					
Landfill gas	13.6	13.6	13.6	13.6	13.6
Sewage sludge digestion	52.9r	44.6r	50.6r	52.4r	67.9
Wood combustion - domestic	265.6	298.8	332.0	358.6	375.2
Wood combustion - industrial	93.1	97.0	101.2	162.3r	164.6
Animal Biomass (10)	14.4	24.9	47.8	42.4	40.3
Plant Biomass (11)	92.4r	103.0r	108.8r	188.1r	203.0
Municipal solid waste combustion (6)	33.7	33.7	33.7	31.5	31.3
Total biomass	565.8r	615.6r	687.8r	848.8r	895.8
Geothermal aquifers	0.8	0.8	0.8	0.8	0.8
Total	**596.0r**	**652.7r**	**733.5r**	**905.4r**	**966.0**
Non-biodegradable wastes (9)	127.5	111.6	137.3	153.7	140.4
Renewable sources used as transport fuels					
as Bioethanol	47.9	53.4	85.8	115.8	177.9
as Biodiesel	26.1	134.4	275.9	705.0	830.7
Total	**74.1**	**187.8**	**361.7**	**820.7**	**1,008.6**
Total use of renewable sources and wastes					
Solar heating and photovoltaics	30.1	37.2	46.1	57.2	71.2
Onshore and offshore wind (4)	249.7	363.3	453.5	610.3	800.0
Hydro	423.2	394.9	437.5	444.4	452.4
Biomass	3,669.4r	3,788.9r	3,871.0r	4,068.5r	4,541.8
Geothermal aquifers	0.8	0.8	0.8	0.8	0.8
Transport fuels	74.1	187.8	361.7	820.7	1,008.6
Total	**4,447.2r**	**4,772.9r**	**5,170.6r**	**6,001.8r**	**6,874.9**
Non-biodegradable wastes (9)	389.5	405.3	435.6	464.1	509.0
All renewables and wastes (12)	**4,836.7r**	**5,178.2r**	**5,606.3r**	**6,465.9r**	**7,383.8**

(1) Includes some waste of fossil fuel origin.
(2) See paragraphs 7.35 to 7.84 for technical notes and definitions of the categories used in this table
(3) For wind, solar PV and hydro, the figures represent the energy content of the electricity supplied but for biomass the figures represent the energy content of the fuel used.
(4) Latest years includes electricity from shoreline wave and tidal but this is less than 0.1 ktoe.
(5) Excluding pumped storage stations.
(6) Biodegradable part only.
(7) Includes electricity from farm waste digestion, poultry litter combustion and meat and bone combustion.
(8) Includes electricity from straw and energy crops.
(9) Non-biodegradable part of municipal solid waste plus waste tyres, hospital waste, and general industrial waste.
(10) Includes heat from farm waste digestion, meat and bone combustion and sewage sludge combustion.
(11) Includes heat from straw, energy crops, paper and packaging.
(12) The figures in this row correspond to the total demand and total supply figures in Tables 7.1, 7.2 and 7.3.

7.7 Renewable sources data used to indicate progress under the EU Renewable Energy Directive 2008 (measured using net calorific values)

Thousand tonnes of oil equivalent

	2005	2006	2007	2008	2009
Electricity generation:					
Normalised hydro generation *(1)*	393	395	393	422	422
Normalised wind generation *(2)*	242	351	444	602	803
Electricity generation from renewables other than wind, hydro, and compliant biofuels	783	799	799	801	916
Electricity generation from compiant biofuels	-	-	-	-	-
Total renewable generation from all compliant sources	1,419	1,545	1,636	1,825	2,141
Total Gross Electricity Consumption	34,717	34,476	34,238	33,991	32,231
Percentage of electricity from renewable sources	4.1%	4.5%	4.8%	5.4%	6.6%
Heat:					
Renewable energy for heating and cooling	569	608	693	851	899
Total Gross energy consumption for heating and cooling	65,104	62,429	59,962	60,802	55,000
Percentage of heating and cooling energy from renewable sources	0.9%	1.0%	1.2%	1.4%	1.6%
Transport:					
Road transport renewable electricity	-	-	-	-	-
Non-road transport renewable electricity	31	32	35	42	50
Biofuels	69	180	349	798	978
Total electricity consumption in transport	758	708	740	779	754
Total petrol and diesel consumption in transport	42,008	42,546	42,650	41,397	39,667
Percentage of transport energy from renewable soruces	0.2%	0.5%	0.9%	2.0%	2.5%
Overall target:					
Renewables used for:					
Electricity generation	1,419	1,545	1,636	1,825	2,141
Heat	569	608	693	851	899
Transport	69	180	349	798	978
Total Final Consumption of Renewable Energy	2,057	2,334	2,679	3,474	4,018
Total Final Energy Consumption *(3)*	150,333	148,141	145,636	145,151	135,468
plus Distribution losses for electricity	2,399	2,367	2,308	2,401	2,298
plus Distribution losses for heat	-	-	-	-	-
plus Consumption of electricity in the electricity and heat generation sectors	1,537	1,591	1,521	1,399	1,417
plus Consumption of heat in the electricity and heat generation sectors	-	-	-	-	-
Gross Final Energy Consumption (GFEC)	154,269	152,099	149,466	148,950	139,182
of which Air transport	13,163	13,299	13,211	12,755	12,094
Air transport as a proportion of GFEC	8.53%	8.74%	8.84%	8.56%	8.69%
Air transport cap specificed in Directive	6.18%	6.18%	6.18%	6.18%	6.18%
Capped air transport	9,534	9,400	9,237	9,205	8,601
Capped Gross Final Energy Consumption (CGFEC)	150,639	148,200	145,492	145,401	135,690
Renewables consumption as a percentage of Capped Gross Final Energy Consumption	1.4%	1.6%	1.8%	2.4%	3.0%

(1) Based on a 15 year average hydro load factor; excludes generation from pumped storage.
(2) Based on a 5 year average wind load factor.
(3) Total final consumption less non-energy use, as shown in Annex I, Table I.1, available on the DECC website

Digest of United Kingdom Energy Statistics 2010

Annexes

Annex A: Energy and commodity balances, conversion factors and calorific values

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Annex D: Major events in the Energy Industry, 2008-2010

Department of Energy and Climate Change

Annex A
Energy and commodity balances, conversion factors and calorific values

Balance principles

A.1 This Annex outlines the principles behind the balance presentation of energy statistics. It covers these in general terms. Fuel specific details are given in the appropriate chapters of this publication.

A.2 Balances are divided into two types, each of which performs a different function.

a) *commodity balance* – a balance for each energy commodity that uses the units usually associated with that commodity. By using a single column of figures, it shows the flow of the commodity from its sources of supply through to its final use. Commodity balances are presented in the individual fuel chapters of this publication.

b) energy balance - presents the commodity balances in a common unit and places them alongside one another in a manner that shows the dependence of the supply of one commodity on another. This is useful as some commodities are manufactured from others. The layout of the energy balance also differs slightly from the commodity balance. The energy balance format is used in Chapter 1.

A.3 Energy commodities can be either primary or secondary. Primary energy commodities are drawn (extracted or captured) from natural reserves or flows, whereas secondary commodities are produced from primary energy commodities. Crude oil and coal are examples of primary commodities, whilst petrol and coke are secondary commodities manufactured from them. For balance purposes, electricity may be considered to be both primary electricity (for example, hydro, wind) or secondary (produced from steam turbines using steam from the combustion of fuels).

A.4 Both commodity and energy balances show the flow of the commodity from its production, extraction or import through to its final use.

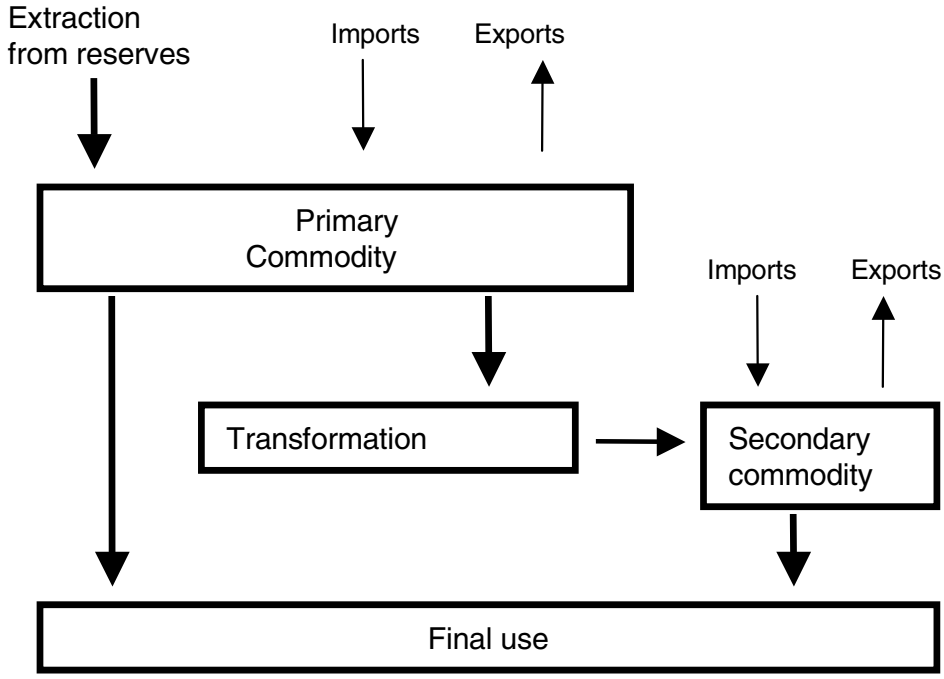
A.5 A simplified model of the commodity flow underlying the balance structure is given in Chart A.1. It illustrates how primary commodities may be used directly and/or be transformed into secondary commodities. The secondary fuels then enter final consumption or may also be transformed into another energy commodity (for example, electricity produced from fuel oil). To keep the diagram simple these “second generation” flows have not been shown.

A.6 The arrows at the top of the chart represent flows to and from the “pools” of primary and secondary commodities, from imports and exports and, in the case of the primary pool, extraction from reserves (eg the production of coal, gas and crude oil).

Commodity balances (Tables 2.1 to 2.6, 3.1 to 3.4, 4.1, 5.1, 5.3 and 7.1 to 7.3)

A.7 A commodity balance comprises a supply section and a demand section. The supply section gives available sources of supply (ie exports are subtracted). The demand section is divided into a transformation section, a section showing uses in the energy industries (other than for transformation) and a section covering uses by final consumers for energy or non-energy purposes. Final consumption for energy purposes is divided into use by sector of economic activity. The section breakdowns are described below.

Chart A.1: Energy flows



Supply

Production

A.8 Production, within the commodity balance, covers indigenous production (extraction or capture of primary commodities) and generation or manufacture of secondary commodities. Production is always gross, that is, it includes the quantities used during the extraction or manufacturing process.

Other sources

A.9 Production from other sources covers sources of supply that do not represent "new" supply. These may be recycled products, recovered fuels (slurry or waste coal), or electricity from pumped storage plants. The production of these quantities will have been reported in an earlier accounting period or have already been reported in the current period of account. Exceptionally, the *Other sources* row in the commodity balances for ethane, propane and butane is used to receive transfers of these hydrocarbons from gas stabilisation plants at North Sea terminals. In this manner, the supplies of primary ethane, propane and butane from the North Sea are combined with the production of these gases in refineries, so that the disposals may be presented together in the balances.

Imports and exports

A.10 The figures for imports and exports relate to energy commodities moving into or out of the United Kingdom as part of transactions involving United Kingdom companies. Exported commodities are produced in the United Kingdom and imported commodities are for use within the United Kingdom (although some may be re-exported before or after transformation). The figures thus exclude commodities either exported from or imported into HM Revenue and Customs bonded areas or warehouses. These areas, although part of the United Kingdom, are regarded as being outside of the normal United Kingdom's customs boundary, and so goods entering into or leaving them are not counted as part of the statistics on trade used in the balances.

A.11 Similarly, commodities that only pass through the United Kingdom on their way to a final destination in another country are also excluded. However, for gas these transit flows are included because it is difficult to identify this quantity separately, without detailed knowledge of the contract information covering the trade. This means that for gas, there is some over statement of the level of imports and exports, but the net flows are correct.

A.12 The convention in these balances is that exports are shown with a negative sign.

Marine bunkers

A.13 These are deliveries of fuels (usually fuel oil or gas oil) to ships of any flag (including the United Kingdom) for consumption during the voyage to other countries. Marine bunkers are treated rather like exports and shown with a negative sign.

Stock changes

A.14 Additions to (- sign) and withdrawals from stocks (+ sign) held by producers and transformation industries correspond to withdrawals from and additions to supply, respectively.

Transfers

A.15 There are several reasons why quantities may be transferred from one commodity balance to another:

- a commodity may no longer meet the original specification and be reclassified;
- the name of the commodity may change through a change in use;
- to show quantities returned to supply from consumers. These may be by-products of the use of commodities as raw materials rather than fuels.

A.16 A quantity transferred from a balance is shown with a negative sign to represent a withdrawal from supply and with a positive sign in the receiving commodity balance representing an addition to its supply.

Total supply

A.17 The total supply available for national use is obtained by summing the flows above this entry in the balance.

Total demand

A.18 The various figures for the disposals and/or consumption of the commodities are summed to provide a measure of the demand for them. The main categories or sectors of demand are described in paragraphs A.31 to A.42.

