Department
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Digest of United Kingdom Energy Statistics 2013

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Digest of United Kingdom Energy Statistics

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This is a National Statistics publication

The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the UK Statistics Authority: Code of Practice for Official Statistics.

Designation can be broadly interpreted to mean that the statistics:

- meet identified user needs
- are well explained and readily accessible
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

Contents

Monthly and quarterly data are also available for Energy, Solid fuels and derived gases, Petroleum, Gas, Electricity and Renewables at:
www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics

Information on Energy Prices is available at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-price-statistics

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Chapter 7 Combined heat and power

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 in 2009 to mark the 60th anniversary of DUKES. The publication is available at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

II The current issue updates the figures given in the Department of Energy and Climate Change's (DECC) *Digest of United Kingdom Energy Statistics 2012*, published in July 2012.

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, renewable sources of energy and combined heat and power. 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 2009 are included on the internet, and tables that show five years in this printed version show fifteen 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 2013 - Annex D
(only Major events for 2011 to 2013 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. The data are also available on the DECC section of the gov.uk website. 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 6 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 Ricardo-AEA on behalf of DECC which complement work undertaken by DECC. These chapters estimate the contribution made by renewable energy sources to energy and combined heat and power (CHP) 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 section of the gov.uk website for each fuel at:
www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics.

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 5.66 to 5.72.

XV Data in this issue have been prepared on the basis of the Standard Industrial Classification (SIC 2007) as far as is practicable. For further details of classification of consumers see Chapter 1, paragraphs 1.56 to 1.60.

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. However, within UK trade statistics, 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, from the UK, 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 2012 Digest, even though some figures may have been amended on the internet version of the tables. A table showing the size of revisions to key aggregates is available (Chapter 1, table 1J). 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, and 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 2013 when this Digest is published, revisions can be made to 2011 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 2013) are published in *Energy Trends* in March of the following year (eg March 2014), percentage growth rates are liable to be distorted if the prior year (ie 2012) data are constrained to the Digest total, when revisions are known to be required. In these circumstances the prior year (ie 2012) 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 2013 data published in *Energy Trends* prior to publication in the 2014 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.gov.uk/government/organisations/department-of-energy-climate-change/series/decc-statistics-governance
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 DECC section of the gov.uk website, under "statistics". The Digest is available at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes. 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;
- quarterly, by DECC in paper and on the internet in *Energy Trends,* and *Quarterly Energy Prices;*
- quarterly, by DECC in a Statistical Press Release which provides a summary of information published in *Energy Trends* and *Quarterly Energy Prices* publications;

To subscribe to *Energy Trends* and *Quarterly Energy Prices,* please contact Kevin Harris 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 not separately available
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, Ricardo-AEA, 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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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 2013

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All the above can be contacted by fax on 0300 068 5006

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

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Chapter 1
Energy

Key points

- In 2012 UK energy production was down 10.7 per cent on a year earlier, as a number of oil and gas production facilities were affected by maintenance issues, alongside longer term decline. (Tables 1.1 and 1.2).
- Primary energy consumption was up 2.1 per cent. Final energy consumption rose by 1.7 per cent with more energy used for heating (more details are available in Energy Consumption in the UK: www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-consumption-in-the-uk).
- On a temperature adjusted basis, primary energy consumption was down 0.6 per cent continuing the downward trend of the last seven years, with temperature adjusted final energy consumption down 0.7 per cent. In 2012 the average UK temperature was 9.8 degrees Celsius, 1.0 degrees lower than in 2011, and 0.2 degrees lower than the average temperature between 1981 and 2010 (Table 1.1.7).
- The UK remained a net importer of energy, with a dependency level that increased to 43 per cent. Fossil fuels remain the dominant source, accounting for 87.3 per cent of supply, though this is a record low level. Supply from renewables increased, with