Statistical difference

A.19 Any excess of supply over demand is shown as a statistical difference. A negative figure indicates that demand exceeds supply. Statistical differences arise when figures are gathered from a variety of independent sources and reflect differences in timing, in definition of coverage of the activity, or in commodity definition. Differences also arise for methodological reasons in the measurement of the flow of the commodity eg if there are differences between the volumes recorded by the gas producing companies and the gas transporting companies. A non-zero statistical difference is normal and, provided that it is not too large, is preferable to a statistical difference of zero as this suggests that a data provider has adjusted a figure to balance the account.

Transformation

A.20 The transformation section of the balance covers those processes and activities that transform the original primary (and sometimes secondary) commodity into a form which is better suited for specific uses than the original form. Most of the transformation activities correspond to particular energy industries whose main business is to manufacture the product associated with them. Certain activities involving transformation take place to make products that are only partly used for energy needs (coke oven coke) or are by-products of other manufacturing processes (coke oven and blast furnace gases). However, as these products and by-products are then used, at least in part, for their energy content they are included in the balance system.

A.21 The figures given under the activity headings of this section represent the quantities used for transformation. The production of the secondary commodities will be shown in the *Production* row of the corresponding commodity balances.

Electricity generation

A.22 The quantities of fuels burned for the generation of electricity are shown in their commodity balances under this heading. The activity is divided into two parts, covering the major power

producers (for whom the main business is the generation of electricity for sale) and autogenerators (whose main business is not electricity generation but who produce electricity for their own needs and may also sell surplus quantities). The amounts of fuels shown in the balance represent the quantities consumed for the gross generation of electricity. Where a generator uses combined heat and power plant, the figures include only the part of the fuel use corresponding to the electricity generated.

A.23 In relation to autogenerators' data, the figures for quantities of fuel used for electricity generation appear under the appropriate fuel headings in the *Transformation* section heading for *Autogenerators,* whilst the electricity generated appears in the *Electricity* column under *Production*. A breakdown of the information according to the branch of industry in which the generation occurs is not shown in the balance but is given in Chapter 1, Table 1.9. The figures for energy commodities consumed by the industry branches shown under final consumption include all use of electricity, but exclude the fuels combusted by the industry branches to generate the electricity.

Heat generation

A.24 The quantities of fuel burned to generate heat that is sold under the provision of a contract to a third party are shown in their commodity balances under this heading. It includes heat that is generated and sold by combined heat and power plants and by community heating schemes (also called district heating).

Petroleum refineries

A.25 Crude oil, natural gas liquids and other oils needed by refineries for the manufacture of finished petroleum products are shown under this heading.

Coke manufacture and blast furnaces

A.26 Quantities of coal for coke ovens and all fuels used within blast furnaces are shown under this heading. The consumption of fuels for heating coke ovens and the blast air for blast furnaces are shown under *Energy industry use*.

Patent fuel manufacture

A.27 The coals and other solid fuels used for the manufacture of solid patent fuels are reported under this heading.

Other

A.28 Any minor transformation activities not specified elsewhere are captured under this heading.

Energy industry use

A.29 Consumption by both extraction and transformation industries to support the transformation process (but not for transformation itself) are included here according to the energy industry concerned. Typical examples are the consumption of electricity in power plants (eg for lighting, compressors and cooling systems) and the use of extracted gases on oil and gas platforms for compressors, pumps and other uses. The headings in this section are identical to those used in the transformation section with the exception of *Pumped storage*. In this case, the electricity used to pump the water to the reservoir is reported.

Losses

A.30 This heading covers the intrinsic losses that occur during the transmission and distribution of electricity and gas (including manufactured gases). Other metering and accounting differences for gas and electricity are within the statistical difference, as are undeclared losses in other commodities.

Final consumption

A.31 *Final consumption* covers both final energy consumption (by different consuming sectors) and the use of energy commodities for non-energy purposes, that is *Non energy use*. Final consumption occurs when the commodities used are not for transformation into secondary commodities. The energy concerned disappears from the account after use. Any fuel used for electricity generation by final consumers is identified and reported separately within the transformation section. When an enterprise generates electricity, the figure for final consumption of the industrial sector to which the enterprise belongs includes its use of the electricity it generates itself (as well as supplies of electricity it purchases from others) but does not include the fuel used to generate that electricity.

A.32 The classification of consumers according to their main business follows, as far as practicable, the *Standard Industrial Classification (SIC2003).* The qualifications to, and constraints on, the classification are described in the technical notes to Chapter 1. Table 1E in Chapter 1 shows the breakdown of final consumers used, and how this corresponds to the SIC2003.

Industry

A.33 Two sectors of industry (iron and steel and chemicals) require special mention because the activities they undertake fall across the transformation, final consumption and non-energy classifications used for the balances. Also, the data permitting an accurate allocation of fuel use within each of these major divisions are not readily available.

Iron and steel

A.34 The iron and steel industry is a heavy energy user for transformation and final consumption activities. Figures shown under final consumption for this industry branch reflect the amounts that remain after quantities used for transformation and energy sector own use have been subtracted from the industry's total energy requirements. Use of fuels for transformation by the industry may be identified within the transformation section of the commodity balances.

A.35 The amounts of coal used for coke manufacture by the iron and steel industry are in the transformation section of the coal balance. Included in this figure is the amount of coal used for coke manufacture by the companies outside of the iron and steel industry, ie solid fuel manufacturers. The corresponding production of coke and coke oven gas may be found in the commodity balances for these products. The use of coke in blast furnaces is shown in the commodity balance for coke, and the gases produced from blast furnaces and the associated basic oxygen steel furnaces are shown in the production row of the commodity balance for blast furnace gas.

A.36 Fuels used for electricity generation by the industry are included in the figures for electricity generation by autogenerators and are not distinguishable as being used by the iron and steel sector in the balances. Electricity generation and fuel used for this by broad industry group are given in Table 1.9.

A.37 Fuels used to support coke manufacture and blast furnace gas production are included in the quantities shown under *Energy industry use.* These gases and other fuels do not enter coke ovens or blast furnaces, but are used to heat the ovens and the blast air supplied to furnaces.

Chemicals

A.38 The petro-chemical industry uses hydrocarbon fuels (mostly oil products and gases) as feedstock for the manufacture of its products. Distinguishing the energy use of delivered fuels from their non-energy use is complicated by the absence of detailed information. The procedures adopted to estimate the use are described in paragraphs A.41 and A.42 under *Non energy use*.

Transport

A.39 Figures under this heading are almost entirely quantities used strictly for transport purposes. However, the figures recorded against road transport usually include some fuel that is actually consumed in some "off-road" activities. Similarly, figures for railway fuels include some amounts of burning oil not used directly for transport purposes. Transport sector use of electricity includes all electricity used in industries classified to SIC2003 Groups 60 to 63. Fuels supplied to cargo and passenger ships undertaking international voyages are reported as *Marine bunkers* (see paragraph A.13). Supplies to fishing vessels are included under "agriculture".

Other sectors

A.40 The classification of all consumers groups under this heading, except *domestic*, follows *SIC2003* and is described in Table 1E in Chapter 1. The consistency of the classification across different commodities cannot be guaranteed because the figures reported are dependent on what the data suppliers can provide.

Non energy use

A.41 The non energy use of fuels may be divided into two types. They may be used directly for their physical properties e.g. lubricants or bitumen used for road surfaces, or by the petro-chemical

industry as raw materials for the manufacture of goods such as plastics. In their use by the petro-chemical industry, relatively little combustion of the fuels takes place and the carbon and/or hydrogen they contain are largely transferred into the finished product. However, in some cases heat from the manufacturing process or from combustion of by-products may be used. Data for this energy use are rarely available. Depending on the feedstock, non energy consumption is either estimated or taken to be the deliveries to the chemicals sector.

A.42 Both types of non energy use are shown under the *Non energy use* heading at the foot of the balances.

The energy balance (Tables 1.1 to 1.3)

Principles

A.43 The energy balance conveniently presents:

- an overall view of the United Kingdom's energy supplies;
- the relative importance of each energy commodity;
- dependence on imports;
- the contribution of our own fossil and renewable resources;
- the interdependence of commodities on one another.

A.44 The energy balance is constructed directly from the commodity balances by expressing the data in a common unit, placing them beside one another and adding appropriate totals. Heat sold is also included as a fuel. However, some rearrangement of the commodity balance format is required to show transformation of primary into secondary commodities in an easily understood manner.

A.45 Energy units are widely used as the common unit, and the current practice for the United Kingdom and the international organisations which prepare balances is to use the tonne of oil equivalent or a larger multiple of this unit, commonly thousands. One tonne of oil equivalent is defined as 10^7 kilocalories (41.868 gigajoules). The tonne of oil equivalent is another unit of energy like the gigajoule, kilocalorie or kilowatt hour, rather than a physical quantity. It has been chosen as it is easier to visualise than the other units. Due to the natural variations in heating value of primary fuels such as crude oil, it is rare that one tonne of oil has an energy content equivalent to one tonne of oil equivalent, however it is generally within a few per cent of the heating value of a tonne of oil equivalent. The energy figures are calculated from the natural units of the commodity balances by multiplying by factors representing the calorific (heating) value of the fuel. The gross calorific values of fuels are used for this purpose. When the natural unit of the commodity is already an energy unit (electricity in kilowatt hours, for example) the factors are just constants, converting one energy unit to another.

A.46 Most of the underlying definitions and ideas of commodity balances can be taken directly over into the energy balance. However, production of secondary commodities and, in particular, electricity are treated differently and need some explanation. The components of the energy balance are described below, drawing out the differences of treatment compared with the commodity balances.

Primary supply

A.47 Within the energy balance, the production row covers only extraction of primary fuels and the generation of primary energy (hydro, nuclear, wind). Note the change of row heading from *Production* in the commodity balances to *Indigenous production* in the energy balance. Production of secondary fuels and secondary electricity are shown in the transformation section and not in the indigenous production row at the top of the balance.

A.48 For fossil fuels, indigenous production represents the marketable quantity extracted from the reserves. Indigenous production of *Primary electricity* comprises hydro-electricity, wind and nuclear energy. The energy value for hydro-electricity is taken to be the energy content of the electricity produced from the hydro power plant and not the energy available in the water driving the turbines. A similar approach is adopted for electricity from wind generators. The electricity is regarded as the primary energy form because there are currently no other uses of the energy resource "upstream" of the generation. The energy value attached to nuclear electricity is discussed in paragraph A.52.

A.49 The other elements of the supply part of the balance are identical to those in the commodity balances. In particular, the sign convention is identical, so that figures for exports and international marine bunkers carry negative signs. A stock build carries a negative sign to denote it as a withdrawal from supply whilst a stock draw carries a positive sign to show it as an addition to supply.

A.50 The *Primary supply* is the sum of the figures above it in the table, taking account of the signs, and expresses the national requirement for primary energy commodities from all sources and foreign supplies of secondary commodities. It is an indicator of the use of indigenous resources and external energy supplies. Both the amount and mixture of fuels in final consumption of energy commodities in the United Kingdom will differ from the primary supply. The "mix" of commodities in final consumption will be much more dependent on the manufacture of secondary commodities, in particular electricity.

Transformation

A.51 Within an energy balance the presentation of the inputs to and outputs from transformation activities requires special mention, as it is carried out using a compact format. The transformation section also plays a key role in moving primary electricity from its own column in the balance into the electricity column, so that it can be combined with electricity from fossil fuelled power stations and the total disposals shown.

A.52 Indigenous production of primary electricity comprises nuclear electricity, hydro electricity and electricity from wind generation. Nuclear electricity is obtained by passing steam from nuclear reactors through conventional steam turbine sets. The heat in the steam is considered to be the primary energy available and its value is calculated from the electricity generated using the average thermal efficiency of nuclear stations, currently 37.9 in the United Kingdom. The electrical energy from hydro and wind is transferred from the *Primary electricity* column to the *Electricity* column using the *transfers* row because electricity is the form of primary energy and no transformation takes place. However, because the form of the nuclear energy is the steam from the nuclear reactors, the energy it contains is shown entering electricity generation and the corresponding electricity produced is included with all electricity generation in the figure, in the same row, under the *Electricity* column.

A.53 Quantities of fuels entering transformation activities (fuels into electricity generation and heat generation, crude oil into petroleum product manufacture (refineries), or coal into coke ovens) are shown with a negative sign to represent the input and the resulting production is shown as a positive number.

A.54 For electricity generated by Major power producers, the inputs are shown in the *Major power producers'* row of the *coal, manufactured fuel, primary oils, petroleum products, gas, renewables* and *primary electricity* columns. The total energy input to electricity generation is the sum of the values in these first seven columns. The *Electricity* column shows total electricity generated from these inputs and the transformation loss is the sum of these two figures, given in the *Total* column.

A.55 Within the transformation section, the negative figures in the *Total* column represent the losses in the various transformation activities. This is a convenient consequence of the sign convention chosen for the inputs and outputs from transformation. Any positive figures represent a transformation gain and, as such, are an indication of incorrect data.

A.56 In the energy balance, the columns containing the input commodities for electricity generation, heat generation and oil refining are separate from the columns for the outputs. However, for the transformation activities involving solid fuels this is only partly the case. Coal used for the manufacture of coke is shown in the coke manufacture row of the transformation section in the coal column, but the related coke and coke oven gas production are shown combined in the *Manufactured fuels* column. Similarly, the input of coke to blast furnaces and the resulting production of blast furnace gas are not identifiable and have been combined in the *Manufactured fuels* column in the *Blast furnace* row. As a result, only the net loss from blast furnace transformation activity appears in the column.

A.57 The share of each commodity or commodity group in primary supply can be calculated from the table. This table also shows the demand for primary as well as foreign supplies. Shares of primary supplies may be taken from the *Primary supply* row of the balance. Shares of fuels in final consumption may be calculated from the final consumption row.

Energy industry use and final consumption

A.58 The figures for final consumption and energy industry use follow, in general, the principles and definitions described under commodity balances in paragraphs A.29 to A.42.

Standard conversion factors

1 tonne of oil equivalent (toe)	= 10^7 kilocalories = 396.83 therms = 41.868 GJ = 11,630 kWh
100,000 British thermal units (Btu)	= 1 therm

This Digest follows UK statistical practice and uses the term "billion" to refer to one thousand million or 10^9

The following prefixes are used for multiples of joules, watts and watt hours:

kilo (k)	= 1,000	or 10^3
mega (M)	= 1,000,000	or 10^6
giga (G)	= 1,000,000,000	or 10^9
tera (T)	= 1,000,000,000,000	or 10^{12}
peta (P)	= 1,000,000,000,000,000	or 10^{15}

WEIGHT

1 kilogramme (kg)	= 2.2046 pounds (lb)
1 pound (lb)	= 0.4536 kg
1 tonne (t)	= 1,000kg = 0.9842 long ton = 1.102 short ton (sh tn)
1 Statute or long ton	= 2,240 lb = 1.016 t = 1.102 sh tn

VOLUME

1 cubic metre (cu m)	= 35.31 cu ft
1 cubic foot (cu ft)	= 0.02832 cu m
1 litre	= 0.22 Imperial gallons (UK gal)
1 UK gallon	= 8 UK pints = 1.201 US gallons (US gal) = 4.54609 litres
1 barrel	= 159.0 litres = 34.97 UK gal = 42 US gal

LENGTH

1 mile	= 1.6093 kilometres
1 kilometre (km)	= 0.62137 miles

TEMPERATURE

1 scale degree Celsius (C)	= 1.8 scale degrees Fahrenheit (F)

For conversion of temperatures: $^{o}C = 5/9 (^{o}F - 32)$; $^{o}F = 9/5\ ^{o}C + 32$

Average conversion factors for petroleum 2009

	Imperial gallons per tonne	Litres per tonne
Crude oil:		
Indigenous	264	1,199
Imported	260	1,181
Average of refining throughput	262	1,192
Ethane	601	2,730
Propane	425	1,931
Butane	380	1,726
Naphtha (l.d.f.)	315	1,429
Aviation gasoline	311	1,414
Motor spirit:		
All grades	300	1,362
Unleaded Super	298	1,355
Ultra low sulphur petrol	300	1,371
Lead replacement petrol	299	1,355
Middle distillate feedstock	210	952
Kerosene:		
Aviation turbine fuel	275	1,249
Burning oil	274	1,245
DERV fuel:		
0.005% or less sulphur	264	1,195

	Imperial gallons per tonne	Litres per tonne
Gas/diesel oil:		
Gas oil	254	1,153
Marine diesel oil	254	1,153
Fuel oil:		
All grades	225	1,024
Light fuel oil:		
1% or less sulphur	234	1,065
Medium fuel oil:		
1% or less sulphur	225	1,020
Heavy fuel oil:		
1% or less sulphur	223	1,012
Lubricating oils:		
White	245	1,111
Greases	247	1,068
Other	248	1,127
Bitumen	216	983
Petroleum coke	186	843
Petroleum waxes	258	1,173
Industrial spirit	274	1,247
White spirit	283	1,286

Note: The above conversion factors, which for refined products have been compiled by DECC using data from UK Petroleum Industry Association companies, apply to the year 2009, and are only approximate for other years.

Fuel conversion factors for converting fossil fuels to carbon dioxide, 2007

	kg CO_2 per tonne	kg CO_2 per kWh	kg CO_2 per litre
Gases			
Natural Gas		0.184	
Liquid fuels			
LPG		0.214	1.495
Gas oil	3190	0.252	2.762
Fuel oil	3216	0.266	3.172*
Burning oil	3150	0.246	2.532
Naptha	3131	0.237	2.159*
Petrol	3135	0.240	2.303
Diesel	3164	0.250	2.639
Aviation spirit	3128	0.238	2.226
Aviation turbine fuel	3150	0.245	2.528
Solid fuels			
Industrial coal	2301	0.308	
Domestic coal	2506	0.296	
Coking coal	2931	0.346	

All emission factors are based on a Gross Calorific Value basis

*DECC estimates

The information above is based on the 2009 Greenhouse gas conversion factors for company reporting, available at: www.defra.gov.uk/environment/business/reporting/conversion-factors.htm. The information on this website also provide emission factors on a Net Calorific Basis.

The figures are derived by AEA based on data contained in the 2008 edition of this Digest, available at www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx, together with information from the National Atmospheric Emissions Inventory. More information on the Inventory is available at: www.naei.org.uk/reports.php. For liquid fuels, the "kg CO_2 per tonne" figure remains fairly constant on a year to year basis, so it is possible to derive "kg CO_2 per kWh" and "kg CO_2 per litre" figures for other years using the average conversion factors for petroleum data contained annually in Annex A of the Digest.

Updated conversion factors for 2008 will be available in Summer 2010.

A.1 Estimated average calorific values of fuels 2009

	GJ per tonne net	GJ per tonne gross
Coal:		
All consumers (weighted average) *(1)*	24.5	25.8
Power stations *(1)*	23.8	25.0
Coke ovens *(1)*	31.0	32.6
Low temperature carbonisation plants and manufactured fuel plants	29.0	30.5
Collieries	27.9	29.4
Agriculture	26.6	28.0
Iron and steel	28.9	30.4
Other industries (weighted average)	26.1	27.5
Non-ferrous metals	23.7	24.9
Food, beverages and tobacco	28.5	30.0
Chemicals	25.4	26.7
Textiles, clothing, leather etc.	28.0	29.5
Pulp, paper, printing etc.	22.7	23.9
Mineral products	26.2	27.6
Engineering (mechanical and electrical engineering and vehicles)	28.0	29.5
Other industries	26.1	27.5
Domestic		
House coal	29.0	30.5
Anthracite and dry steam coal	33.0	34.7
Other consumers	28.0	29.5
Imported coal (weighted average)	26.0	27.4
Exports (weighted average)	31.5	33.2
Coke (including low temperature carbonisation cokes)	29.8	29.8
Coke breeze	24.8	24.8
Other manufactured solid fuel	31.0	32.6

	GJ per tonne net	GJ per tonne gross
Renewable sources:		
Domestic wood *(2)*	11.7	13.9
Industrial wood *(3)*	11.5	13.7
Straw	12.8	15.0
Poultry litter	7.4	8.8
Meat and bone	15.6	18.6
General industrial waste	15.2	16.0
Hospital waste	13.3	14.0
Municipal solid waste *(4)*	6.7	9.5
Refuse derived waste *(4)*	13.1	18.5
Short rotation coppice *(5)*	9.3	11.1
Tyres	30.4	32.0
Petroleum:		
Crude oil (weighted average)	43.4	45.7
Petroleum products (weighted average)	43.8	46.1
Ethane	46.6	50.7
Butane and propane (LPG)	46.0	49.2
Light distillate feedstock for gasworks	45.2	47.5
Aviation spirit and wide cut gasoline	45.1	47.4
Aviation turbine fuel	43.9	46.2
Motor spirit	44.7	47.1
Burning oil	43.9	46.2
Gas/diesel oil (DERV)	42.9	45.6
Fuel oil	40.8	43.5
Power station oil	40.8	43.5
Non-fuel products (notional value)	40.9	43.1

	MJ per cubic metre net	MJ per cubic metre gross
Natural gas produced *(6)*	36.0	40.0
Natural gas consumed *(7)*	35.6	39.6
Coke oven gas	16.2	18.0
Blast furnace gas	3.0	3.0
Landfill gas *(8)*	19-23	21-25
Sewage gas *(8)*	19-23	21-25

(1) Applicable to UK consumption - based on calorific value for home produced coal plus imports and, for "All consumers" net of exports.

(2) On an "as received" basis; seasoned logs at 25% moisture content. On a "dry" basis 18.6 GJ per tonne.

(3) Average figure covering a range of possible feedstock; at 25% moisture content. On a "dry" basis 18.6 GJ per tonne.

(4) Average figure based on survey returns.

(5) On an "as received" basis; at 40% moisture content. On a "dry" basis 18.6 GJ per tonne.

(6) The gross calorific value of natural gas can also be expressed as 11.117 kWh per cubic metre. This value represents the average calorific value seen for gas when extracted. At this point it contains not just methane, but also some other hydrocarbon gases (ethane, butane, propane). These gases are removed before the gas enters the National Transmission System for sale to final consumers.

(7) UK produced and imported gas. This weighted average of calorific values will approximate the average for the year of entering the Natioanl Transmission System. It can also be expressed as 10.989 kWh per cubic metre.

(8) Calorific value varies depending on the methane content of the gas.

Note: The above estimated average calorific values apply only to the year 2009. For calorific values of fuels in earlier years see Tables A.2 and A.3 and previous issues of this Digest. See the notes in Chapter 1, paragraph 1.52 regarding net calorific values. The calorific values for coal other than imported coal are based on estimates provided by the main coal producers, but with some exceptions as noted on Table A.2. The calorific values for petroleum products have been calculated using the method described in Chapter 1, paragraph 1.29. The calorific values for coke oven gas, blast furnace gas, coke and coke breeze are currently being reviewed jointly by DECC and the Iron and Steel Statistics Bureau (ISSB).

Data reported in this Digest in 'thousand tonnes of oil equivalent' have been prepared on the basis of 1 tonne of oil equivalent having an energy content of 41.868 gigajoules (GJ), (1 GJ = 9.478 therms) - see notes in Chapter 1, paragraphs 1.26 to 1.27.

A.2 Estimated average gross calorific values of fuels 1980, 1990, 2000 and 2006 to 2009

GJ per tonne (gross)

	1980	1990	2000	2006	2007	2008	2009
Coal							
All consumers *(1)(2)*	25.6	25.5	26.2	25.8	26.3	26.1	25.8
All consumers - home produced plus imports minus exports *(1)*	..	..	27.0	26.8	27.0	27.0	26.9
Power stations *(2)*	23.8	24.8	25.6	25.0	25.3	25.4	25.0
Power stations - home produced plus imports *(1)*	..	..	26.0	26.2	26.2	26.2	26.1
Coke ovens *(2)*	30.5	30.2	31.2	32.3	32.8	32.6	32.6
Coke ovens - home produced plus imports *(1)*	..	..	30.4	30.5	30.5	30.5	30.5
Low temperature carbonisation plants and manufactured fuel plants	19.1	29.2	30.3	29.5	29.4	30.5	30.2
Collieries	27.0	28.6	29.6	30.0	29.8	29.7	29.4
Agriculture	30.1	28.9	29.2	28.0	28.0	28.0	28.0
Iron and steel industry *(3)*	29.1	28.9	30.7	30.4	30.4	30.4	30.4
Other industries *(1)*	27.1	27.8	26.7	26.6	27.2	27.0	27.5
Non-ferrous metals	..	23.1	25.1	25.0	25.4	25.4	24.9
Food, beverages and tobacco	28.6	28.1	29.5	29.0	30.4	30.4	30.0
Chemicals	25.8	27.3	28.7	26.7	26.7	26.7	26.7
Textiles, clothing, leather and footwear	27.5	27.7	30.4	29.6	29.5	29.5	29.5
Pulp, paper, printing, etc.	26.5	27.9	28.7	29.4	29.4	29.4	23.9
Mineral products *(4)*	..	28.2	27.0	27.6	27.6	27.6	27.6
Engineering *(5)*	27.7	28.3	29.3	30.4	29.5	29.5	29.5
Other industry *(6)*	28.4	28.5	26.7	26.6	27.2	27.0	27.5
Domestic							
House coal	30.1	30.2	30.9	30.5	30.5	30.5	30.5
Anthracite and dry steam coal	33.3	33.6	33.5	33.9	33.8	34.7	34.7
Other consumers	27.5	27.5	29.2	30.1	29.3	29.3	29.5
Transport - Rail	..	..	..	30.5	30.5	30.1	30.0
Imported coal *(1)*	..	28.3	28.0	27.2	27.3	27.2	27.4
of which Steam coal	..	..	26.6	26.5	26.5	26.5	26.5
Coking coal	..	..	30.4	30.4	30.4	30.4	30.4
Anthracite	..	..	31.2	31.4	32.7	30.9	32.2
Exports *(1)*	..	29.0	32.0	32.5	32.6	33.0	33.2
of which Steam coal	..	..	31.0	32.2	32.2	32.2	29.8
Anthracite	..	..	32.6	32.5	32.6	33.0	33.2
Coke *(7)*	28.1	28.1	29.8	29.8	29.8	29.8	29.8
Coke breeze	24.4	24.8	24.8	24.8	24.8	24.8	24.8
Other manufactured solid fuels *(1)*	27.6	27.6	30.8	32.5	32.6	32.6	32.6
Petroleum							
Crude oil *(1)*	45.2	45.6	45.7	45.7	45.7	45.7	45.7
Liquified petroleum gas	49.6	49.4	49.4	49.4	49.3	49.3	49.2
Ethane	52.3	50.6	50.7	50.7	50.7	50.7	50.7
LDF for gasworks/Naphtha	47.8	47.9	47.7	47.5	47.7	47.7	47.5
Aviation spirit and wide-cut gasoline (AVGAS and AVTAG)	47.2	47.3	47.3	47.4	47.4	47.4	47.4
Aviation turbine fuel (AVTUR)	46.4	46.2	46.2	46.2	46.2	46.2	46.2
Motor spirit	47.0	47.0	47.0	47.1	47.1	47.1	47.1
Burning oil	46.5	46.2	46.2	46.2	46.2	46.2	46.2
Vaporising oil	45.9	45.9	..		..		
Gas/diesel oil (including DERV)	45.5	45.4	45.6	45.6	45.5	45.5	45.6
Fuel oil	42.8	43.2	43.1	43.3	43.6	43.6	43.5
Power station oil	42.8	43.2	43.1	43.3	43.6	43.6	43.5
Non-fuel products (notional value)	42.2	43.2	43.8	43.1	43.2	43.1	43.1
Petroleum coke	..	39.5	35.8	35.8	35.8	35.8	35.8
Natural Gas *(8)*	..	38.4	39.4	39.8	39.7	39.7	40.0

(1) Weighted averages.
(2) Home produced coal only.
(3) From 2001 onwards almost entirely sourced from imports.
(4) Based on information provided by the British Cement Industry Association; almost all coal used by this sector in the latest 4 years was imported.
(5) Mechanical engineering and metal products, electrical and instrument engineering and vehicle manufacture.
(6) Includes construction.
(7) Since 1995 the source of these figures has been the ISSB.
(8) Natural Gas figures are shown in MJ per cubic metre
(9) Net calorific values have been revised back to 1980 in accordance with revised assumptions.

A.3 Estimated average net calorific values of fuels 1980, 1990, 2000 and 2006 to 2009

GJ per tonne (net)

	1980	1990	2000	2006	2007	2008	2009
Coal							
All consumers *(1)(2)*	24.3	24.2	24.9	24.5	25.0	24.8	24.5
All consumers - home produced plus imports minus exports *(1)*	..	..	25.7	25.5	25.7	25.7	25.6
Power stations *(2)*	22.6	23.6	24.3	23.8	24.0	24.1	23.8
Power stations - home produced plus imports *(1)*	..	..	24.7	24.9	24.9	24.9	24.8
Coke ovens *(2)*	29.0	28.7	29.6	30.7	31.2	31.0	31.0
Coke ovens - home produced plus imports *(1)*	..	..	28.9	29.0	29.0	29.0	29.0
Low temperature carbonisation plants and manufactured fuel plants	18.1	27.7	28.8	28.0	27.9	29.0	28.7
Collieries	25.7	27.2	28.1	28.5	28.3	28.2	27.9
Agriculture	28.6	27.5	27.7	26.6	26.6	26.6	26.6
Iron and steel industry *(3)*	27.6	27.5	29.2	28.9	28.9	28.9	28.9
Other industries *(1)*	25.7	26.4	25.4	25.3	25.8	25.7	26.1
Non-ferrous metals	..	21.9	23.8	23.8	24.1	24.1	23.7
Food, beverages and tobacco	27.2	26.7	28.0	27.6	28.9	28.9	28.5
Chemicals	24.5	25.9	27.3	25.4	25.4	25.4	25.4
Textiles, clothing, leather and footwear	26.1	26.3	28.9	28.1	28.0	28.0	28.0
Pulp, paper, printing, etc.	25.2	26.5	27.3	27.9	27.9	27.9	22.7
Mineral products *(4)*	..	26.8	25.7	26.2	26.2	26.2	26.2
Engineering *(5)*	26.3	26.9	27.8	28.9	28.0	28.0	28.0
Other industry *(6)*	27.0	27.1	25.4	25.3	25.8	25.7	26.1
Domestic							
House coal	28.6	28.7	29.4	29.0	29.0	29.0	29.0
Anthracite and dry steam coal	31.6	31.9	31.8	32.2	32.1	33.0	33.0
Other consumers	26.1	26.1	27.7	28.6	27.8	27.8	28.0
Transport - Rail	..	..	..	29.0	29.0	28.6	28.5
Imported coal *(1)*	..	26.9	26.6	25.8	25.9	25.8	26.0
of which Steam coal	..	..	25.3	25.2	25.2	25.2	25.2
Coking coal	..	..	28.9	28.9	28.9	28.9	28.9
Anthracite	..	..	29.6	29.8	31.1	29.4	30.6
Exports *(1)*	..	27.6	30.4	30.9	31.0	31.4	31.5
of which Steam coal	..	..	29.5	30.6	30.6	30.6	28.3
Anthracite	..	..	31.0	30.9	31.0	31.4	31.5
Coke *(7)*	28.1	28.1	29.8	29.8	29.8	29.8	29.8
Coke breeze	24.4	24.8	24.8	24.8	24.8	24.8	24.8
Other manufactured solid fuels *(1)*	26.2	26.2	29.3	30.9	31.0	31.0	31.0
Petroleum							
Crude oil *(1)*	42.9	43.3	43.4	43.4	43.4	43.4	43.4
Liquified petroleum gas (9)	46.2	46.0	46.0	45.9	45.9	45.9	45.9
Ethane (9)	48.1	46.6	46.6	46.6	46.6	46.6	46.6
LDF for gasworks/Naphtha	45.4	45.5	45.3	45.1	45.3	45.3	45.2
Aviation spirit and wide-cut gasoline (AVGAS and AVTAG)	44.8	44.9	44.9	45.0	45.0	45.0	45.1
Aviation turbine fuel (AVTUR)	44.1	43.9	43.9	43.9	43.9	43.9	43.9
Motor spirit	44.7	44.7	44.7	44.7	44.7	44.7	44.7
Burning oil	44.2	43.9	43.9	43.9	43.9	43.9	43.9
Vaporising oil	43.6	43.6	..	..	..	..	..
Gas/diesel oil (including DERV) (9)	42.8	42.7	42.9	42.9	42.8	42.8	42.9
Fuel oil (9)	40.2	40.6	40.5	40.7	41.0	41.0	40.8
Power station oil (9)	40.2	40.6	40.5	40.7	41.0	41.0	40.8
Non-fuel products (notional value)	40.1	41.0	41.6	40.9	41.1	40.9	40.9
Petroleum coke	..	37.5	34.0	34.0	34.0	34.0	34.0
Natural Gas *(8)*	-	34.6	35.5	35.8	35.7	35.7	36.0

For footnotes see table A.2

The net calorific values of natural gas and coke oven gas are the gross calorific values x 0.9.

Annex B
Glossary and Acronyms

Advanced gas-cooled reactor (AGR)	A type of nuclear reactor cooled by carbon dioxide gas.
AEA Energy & Environment	Part of the AEA Group, comprising the former Future Energy Solutions and NETCEN.
AES	Association of Electricity Supplies
Anthracite	Within this publication, anthracite is coal classified as such by UK coal producers and importers of coal. Typically it has a high heat content making it particularly suitable for certain industrial processes and for use as a domestic fuel.
Anthropogenic	Produced by human activities.
Associated Gas	Natural gas found in association with crude oil in a reservoir, either dissolved in the oil or as a cap above the oil.
Autogeneration	Generation of electricity by companies whose main business is not electricity generation, the electricity being produced mainly for that company's own use.
Aviation spirit	A light hydrocarbon oil product used to power piston-engined aircraft power units.
Aviation turbine fuel	The main aviation fuel used for powering aviation gas-turbine power units (jet aircraft engine).
BE	British Energy
Benzole	A colourless liquid, flammable, aromatic hydrocarbon by-product of the iron and steel making process. It is used as a solvent in the manufacture of styrenes and phenols but is also used as a motor fuel.
BERR	Department for Business, Enterprise and Regulatory Reform
BETTA	British Electricity Trading and Transmission Arrangements (BETTA) refer to changes to electricity generation, distribution and supply licences. On 1 April 2005, the England and Wales trading arrangements were extended to Scotland by the British Electricity Trading and Transmission Arrangements creating a single GB market for trading of wholesale electricity, with common arrangements for access to and use of GB transmission system. From 1 April 2005, NGC has become the System Operator for the whole of GB. BETTA replaced NETA (see page 234) on 4 April 2005.
Biodiesel	(FAME - biodiesel produced to BS EN 14214). Produced from vegetable oils or animal fats by mixing them with ethanol or methanol to break them down.
Bioethanol	Created from crops rich in starch or sugar by fermentation, distillation and finally dehydration.

Biogas Energy produced from the anaerobic digestion of sewage and industrial waste.

Bitumen The residue left after the production of lubricating oil distillates and vacuum gas oil for upgrading plant feedstock. Used mainly for road making and construction purposes.

Blast furnace gas Mainly produced and consumed within the iron and steel industry. Obtained as a by-product of iron making in a blast furnace, it is recovered on leaving the furnace and used partly within the plant and partly in other steel industry processes or in power plants equipped to burn it. A similar gas is obtained when steel is made in basic oxygen steel converters; this gas is recovered and used in the same way.

Breeze Breeze can generally be described as coke screened below 19 mm (¾ inch) with no fines removed but the screen size may vary in different areas and to meet the requirements of particular markets.

BG British Gas

BOS Basic Oxygen Steel furnace gas

BNFL British Nuclear Fuels plc.

BRE Building Research Establishment

Burning oil A refined petroleum product, with a volatility in between that of motor spirit and gas diesel oil primarily used for heating and lighting.

Butane Hydrocarbon (C_4H_{10}), gaseous at normal temperature but generally stored and transported as a liquid. Used as a component in Motor Spirit to improve combustion, and for cooking and heating (see LPG).

Calorific values (CVs) The energy content of a fuel can be measured as the heat released on complete combustion. The SI (Système International - see page 236) derived unit of energy and heat is the Joule. This is the energy per unit volume of the fuel and is often measured in GJ per tonne. The energy content can be expressed as an upper (or gross) value and a lower (or net) value. The difference between the two values is due to the release of energy from the condensation of water in the products of combustion. Gross calorific values are used throughout this publication.

CCA Climate Change Agreement. Climate Change Agreements allow energy intensive business users to receive an 80 per cent discount from the Climate Change Levy (CCL), in return for meeting energy efficiency or carbon saving targets. The CCL is a tax on the use of energy in industry, commerce and the public sector. The aim of the levy is to encourage users to improve energy efficiency and reduce emissions of greenhouse gases.

CCL Climate Change Levy. The Climate Change Levy is a tax on the use of energy in industry, commerce and the public sector, with offsetting cuts in employers' National Insurance Contributions and additional support for energy efficiency schemes and renewable sources of energy. The aim of the levy is to encourage users to improve energy efficiency and reduce emissions of greenhouse gases.

CO_2	Carbon dioxide. Carbon dioxide contributes about 60 per cent of the potential global warming effect of man-made emissions of greenhouse gases. Although this gas is naturally emitted by living organisms, these emissions are offset by the uptake of carbon dioxide by plants during photosynthesis; they therefore tend to have no net effect on atmospheric concentrations. The burning of fossil fuels, however, releases carbon dioxide fixed by plants many millions of years ago, and thus increases its concentration in the atmosphere.
Co-firing	The burning of biomass products in fossil fuel power stations
Coke oven coke	The solid product obtained from carbonisation of coal, principally coking coal, at high temperature, it is low in moisture and volatile matter. Used mainly in iron and steel industry.
Coke oven gas	Gas produced as a by-product of solid fuel carbonisation and gasification at coke ovens, but not from low temperature carbonisation plants. Synthetic coke oven gas is mainly natural gas which is mixed with smaller amounts of blast furnace and basic oxygen steel furnace gas to produce a gas with almost the same quantities as coke oven gas.
Coking coal	Within this publication, coking coal is coal sold by producers for use in coke ovens and similar carbonising processes. The definition is not therefore determined by the calorific value or caking qualities of each batch of coal sold, although calorific values tend to be higher than for steam coal. Not all coals form cokes. For a coal to coke it must exhibit softening and agglomeration properties, ie the end product must be a coherent solid.
Colliery methane	Methane released from coal seams in deep mines which is piped to the surface and consumed at the colliery or transmitted by pipeline to consumers.
Combined cycle gas Turbine (CCGT)	Combined cycle gas turbine power stations combine gas turbines and steam turbines which are connected to one or more electrical generators in the same plant. The gas turbine (usually fuelled by natural gas or oil) produces mechanical power (to drive the generator) and heat in the form of hot exhaust gases. These gases are fed to a boiler, where steam is raised at pressure to drive a conventional steam turbine, which is also connected, to an electrical generator.
Combined Heat and Power (CHP)	CHP is the simultaneous generation of usable heat and power (usually electricity) in a single process. The term CHP is synonymous with cogeneration and total energy, which are terms often used in the United States or other Member States of the European Community. The basic elements of a CHP plant comprise one or more prime movers driving electrical generators, where the steam or hot water generated in the process is utilised via suitable heat recovery equipment for use either in industrial processes, or in community heating and space heating. For further information see Chapter 6 paragraph 6.33.
CHPQA	Combined Heat and Power Quality Assurance Scheme
Conventional thermal power stations	These are stations which generate electricity by burning fossil fuels to produce heat to convert water into steam, which then powers steam turbines.

Cracking/conversion	A refining process using combinations of temperature, pressure and in some cases a catalyst to produce petroleum products by changing the composition of a fraction of petroleum, either by splitting existing longer carbon chain or combining shorter carbon chain components of crude oil or other refinery feedstock's. Cracking allows refiners to selectively increase the yield of specific fractions from any given input petroleum mix depending on their requirements in terms of output products.
CRC	Carbon Reduction Commitment. The Carbon Reduction Commitment is a proposed mandatory cap and trade scheme that will apply to large non energy-intensive organisations in the public and private sectors. It is anticipated that the scheme will have cut carbon emissions by 1.2 million tonnes of carbon per year by 2020.
Crude oil	A mineral oil consisting of a mixture of hydrocarbons of natural origins, yellow to black in colour, of variable density and viscosity.
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DERV	Diesel engined road vehicle fuel used in internal combustion engines that are compression-ignited (see gas diesel oil on page 232).
DFT	Department for Transport
Distillation	A process of separation of the various components of crude oil and refinery feedstocks using the different temperatures of evaporation and condensation of the different components of the mix received at the refineries.
DNC	Declared net capacity and capability are used to measure the maximum power available from generating stations at a point in time. See Chapter 5 paragraphs 5.63 and 5.64 and Chapter 7 paragraph 7.68 for a fuller definition.
DNO	Distribution Network Operator
Downstream	Used in oil and gas processes to cover the part of the industry after the production of the oil and gas. For example, it covers refining, supply and trading, marketing and exporting.
DTI	Department of Trade and Industry
DUKES	Digest of United Kingdom Energy Statistics, the Digest provides essential information for everyone, from economists to environmentalists and from energy suppliers to energy users.
ECA	Enhanced Capital Allowances
EESs	The Energy Efficiency Commitment (formerly known as Energy Efficiency Standards of Performance) is an obligation placed on all energy suppliers to offer help and advice to their customers to improve the energy efficiency of their homes.
EHCS	English House Condition Survey

Embedded Generation Embedded generation is electricity generation by plant which has been connected to the distribution networks of the public electricity distributors rather than directly to the National Grid Company's transmission systems. Typically they are either smaller stations located on industrial sites, or combined heat and power plant, or renewable energy plant such as wind farms, or refuse burner generators. The category also includes some domestic generators such as those with electric solar panels. For a description of the current structure of the electricity industry in the UK see Chapter 5 paragraphs 5.48 to 5.53.

Energy use Energy use of fuel mainly comprises use for lighting, heating or cooling, motive power and power for appliances. See also non-energy use on page 234.

ESA European System of National and Regional Accounts. An integrated system of economic accounts which is the European version of the System of National Accounts (SNA).

Ethane A light hydrocarbon gas (C_2H_6) in natural gas and refinery gas streams (see LPG).

EU-ETS European Union Emissions Trading Scheme. This began on 1st January 2005 and involves the trading of emissions allowances as means of reducing emissions by a fixed amount.

EUROSTAT Statistical Office of the European Communities (SOEC).

Exports For some parts of the energy industry, statistics on trade in energy related products can be derived from two separate sources. Firstly, figures can be reported by companies as part of systems for collecting data on specific parts of the energy industry (eg as part of the system for recording the production and disposals of oil from the UK continental shelf). Secondly, figures are also available from the general systems that exist for monitoring trade in all types of products operated by HM Revenue and Customs.

Feedstock In the refining industry, a product or a combination of products derived from crude oil, destined for further processing other than blending. It is distinguished from use as a chemical feedstock etc. See non-energy use on page 234.

FES Future Energy Solutions, now known as AEA Energy & Environment, part of the AEA Group.

Final energy consumption Energy consumption by final user – ie which is not being used for transformation into other forms of energy.

Fossil fuels Coal, natural gas and fuels derived from crude oil (for example petrol and diesel) are called fossil fuels because they have been formed over long periods of time from ancient organic matter.

Fuel oils The heavy oils from the refining process; used as fuel in furnaces and boilers of power stations, industry, in domestic and industrial heating, ships, locomotives, metallurgic operations, and industrial power plants etc.

Fuel oil - Light Fuel oil made up of heavier straight-run or cracked distillates and used in commercial or industrial burner installations not equipped with pre-heating facilities.

Fuel oil - Medium Other fuel oils, sometimes referred to as bunker fuels, which generally require pre-heating before being burned, but in certain climatic conditions do not require pre-heating.

Fuel oil - Heavy Other heavier grade fuel oils which in all situations require some form of pre-heating before being burned.

Fuel poverty The common definition of a fuel poor household is one needing to spend in excess of 10 per cent of household income to achieve a satisfactory heating regime (21ºC in the living room and 18ºC in the other occupied rooms).

Gas Diesel Oil The medium oil from the refinery process; used as a fuel in diesel engines (ie internal combustion engines that are compression-ignited), burned in central heating systems and used as a feedstock for the chemical industry.

GDP Gross Domestic Product.

GDP deflator An index of the ratio of GDP at current prices to GDP at constant prices. It provides a measure of general price inflation within the whole economy.

Gigajoule (GJ) A unit of energy equal to 10^9 joules (see note on joules on page 233).

Gigawatt (GW) A unit of electrical power, equal to 10^9 watts.

Heat sold Heat (or steam) that is produced and sold under the provision of a contract. Heat sold is derived from heat generated by Combined Heat and Power (CHP) plants and from community heating schemes without CHP plants.

HMRC HM Revenue and Customs.

Imports See the entry for exports on page 231. Before the 1997 edition of the Digest, the term "arrivals" was used to distinguish figures derived from the former source from those import figures derived from the systems operated by HM Revenue and Customs. To make it clearer for users, a single term is now being used for both these sources of figures (the term imports) as this more clearly states what the figures relate to, which is goods entering the UK.

Indigenous production For oil this includes production from the UK Continental Shelf both onshore and offshore.

Industrial spirit Refined petroleum fractions with boiling ranges up to 200ºC dependent on the use to which they are put – e.g. seed extraction, rubber solvents, perfume etc.

International Energy Agency (IEA) The IEA is an autonomous body located in Paris which was established in November 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.

ISSB Iron and Steel Statistics Bureau

ITF Industry Technology Facilitator

Joules	A joule is a generic unit of energy in the conventional SI system (see note on page 236). It is equal to the energy dissipated by an electrical current of 1 ampere driven by 1 volt for 1 second; it is also equal to twice the energy of motion in a mass of 1 kilogram moving at 1 metre per second.
Kilowatt (kW)	1,000 watts
Landfill gas	The methane-rich biogas formed from the decomposition of organic material in landfill.
LDF	Light distillate feedstock
LDZ	Local distribution zone
Liquefied natural Gas (LNG)	Natural gas that has been converted to liquid form for ease of storage or transport.
Liquefied petroleum Gas (LPG)	Gas usually propane or butane, derived from oil and put under pressure so that it is in liquid form. Often used to power portable cooking stoves or heaters and to fuel some types of vehicle, eg some specially adapted road vehicles, forklift trucks.
Lead Replacement Petrol (LRP)	An alternative to Leaded Petrol containing a different additive to lead (in the UK usually potassium based) to perform the lubrication functions of lead additives in reducing engine wear.
Lubricating oils	Refined heavy distillates obtained from the vacuum distillation of petroleum residues. Includes liquid and solid hydrocarbons sold by the lubricating oil trade, either alone or blended with fixed oils, metallic soaps and other organic and/or inorganic bodies.
Magnox	A type of gas-cooled nuclear fission reactor developed in the UK, so called because of the magnesium alloy used to clad the uranium fuel.
Major power producers	Companies whose prime purpose is the generation of electricity (paragraph 5.51 of Chapter 5 gives a full list of major power producers).
Megawatt (MW)	1,000 kilowatts. MWe is used to emphasise when electricity is being measured. MWt is used when heat ("thermal") is being measured.
Micro CHP	Micro CHP is a new technology that is expected to make a significant contribution to domestic energy efficiency in the future.
MMC	Monopolies and Mergers Commission
Motor spirit	Blended light petroleum product used as a fuel in spark-ignition internal combustion engines (other than aircraft engines).
NAEI	National Atmospheric Emissions Inventory
Naphtha	(Light distillate feedstock) – Petroleum distillate boiling predominantly below 200ºC.
National Allocation Plan (NAP)	Under the EU Emissions Trading Scheme (EU-ETS) Directive each EU country must have a National Allocation Plan which lays down the overall contribution of the EU-ETS participants (the "cap") for the country and the allowances that each sector and each individual installation covered under the Directive is allocate, effectively stating how much that sector can emit over the trading period of the scheme.

Natural gas	Natural gas is a mixture of naturally occurring gases found either in isolation, or associated with crude oil, in underground reservoirs. The main component is methane; ethane, propane, butane, hydrogen sulphide and carbon dioxide may also be present, but these are mostly removed at or near the well head in gas processing plants.
Natural gas - compressed	Natural gas that has been compressed to reduce the volume it occupies to make it easier to transport other than in pipelines. Whilst other petroleum gases can be compressed such that they move into liquid form, the volatility of natural gas is such that liquefaction cannot be achieved without very high pressures and low temperatures being used. As such, the compressed form is usually used as a "half-way house".
Natural gas liquids (NGLs)	A mixture of liquids derived from natural gas and crude oil during the production process, including propane, butane, ethane and gasoline components (pentanes plus).
NDA	Nuclear Decommissioning Authority
NETA	New Electricity Trading Arrangements - In England and Wales these arrangements replaced "the pool" from 27 March 2001. The arrangements are based on bi-lateral trading between generators, suppliers, traders and customers and are designed to be more efficient, and provide more market choice.
NETCEN	National Environment Technology Centre, now known as AEA Energy & Environment, part of the AEA Group.
NFFO	Non Fossil Fuel Obligation. The 1989 Electricity Act empowers the Secretary of State to make orders requiring the Regional Electricity Companies in England and Wales to secure specified amounts of electricity from renewable sources.
NFPA	Non Fossil Purchasing Agency
NIE	Northern Ireland Electricity
NI NFFO	Northern Ireland Non Fossil Fuel Obligation
Non-energy use	Includes fuel used for chemical feedstock, solvents, lubricants, and road making material.
NO_X	Nitrogen oxides. A number of nitrogen compounds including nitrogen dioxide are formed in combustion processes when nitrogen in the air or the fuel combines with oxygen. These compounds can add to the natural acidity of rainfall.
NSCP	National Statistics Code of Practice
NUTS	Nonmenclature of Units for Territorial Statistics
OFGEM	The regulatory office for gas and electricity markets
OFT	Office of Fair Trading
ONS	Office for National Statistics
Orimulsion	An emulsion of bitumen in water that was used as a fuel in some power stations until 1997.

OTS	Overseas Trade Statistics of the United Kingdom
OXERA	Oxford Economic Research Association Ltd
Patent fuel	A composition fuel manufactured from coal fines by shaping with the addition of a binding agent (typically pitch). The term manufactured solid fuel is also used.
Petrochemical feedstock	All petroleum products intended for use in the manufacture of petroleum chemicals. This includes middle distillate feedstock of which there are several grades depending on viscosity. The boiling point ranges between 200°C and 400°C.
Petroleum cokes	Carbonaceous material derived from hydrocarbon oils, uses for which include metallurgical electrode manufacture and in the manufacture of cement.
Photovoltaics	The direct conversion of solar radiation into electricity by the interaction of light with the electrons in a semiconductor device or cell.
PILOT	Phase 2 (PILOT) is the successor body to the Oil & Gas Industry Task Force (OGITF) and was established on 1 January 2000, to secure the long-term future of the oil and gas industry in the UK. A forum that brings together Government and industry to address the challenges facing the oil and gas industry. One outcome of PILOT's work is the published Code of Practice on Supply Chain Relationships.
Plant capacity	The maximum power available from a power station at a point in time (see also Chapter 5 paragraph 5.63).
Plant loads, demands and efficiency	Measures of how intensively and efficiently power stations are being used. These terms are defined in Chapter 5 paragraphs 5.65 and 5.66.
PPRS	Petroleum production reporting system. Licensees operating in the UK Continental Shelf are required to make monthly returns on their production of hydrocarbons (oil and gas) to DECC. This information is recorded in the PPRS, which is used to report flows, stocks and uses of hydrocarbon from the well-head through to final disposal from a pipeline or terminal (see DUKES internet annex F on the energy statistics web site for further information).
Primary electricity	Electricity obtained other than from fossil fuel sources, e.g. nuclear, hydro and other non-thermal renewables. Imports of electricity are also included.
Primary fuels	Fuels obtained directly from natural sources, e.g. coal, oil and natural gas.
Process oils	Partially processed feedstocks which require further processing before being classified as a finished product suitable for sale. They can also be used as a reaction medium in the production process.
Propane	Hydrocarbon containing three carbon atoms (C_3H_8), gaseous at normal temperature, but generally stored and transported under pressure as a liquid.
PWR	Pressurised water reactor. A nuclear fission reactor cooled by ordinary water kept from boiling by containment under high pressure.

RD	Renewables Directive – this proposes that EU Member States adopt national targets that are consistent with the overall EU target of 12 per cent of energy (22.1 per cent of electricity) from renewables by 2010.
Refinery fuel	Petroleum products produced by the refining process that are used as fuel at refineries.
Reforming	Processes by which the molecular structure of different fractions of petroleum can be modified. It usually involves some form of catalyst, most often platinum, and allows the conversion of lower grades of petroleum product into higher grades, improving their octane rating. It is a generic term for processes such as cracking, cyclization, dehydrogenation and isomerisation. These processes generally led to the production of hydrogen as a by-product, which can be used in the refineries in some desulphurization procedures.
Renewable energy sources	Renewable energy includes solar power, wind, wave and tide, and hydroelectricity. Solid renewable energy sources consist of wood, straw, short rotation coppice, other biomass and the biodegradable fraction of wastes. Gaseous renewables consist of landfill gas and sewage gas. Non-biodegradable wastes are not counted as a renewables source but appear in the Renewable sources of energy chapter of this Digest for completeness.
Reserves	With oil and gas these relate to the quantities identified as being present in underground cavities. The actual amounts that can be recovered depend on the level of technology available and existing economic situations. These continually change; hence the level of the UK's reserves can change quite independently of whether or not new reserves have been identified.
RESTATS	The Renewable Energy Statistics System
RO	Renewables Obligation – this is an obligation on all electricity suppliers to supply a specific proportion of electricity from eligible renewable sources.
ROCs	Renewables Obligation Certificates
Secondary fuels	Fuels derived from natural primary sources of energy. For example electricity generated from burning coal, gas or oil is a secondary fuel, as are coke and coke oven gas.
SEPN	Sustainable Energy Policy Network represents the body of people responsible for delivering the white paper directly or indirectly through having links to business and other organisations nationally and regionally.
SI (Système International)	Refers to the agreed conventions for the measurement of physical quantities**.**

SIC	The United Kingdom Standard Industrial Classification of Economic Activities (SIC) is used to classify business establishments and other standard units by the type of economic activity in which they are engaged. It provides a framework for the collection, tabulation, presentation and analysis of data and its use promotes uniformity. In addition, it can be used for administrative purposes and by non-government bodies as a convenient way of classifying industrial activities into a common structure. The system is identical to the EUROSTAT System NACE at the four digit class level and the United Nations system ISIC at the two digit Divisional level.
SO_2	Sulphur Dioxide. Sulphur dioxide is a gas produced by the combustion of sulphur-containing fuels such as coal and oil.
SOEC	Statistical Office of the European Communities
SRO	Scottish Renewable Orders
Steam coal	Within this publication, steam coal is coal classified as such by UK coal producers and by importers of coal. It tends to be coal having lower calorific values; the type of coal that is typically used for steam raising.
Synthetic coke oven gas	Mainly a natural gas, which is mixed with smaller amounts of blast furnace, and BOS (basic oxygen steel furnace) gas to produce a gas with almost the same quantities as coke oven gas.
Tars	Viscous materials usually derived from the destructive distillation of coal which are by-products of the coke and iron making processes.
Temperature correction	The temperature corrected series of total inland fuel consumption indicates what annual consumption might have been if the average temperature during the year had been the same as the average for the years 1971 to 2000.
Terawatt (TW)	1,000 gigawatts
Therm	A common unit of measurement similar to a tonne of oil equivalent which enables different fuels to be compared and aggregated. (see Annex A).
Thermal efficiency	The thermal efficiency of a power station is the efficiency with which heat energy contained in fuel is converted into electrical energy. It is calculated for fossil fuel burning stations by expressing electricity generated as a percentage of the total energy content of the fuel consumed (based on average gross calorific values). For nuclear stations it is calculated using the quantity of heat released as a result of fission of the nuclear fuel inside the reactor.
Thermal Sources of Electricity	These include coal, oil, natural gas, nuclear, landfill gas, sewage gas, municipal solid waste, farm waste, tyres, poultry litter, short rotation coppice, straw, coke oven gas, blast furnace gas, and waste products from chemical processes.
Tonne of oil equivalent (toe)	A common unit of measurement which enables different fuels to be compared and aggregated. (See Chapter 1 paragraphs 1.26 to 1.27 for further information and Annex A page 221 for conversion factors).
TWh	Terawatt Hour

UKCS	United Kingdom Continental Shelf
UKOOA	United Kingdom Offshore Operators Association
UKPIA	UK Petroleum Industry Association. The trade association for the UK petroleum industry.
UKSA	UK Statistics Authority
Ultra low sulphur Diesel (ULSD)	A grade of diesel fuel which has a much lower sulphur content (less than 0.005 per cent or 50 parts per million) and of a slightly higher volatility than ordinary diesel fuels. As a result it produces fewer emissions when burned, and initially enjoyed a lower rate of Hydrocarbon Oil Duty in the UK than ordinary diesel to promote its use, although duty rates on standard diesel and ULSD have since been equalised. Virtually 100 per cent of sales of DERV fuel in the UK are ULSD.
Ultra low sulphur Petrol (ULSP)	A grade of motor spirit with a similar level of sulphur to ULSD (less than 0.005 per cent or 50 parts per million). ULSP initially enjoyed a lower rate of Hydrocarbon Oil Duty in the UK than ordinary petrol to promote its use, although duty rates on standard petrol and ULSP have since been equalised. It has quickly replaced ordinary premium grade unleaded petrol in the UK market place.
Upstream	A term to cover the activities related to the exploration, production and delivery to a terminal or other facility of oil or gas for export or onward shipment within the UK.
USBS	United States Bureau of Standards refers to legislation that sets minimum safety standards in the coal market and mining industry.
VAT	Value added tax
Watt (W)	The conventional unit to measure a rate of flow of energy. One watt amounts to 1 joule per second.
White spirit	A highly refined distillate with a boiling range of about 150ºC to 200ºC used as a paint solvent and for dry cleaning purposes etc.

Annex C
Further sources of United Kingdom energy publications

Some of the publications listed below give shorter term statistics, some provide further information about energy production and consumption in the United Kingdom and in other countries, and others provide more detail on a country or fuel industry basis. The list also covers recent publications on energy issues and policy, including statistical information, produced or commissioned by DECC. The list is not exhaustive and the titles of publications and publishers may alter. Unless otherwise stated, all titles are available from

Publications Orderline
Web: www.decc.gov.uk/publications
Phone: 0845 504 9188
Email: deccteam@decc.ecgroup.net

and can also be found on the DECC web site at www.decc.gov.uk/.

Department of Energy and Climate Change publications on energy statistics

Energy Statistics
Monthly, quarterly and annual statistics on production and consumption of overall energy and individual fuels in the United Kingdom together with energy prices is available in MS Excel format on the Internet at: www.decc.gov.uk/en/content/cms/statistics/source/source.aspx

Energy Trends
A quarterly publication covering all major aspects of energy. It provides a comprehensive picture of energy production and use and contains analysis of data and articles covering energy issues. Available on subscription, with Quarterly Energy Prices (see below). Annual subscriptions run from June to March and are available at £40 to UK subscribers from Amey Plc, 7th Floor, Clarence House, Clarence Place, Newport, Wales NP19 7AA, Tel. 01633 224712. A subscription form is available at: www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx. An electronic version of the latest nine editions can be found at the same address. Single copies are available from the Publications Orderline priced at £6.

Quarterly Energy Prices
A quarterly publication containing tables, charts and commentary covering energy prices to domestic and industrial consumers for all the major fuels as well as presenting comparisons of fuel prices in the European Union and G7 countries. Available on subscription, with Energy Trends, (details given above). An electronic version of the latest nine editions can be found at www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx. Single copies are available from the Publications Orderline priced at £8.

Energy Flow Chart
An annual publication illustrating the flow of primary fuels from home production and imports to their eventual final uses. They are shown in their original state and after being converted into different kinds of energy by the secondary fuel producers. The 2010 edition of the chart shows the flows for 2009. Available free from DECC, Energy Statistics Team, 6th Floor, Area B, 3 Whitehall Place, London SW1A 2AW, tel. 0300 068 5056 and from the Publications Orderline. It is also available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/publications/flow/flow.aspx

UK Energy in Brief

An annual publication summarising the latest statistics on energy production, consumption and prices in the United Kingdom. The figures are taken from "Digest of UK Energy Statistics". Available free from DECC, Energy Statistics Team, 6th Floor, Area B, 3 Whitehall Place, London SW1A 2AW, tel. 0300 068 5056 and from the Publications Orderline. It is also available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/publications/brief/brief.aspx

UK Energy Sector Indicators

An annual publication designed to show in headline form the progress that has been made in implementing energy policy. It is available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/publications/indicators/indicators.aspx. A further set of background indicators (charts and tables) will be available on the internet (web address as above) in October 2010.

Energy Consumption in the United Kingdom

Energy consumption in the United Kingdom brings together statistics from a variety of sources to produce a comprehensive review of energy consumption in the UK since the 1970s. The data describes the key trends in energy consumption in the UK since 1970 with a particular focus on trends since 1990. The information is presented in five sections covering overall energy consumption and energy consumption in the transport, domestic, industrial and service sectors. It includes an analysis of the factors driving the changes in energy consumption, the impact of increasing activity, increased efficiency, and structural change in the economy. It is available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

Annual report on fuel poverty statistics

A report, published separately from the UK Fuel Poverty Strategy Annual Progress Report, detailing the latest statistics on fuel poverty. Available free from DECC (0300 068 5058). It is also available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/fuelpov_stats/fuelpov_stats.aspx

Energy Markets Outlook

The Energy Markets Outlook report provides energy market information on security of supply, looking forward over a fifteen-year time span. The intention is to help develop a shared understanding of the longer-term outlook for energy supply and demand, and to help understand emerging risks that could affect security of supply. Available free from DECC (0300 068 6086). It is also available on the Internet at: www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/markets/markets.aspx

UK Energy and CO2 emissions projections

The Updated Energy Projections (UEP) are published annually by DECC. They provide updated projections and analysis of energy use and carbon dioxide emissions in the UK. The UEP exercise incorporates all firm environmental policy measures and is based on updated assumptions consistent with the most recent UK Budget announcements. The latest report is available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx

Department of Energy and Climate Change policy publications

Energy Bill 2010
The Energy Bill 2010 was announced in the Queen's Speech on 25 May 2010. The purpose of the Bill is to provide a step change in the provision of energy efficiency measures to homes and businesses. It will also put in place a framework to deliver a future with secure, low carbon energy supplies and fair competition in the energy markets. The Bill is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/energy_bill/energy_bill.aspx

Energy Act 2010
The Energy Act 2010 was given Royal Assent on 8 April 2010. The Act is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/energy_act_10/energy_act_10.aspx

UK Low Carbon Transition Plan
The UK Low Carbon Transition Plan was published on 15 July 2009. The Plan is available on the Internet at: www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx
and in hard copy from The Stationery Office.

Energy Act 2008
The Energy Act 2008 was granted Royal Assent on 26 November 2008. The Act is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/energy_act_08/energy_act_08.aspx

Climate Change Act 2008
The Climate Change Act 2008 was granted Royal Assent on 26 November 2008. The Act is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx

Planning Act 2008
The Planning Act 2008 was granted Royal Assent on 26 November 2008. The Act is available on the Internet at:
www.communities.gov.uk/planningandbuilding/planning/planningpolicyimplementation/reformplanningsystem/planningbill/

Nuclear White Paper, 'Meeting the energy challenge: a White Paper on nuclear power'
The Nuclear White Paper, 'Meeting the energy challenge: a White Paper on nuclear power" was published on 10 January 2008. The White Paper is available on the Internet at:
www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/nuclear/white_paper_08/white_paper_08.aspx and in hard copy from The Stationery Office.

Energy White Paper, 'Meeting the Energy Challenge'
The Energy White Paper, 'Meeting the Energy Challenge' was published on 23 May 2007. The White Paper is available on the Internet at:
www.decc.gov.uk/en/content/cms/publications/white_paper_07/white_paper_07.aspx and in hard copy from The Stationery Office.

Other publications including energy information

General

Wales in Figures; *Welsh Assembly Government*
Eurostat Yearbook (annual); *Statistical Office of the European Communities - Eurostat*
Eurostatistics (monthly); *Statistical Office of the European Communities – Eurostat*
High Level Summary of Statistics: Key Trends for Scotland; *Scottish Government*
Monthly Digest of Statistics; *Office for National Statistics*
Northern Ireland Abstract of Statistics; *Northern Ireland Statistics and Research Agency*
Overseas Trade Statistics of the United Kingdom; *H.M. Revenue and Customs*
- Business Monitor OTS1 (monthly) (trade with countries outside the EC)
- Business Monitor OTS2 (monthly) (trade with the EC and the world)
- Business Monitor OTSQ (quarterly) (trade with the EC)
- Business Monitor OTSA (annually) (trade with the EC and the world)

Regional Trends (annual); *Office for National Statistics*
Regional Yearbook (annual); *Statistical Office of the European Communities – Eurostat*
United Kingdom Minerals Yearbook; *British Geological Survey*

Energy

BP Statistical Review of World Energy (annual); *BP*
Energy - Yearly Statistics; *Statistical Office of the European Communities – Eurostat*
Energy Balance Sheets; *Statistical Office of the European Communities – Eurostat*
Panorama of Energy; *Statistical Office of the European Communities – Eurostat*
Energy Statistics and Balances of Non-OECD Countries (annual); *International Energy Agency*
Energy Statistics and Balances of OECD Countries (annual); *International Energy Agency*
UN Energy Statistics Yearbook (annual); *United Nations Statistical Office*

Coal

Annual Reports and Accounts of The Coal Authority and the private coal companies; (*apply to the Headquarters of the company concerned)*
Coal Information (annual); *International Energy Agency*
Coal Statistics (quarterly); *International Energy Agency*

Electricity

Annual Report of The Office of Gas and Electricity Markets; *OFGEM*
Annual Reports and Accounts of the Electricity Supply Companies, Distributed Companies and Generators; (*apply to the Headquarters of the company concerned)*
Electricity Information (annual); *International Energy Agency*
Electricity Statistics (quarterly); *International Energy Agency*
National Grid - Seven Year Statement - (annual); *National Grid*

Environment

e-Digest of Environmental Statistics; *Department for Environment, Food and Rural Affairs (Defra).*
Sustainable development indicators in your pocket; *Department for Environment, Food and Rural Affairs (Defra)*

Oil and gas

Annual Reports and Accounts of National Grid, Centrica and other independent gas supply companies; (contact *the Headquarters of the company concerned directly)*
Oil and Gas Information (annual); *International Energy Agency*
Oil and Gas Statistics (quarterly); *International Energy Agency*
UK Petroleum Industry Statistics Consumption and Refinery Production (annual and quarterly); *Energy Institute*

Prices

Energy Prices and Taxes (quarterly); *International Energy Agency*
Gas and Electricity Market Statistics (annual); *Statistical Office of the European Communities - Eurostat (substitutes the previous publications "Energy prices", "Gas prices" and "Electricity prices")*

Renewables

Renewables Information (annual); *International Energy Agency*

Useful energy related web sites

The DECC web site can be found at www.decc.gov.uk/, the energy information and statistics web site is at www.decc.gov.uk/en/content/cms/statistics/statistics.aspx

Other Government web sites

Central Office of Information	www.coi.gov.uk
Department for Communities and Local Government.	www.communities.gov.uk
Department for Environment, Food and Rural Affairs	www.defra.gov.uk
Department for Transport	www.dft.gov.uk
HM Government Online	www.direct.gov.uk
HM Revenue and Customs	www.hmrc.gov.uk
Northern Ireland Executive	www.northernireland.gov.uk
Ofgem (The Office of Gas and Electricity Markets)	www.ofgem.gov.uk
The Scottish Government	www.scotland.gov.uk
The Scottish Parliament	www.scottish.parliament.uk
UK Parliament	www.parliament.uk
UK Statistics Authority	www.statisticsauthority.gov.uk
Welsh Assembly Government	www.wales.gov.uk

Other useful energy related web sites

AEA Energy & Environment	www.aeat.co.uk
Association of Electricity Producers	www.aepuk.com
BP	www.bp.com
British Geological Survey	www.bgs.ac.uk
Building Research Establishment	www.bre.co.uk
Coal Authority	www.coal.gov.uk
Consumer Focus	www.consumerfocus.org.uk/
Energy Institute	www.energyinst.org.uk
Energy Networks Association	www.energynetworks.org
Europa (European Union Online)	http://europa.eu/
Eurostat	http://epp.eurostat.ec.europa.eu/
Interconnector (UK) Ltd	www.interconnector.com
International Energy Agency	www.iea.org
Iron and Steel Statistics Bureau	www.issb.co.uk
National Grid	www.nationalgrid.com
Oil & Gas UK	www.ukooa.co.uk
Renewable UK	www.bwea.com
The Stationery Office	www.tso.co.uk
UK Air Quality Archive	www.airquality.co.uk
UK Petroleum Industry Association	www.ukpia.com
United Nations Statistics Division	http://unstats.un.org/unsd/default.htm
US Department of Energy	www.energy.gov
US Energy Information Administration	www.eia.doe.gov

Annex D

Major events in the Energy Industry

To June 2010 **Carbon Capture and Storage**

Funding was awarded by the Government in March 2010 to E.ON and Scottish Power for design and development studies as part of the competition to build one of the world's first commercial scale carbon capture and storage demonstration plants. The funding will support Front End Engineering and Design studies, which will enable the companies to further their designs for the projects at Kingsnorth and Longannet respectively.

Climate Change

In April 2010, the Government launched an incentive scheme, Carbon Reduction Commitment Energy Efficiency Scheme (CRC EES), which aims to save public and private sector organisations around £1billion per year by 2020 through cost effective energy efficiency measures that are not yet being taken up.

Emissions Trading

In January 2010, 4.9 million allowances were auctioned in the eighth auction as part of phase II of the EU ETS. In 2010, the UK plans to auction a total of 35.8 million allowances.

Energy Policy

Major low carbon components of the Budget announced by the Chancellor in June 2010 include:

- An assessment of how the energy tax framework can provide the right incentives for investment, alongside wider market reforms.
- Detailed proposals on the creation of a Green Investment Bank, following the Spending Review, to help the UK meet the low-carbon investment challenge.
- Establishing a Green Deal for households through legislation in the Energy Security and Green Economy Bill, to help individuals invest in home energy efficiency improvements that can pay for themselves from the savings in energy bills.
- Making the tax system fairer by examining options for the design of a fair fuel stabiliser; considering the case for introducing a fuel duty discount in remote rural areas; and exploring changes to the aviation tax system.

The Energy Bill 2010 was announced in the Queen's Speech in May 2010. The Bill will provide a step change in the provision of energy efficiency measures to homes and businesses, and put in place a framework to deliver a future with secure, low carbon energy supplies and fair competition in the energy markets.

2010 (continued) The Energy Bill received Royal Assent in April 2010, becoming the Energy Act 2010. The main elements of the new Act are:

- Carbon capture and storage (CCS) – delivering a new financial incentive to bring forward four commercial scale demonstration projects on coal-fired power stations and to support the retrofit of additional CCS capacity to those projects should it be required at a later date.
- Mandatory social price support – creating a framework to mandate energy companies to provide support to the fuel poor, including powers to give greater guidance and direction on the types of households eligible for future support and the type of support they should be given.
- Clarifying Ofgem's remit – making it clear that Ofgem must: include the reduction of carbon emissions and the delivery of secure energy supplies in their assessment of the interests of consumers, and step in proactively to protect consumers as well as considering longer term actions to promote competition
- Tackling market power exploitation – giving Ofgem additional powers to tackle market exploitation where companies might take advantage of constraints in the electricity transmission grid.

Major low carbon components of the Budget announced by the Chancellor in March 2010 include:

- A new Green Investment Bank for Low Carbon Development to assist the finance challenge confronting infrastructure projects in the UK.
- An offshore wind infrastructure competition for up to £60m of funds to develop sites close to ports that will support manufacturing for the offshore wind industry.
- Publication of the initial findings of the Energy Market Assessment, narrowing down the options for market reform to incentivise the necessary investment over the next few decades and to ensure the consumer gets the best deal possible in the long term.
- Government and the financial services industry will undertake detailed work through a joint forum to develop Pay As You Save arrangements. This will enable millions of households to finance the high upfront costs of installations from the savings they make on their energy bills.
- A consultation on proposals to change the way in which electricity from biomass is supported to improve investor certainty and ensure sustainability.
- Government intends to opt nitrous oxide gases from nitric acid production into the EU ETS from 2011.

The Government launched in January 2010 a national scheme to upgrade household heating systems to cut carbon, save money on fuel bills and sustain work for the heating industry. Up to 125,000 households in England with working "G-rated" boilers can apply through the Energy Saving Trust for a voucher which will entitle them to £400 off the price of a new, modern "A-rated" boiler or a renewable heating system like a biomass boiler or a heat pump.

Oil and Gas

In June 2010, the Government approved the development of the Bacchus oil and gas field located in the Central North Sea, which has estimated reserves of 18 million barrels of oil equivalent.

In June 2010 the Government announced record levels of interest in new developments in the North Sea. 356 blocks were applied for in the latest licensing round, the largest number of blocks applied for since the first licensing round was launched in 1964.

2010 (continued) In April 2010, South Hook, Europe's largest Liquefied Natural Gas (LNG) Terminal, at Milford Haven in South West Wales, successfully completed the build and commissioning of phase 2 and is now complete. The terminal has a total processing capacity of 15.6 million tonnes per annum of LNG and is capable of delivering up to 21 billion cubic metres per annum of gas into the National Transmission System (NTS).

The Government gave consent, in April 2010, for the construction of a 1,520 MW Combined Cycle Gas Turbine (CCGT) power plant in Carrington, Greater Manchester.

The Government gave consent, in March 2010, for Total and Dong Energy to develop the Laggan and Tormore gas fields, which lie in 600 metres of water and in one of the most hostile environments in the UK. These will be the first gas fields to be developed in UK waters at this depth and will produce more than 1 trillion cubic feet of gas in the course of the field's life.

The Government issued, in February 2010, the first licence under the Energy Act 2008 to encourage the construction of more gas storage which could see the UK's gas storage capacity increase by 30%. The Gateway Project, located in the east Irish Sea, will create twenty new salt caverns each the size of the Albert Hall.

A new round of offshore licensing was announced in January 2010. The 26th offshore licensing round will allow for oil and gas exploration in UK waters; for the first time since 1998, this round offers blocks in all areas of the UK seas for new licensing. The blocks offered include a number relinquished under the Government and industry's 'Fallow Initiative', which stimulates activity on blocks where there had been no significant activity for three years.

Renewables

In April 2010, the Government launched an incentive scheme, Feed in tariffs (FITs), which will allow individuals, organisations or businesses in England, Wales and Scotland who install low carbon electricity generation to be paid for any electricity they generate themselves from low carbon sources and benefit from a cheaper electricity bill.

The Government, in March 2010, gave approval to the construction of a new 100 MW power plant fuelled by biomass at Bristol Port, Avonmouth.

The UK's long term energy and climate security was strengthened substantially in January 2010 as The Crown Estate, owner of the UK's coastal seabeds, granted rights to energy companies to develop the biggest expansion of wind energy ever seen in the world. The announcement has the potential to see an additional 32GW of clean electricity feeding into the UK grid, on top of 8GW from previous rounds, and will mean an extra 6,400 turbines.

2009

Carbon Capture and Storage

Alongside the six draft National Policy Statements laid before Parliament in November 2009 by the Secretary of State for Energy and Climate Change, a Framework for the Development of Clean Coal was also published which confirmed that with immediate effect, to gain development consent all new coal plant will have to show that they will demonstrate the full CCS chain (capture, transport and storage) from the outset on at least 300 MW net of their total output.

The Secretary of State for Energy and Climate Change announced in a statement to Parliament in April 2009 a new generation of coal-fired power stations equipped for carbon capture and storage, of which up to four such plants could be built by 2020.

2009 (continued)

Carbon Emissions Reduction Target

The Government announced in June 2009 that more help to save energy will be available to householders due to an increase in the Carbon Emissions Reduction Target (CERT) scheme and the introduction of a new Community Energy Saving Programme (CESP). Together, CERT and CESP will see extra investment by energy companies under the two schemes, taking the total to an estimated £3.5billion in energy efficiency improvements by the end of 2012.

The Government published in February 2009 a consultation on proposals to amend the Carbon Emissions Reduction Target (CERT) through the Electricity and Gas (Carbon Emissions Reduction) Order 2008. This supports a key element of the Prime Minister's £1 billion Home Energy Saving Programme announced in September 2008.

Climate Change

The move towards global and immediate action on climate change was agreed as part of the Copenhagen Accord, in December 2009. The Accord – agreed by major developed and developing country leaders and backed by a large majority of countries - will reinforce the need for strong domestic action on climate change across the world. The Accord includes international backing for an overall limit of 2 degrees on global warming; agreement that all countries need to take action on climate change; and the provision of immediate and longer term financial help to those countries most at risk of climate change.

The Secretary of State for Energy and Climate Change announced in September 2009 new measures to help householders save money and energy following the launch of 10:10 – a new independent campaign to cut carbon emissions by 10% in 2010.

In September 2009, the Government launched a search for local authorities, charities and social enterprises to take up the challenge to help communities fight climate change. Communities will be able to apply for a share of a £10million fund as part of the Low Carbon Communities Challenge to build on existing low carbon schemes.

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

- Legally binding carbon budgets for the first three five-year periods 2008-2012, 2013-2017 and 2018-2022.
- A revised target to reduce emissions to at least 34% below 1990 emissions by 2018-22.
- Aim to meet the carbon budgets announced through domestic action alone, and consistent with this, setting a zero limit in the non-traded sector on offsetting through international credits for the first budget period.
- Commitment to tighten the budget after Copenhagen in December 2009, once we have a global climate change agreement.

2009 (continued)

Electricity

A new 95 Mega Watt power plant capable of turning 600,000 tonnes of waste each year into electricity and heat, to be built at Ince in Cheshire, was approved by the Government in August 2009. The waste, which would have otherwise gone to landfill, will instead be used to generate electricity to power a new Resource Recovery Park. Excess electricity will also be exported to the National Grid.

The Government granted consent in February 2009 for three new power stations capable of providing approximately four million homes with electricity to be constructed at Pembroke, King's Lynn and Hatfield. The new gas fired power stations will produce around 4 gigawatts of power.

Emissions Trading

The Government announced in February 2009 that it intends to auction four million allowances in its second auction as part of the EU ETS. In 2009 the UK plans to auction a total of 25 million allowances

Energy Policy

A new Energy Bill was introduced into Parliament in November 2009 by the Government. New powers and clearer legislation will provide support for energy consumers, giving a greater amount of help to the poorest and most vulnerable, as well as introducing a new financial incentive for carbon capture and storage.

Faster and fairer planning decisions on new energy infrastructure were laid before Parliament in November 2009 by the Secretary of State for Energy and Climate Change. Six draft National Policy Statements - one overarching and one for each of the following areas: fossil fuels, nuclear, renewables, transmission networks and oil and gas pipelines – will guide planning decisions on energy infrastructure from March 2010 by the Infrastructure Planning Commission.

A comprehensive plan to move the UK onto a permanent low carbon footing and to maximise economic opportunities, growth and jobs was published by the Government in July 2009. The UK Low Carbon Transition Plan sets out how by 2020:

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

In February 2009 the Department of Energy and Climate Change, together with the Department for Communities and Local Government, published three consultation documents: the Heat and Energy Saving Strategy (HESS), the Carbon Emissions Reduction Target uplift (CERT) and the Community Energy Saving Programme (CESP). These home energy efficiency measures make up a comprehensive package to save people energy and reduce emissions from now through to 2020 and beyond.

2009 (continued)

Fuel Poverty

The Government published its UK Fuel Poverty Strategy Seventh Annual Progress Report in October 2009, reporting on the progress made since the last report, highlighting key areas for attention during the coming year, and setting out the fuel poverty figures for 2007. Alongside the report the Government set out four next steps to help low income homes deal with high energy bills:

- Action to help the poorest insulate their homes.
- Provision of street by street help in low income neighbourhoods.
- Action on prices for the most vulnerable.
- Tougher regulation to make sure all consumers get a fair deal.

In April 2009, following a review, it was announced that the Warm Front Scheme had been changed to improve the quality of service for its customers. Households connected to the gas grid are now eligible for grants of up to £3500, up from £2700, while those in areas off the gas grid can apply for funding up to £6000, an increase of £2000.

Nuclear

In the draft nuclear National Policy Statement laid before Parliament in November 2009 by the Secretary of State for Energy and Climate Change, the Government confirmed that all of the sites, with the exception of Dungeness, nominated by industry have been assessed as potentially suitable for new nuclear deployment by the end of 2025.

A third potential new nuclear operator entered the UK market in October 2009 taking total proposals for new nuclear power stations up to 16 gigawatts of electricity. A consortium of GDF SUEZ SA, Iberdrola SA and Scottish and Southern Energy Plc have secured an option to purchase land for the development of a new nuclear power station at Sellafield.

A list of eleven sites that could be potential hosts to new nuclear power stations in the UK, and be operational by 2025, was published in April 2009.

In January 2009, EDF's £12.5 billion purchase of British Energy Group plc (British Energy) was completed. The purchase is a significant step in EDF's plans to build four new nuclear reactors in the UK. The sale, which includes the 36 per cent stake in the company held by the Government's Nuclear Liabilities Fund, raises approximately £4.4 billion towards the cost of decommissioning British Energy's existing nuclear power stations.

Oil and Gas

In May 2009 the South Hook LNG re-gasification terminal, the largest LNG terminal in Europe, was officially opened, following earlier arrival of commissioning cargoes.

A proposed new licensing scheme which will open up an area of up to 200 miles around the UK for offshore gas storage and importation projects was announced in a consultation document published in February 2009. The scheme will create a regulatory environment that will encourage investment in new gas supply infrastructure, including gas storage.

Renewables

At an Energy Council meeting in Brussels in December 2009, the Government signed an agreement along with Germany, France, Belgium, the Netherlands, Luxembourg, Denmark, Sweden and Ireland to develop an integrated offshore wind grid in the North and Irish Seas.

2009 (continued) In November 2009 the Government gave approval for the construction of a 80MW energy from waste and biomass fuelled power station at Storey's Bar Gate in Peterborough.

In August 2009 the Government gave approval for a new 60 Mega Watt power plant, fuelled by biomass and waste, to be built on a disused site at Tilbury Docks in Essex.

The Secretary of State for Energy and Climate Change announced in July 2009 that three UK-based banks, RBS, Lloyds and BNP Paribas Fortis, will start work with the European Investment Bank (EIB) on a programme to lend up to £1 billion to onshore wind farms over the next 3 years. The cash will help get building started for onshore wind projects which have been hit by the credit crunch, particularly small and mid-sized wind farms.

In July 2009 the Government published, alongside the UK Low Carbon Transition Plan, the Renewable Energy Strategy which maps out how the UK will deliver its target of getting 15% of all energy (electricity, heat and transport) from renewables by 2020.

In May 2009 E.ON, Dong and Masdar announced the go ahead of the first phase of the London Array offshore windfarm. The 1 Gigawatt London Array, to be situated off Kent and Essex, will be the biggest offshore wind farm in the world, generating enough electricity to power a quarter of Greater London's homes, with the first power feeding into the grid by 2012.

Smart Meters

In December 2009 the Government confirmed that smart meters will be rolled out through energy suppliers to every home by the end of 2020, alongside a paper setting out the case for developing smart grids in the UK.

All homes in Britain will have smart meters installed by 2020 under plans published by the Government in May 2009. Smart meters enable meter readings to be taken remotely and together with a display device give householders real time information on their energy use. The new information smart meters provide will help consumers to see what energy they are using and how to save money on their bills.

2008

Energy Bill

The Energy Bill was published in January 2008 in tandem with the Nuclear White Paper. The purpose of the Bill, alongside the Climate Change and Planning Bills, is to update and strengthen the legislative framework so that it is appropriate for today's energy market and fit for the challenges to be faced on climate change and security of supply. Key elements of the bill are:

- Create a regulatory framework to enable private sector investment in Carbon Capture and Storage projects while also protecting the environment;
- Ensure adequate funding provision be made by potential developers of new nuclear power stations to pay the full costs of decommissioning and their full share of waste management costs.
- Strengthen and simplify the regulatory framework to give investors more clarity and certainty, reducing costs and risks for private sector investment in offshore gas supply projects such as offshore storage and liquefied natural gas infrastructure.
- Strengthen the Renewables Obligation (RO) to drive greater and more rapid development of renewables in the UK. Proposals include amending the RO to give more support to new and emerging technologies such as offshore wind, wave and tidal by banding the Obligation.
- Measures to be brought forward for offshore renewables decommissioning, ensuring that companies have adequate decommissioning funds so that both the tax payer and the offshore environment is protected.

Carbon Capture and Storage

The Government published, in June 2008, a consultation on the legislative framework for Carbon Capture and Storage (CCS), including carbon capture readiness. The consultation sets out the Government's views on CCS as a 'high potential' carbon abatement technology and asks for views on what more can be done to promote, develop and deploy CCS in the UK, EU and globally.

Climate Change

In December 2008 the Committee on Climate Change published its inaugural report 'Building a low-carbon economy - the UK's contribution to tackling climate change'. The report contained the Committees recommendations on the 2050 emissions reduction target and advised on the levels of the UK's first three legally binding carbon budgets for 2008-2022.

In December 2008 at a meeting of the European Council EU leaders agreed measures to deliver a unilateral commitment to reduce greenhouse gas emissions by 20% by 2020 compared to 1990 levels.

In October 2008, the Government committed the UK to cutting greenhouse gas emissions by 80% on 1990 levels by 2050 as a major contribution to a global deal on climate change.

Coal

Tower Colliery, the last deep mine in Wales, closed in January 2008, thirteen years after its workforce rescued it from the pit closure programme.

Electricity

The Government announced, in January 2008, its support for electricity generated from geopressure through the Renewables Obligation scheme, which provides companies using green energy sources with assistance in competing with fossil fuel generators.

2008 (continued)

Emissions Trading

In November 2008, the Government held Europe's first carbon allowance auction in Phase II (2008-2012) of the EU Emissions Trading Scheme (EU ETS). Four million allowances were sold at a total value of £54m excluding VAT.

The proposals announced by the European Commission in January 2008 for tackling climate change and delivering a low carbon economy in Europe put the EU Emissions Trading Scheme at the heart of EU climate policy, including establishing an EU wide central cap on emissions covered by the EU ETS to 2020 and beyond.

Energy Policy

The second Energy Markets Outlook report, published in December 2008, set out the risks and drivers associated with future security of energy supply, including scenarios for future security of supply of electricity and gas and the full range of other fuels.

Machinery of Government changes announced in October 2008 resulted in Energy Policy being transferred from the Department for Business, Enterprise and Regulatory Reform, and Climate Change Policy being transferred from the Department for Environment, Food and Rural Affairs to the new Department of Energy and Climate Change.

EU Energy Review

The European Commission's proposals for tackling climate change and delivering a low carbon economy in Europe were announced in January 2008. The proposals implement the decisions agreed by EU Heads of State and Government at the 2007 Spring European Council. For the UK, the Commission's proposals include:

- a reduction of 16 per cent in UK greenhouse gas emissions from sectors not covered by the EU ETS by 2020 from 2005 levels;
- for 15 per cent of the energy consumed in the UK to come from renewable sources by 2020;
- for 10 per cent of road transport fuels to come from renewable sources, subject to them being produced in a sustainable way.

Fuel Poverty

Help for people struggling with high home energy bills was announced in November 2008 by the Chancellor in the Pre-Budget Report, with additional Warm Front funding of £100 million, and £50 million of existing allocation to be spent a year sooner than planned.

The Government published its UK Fuel Poverty Strategy Sixth Annual Progress Report in October 2008, reporting on the progress made since the last report, highlighting key areas for attention during the coming year, and setting out the fuel poverty figures for 2006. As part of the progress report, annexes were also produced on methodology, detailed analyses of the fuel poor, fuel poverty monitoring and company schemes and case studies.

In September 2008, the Government announced a new package of measures to help people with their gas and electricity bills. The launch of the Home Energy Saving Programme will offer energy efficiency and other measures to households in deprived areas and will be funded by energy suppliers and electricity generators. Suppliers will also fund a 20% expansion in CERT, and increase their collective spend on social programmes to £225million over the next three years.

2008 (continued) A raft of new measures was agreed at a Fuel Poverty Summit hosted by OFGEM in May 2008 to help vulnerable consumers access the best available tariffs.

In April 2008, the six largest energy suppliers individually agreed to spend an extra £225m over three years to help those squeezed by rising fuel bills, which could lift 100,000 households out of fuel poverty.

Heat

In January 2008, following a commitment in the 2007 Energy White Paper, BERR along with Defra and DCLG published the Heat Call for Evidence. The Call for Evidence will play an important part in developing a strategy for heat given that half of all UK's CO2 emissions arise from the use of heat.

Nuclear

In September 2008 EDF announced that its proposed takeover offer for British Energy included substantial investment to build four new reactors, two each at Hinckley Point and Sizewell, with a total generating capacity of 6.4GW of electricity.

The Government published in July 2008 its Strategic Siting Assessment of where new nuclear power stations could safely and securely be built across England and Wales.

In June 2008 the Secretary of State for Business, Enterprise and Regulatory Reform announced the creation of a Nuclear Development Forum to provide regular discussions between Government and industry, and an Office of Nuclear Development to provide a single focus within Government on the development of new nuclear.

The Government's response to its nuclear consultation, in the form of a White Paper, was published alongside the Energy Bill in January 2008. Following the consultation, the Government has now decided that it is in the public interest to allow private sector energy companies to invest in new nuclear power stations. Building of new nuclear power stations is expected to commence in 2013-2014 with operation commencing in 2017-2020.

Oil and Gas

171 new licences were offered, in November 2008, to 100 companies covering 257 blocks of the North Sea as part of the 25th offshore oil and gas licensing round.

Industrial action by oil workers at the Grangemouth refinery in April 2008 led to the temporary closure of the Forties oil pipeline, which provides 30% of the UK's daily oil output from the North Sea.

Brent crude oil prices topped $100 a barrel for the first time in March 2008, and rose to over $140 a barrel in June and July.

A record breaking 2,297 blocks or part blocks in UK waters were offered, in February 2008, for exploration in the 25th Offshore Oil and Gas Licensing Round.

Renewables

In December 2008 at a meeting of the European Council EU leaders agreed a commitment to 20% of all energy to come from renewable sources by 2020 (including a 10% target for the use of renewable fuels in transport).

2008 (continued) The Chancellor announced in the Pre-Budget Report in November 2008 the extension of the Renewables Obligation from its current end date of 2027 to at least 2037. The extension will ensure that investors can plan with confidence for the future so that over the next decade the market will continue to deliver the renewables projects that are needed to achieve the 2020 target.

In October 2008 the UK overtook Denmark to become the world's number one for wind farms built offshore, with 597MW fully constructed. The achievement was made possible after building work finished at Centrica's Lynn and Inner Dowsing wind farms near Skegness. Offshore wind farms now have the potential to power the equivalent of around 300,000 UK homes.

The Government published, in June 2008, a consultation on the UK Renewable Energy Strategy. The consultation puts forward a package of measures to drive up the use and deployment of renewable energy as part of the UK goal to tackle climate change and ensure security of supply and to enable the UK to meet its EU 2020 target.

The Crown Estate launched, in June 2008, its round 3 leasing programme for the delivery of up to 25 GW (gigawatts) of new offshore windfarm sites by 2020. The announcement was made at the BWEA (British Wind Energy Association) conference in central London.

The UK's offshore renewable industry will benefit from measures, jointly announced by the Government and Ofgem in January 2008, to connect at least £2 billion of investment to the national grid. The investment will support the delivery of the necessary infrastructure to connect 8 gigawatts of planned offshore wind generation.

Retail Prices

The Chancellor announced in November 2008 in the Pre-Budget Report that Ofgem will publish quarterly reports over the coming year showing the relationship between wholesale prices, estimated hedged wholesale costs and average retail prices for gas and electricity. This will make it clearer when companies are passing the benefits of downward price changes through to their consumers and will ensure transparency over future price changes. The first report was published in February 2009.

For major events in earlier years see the DECC website version of this annex at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

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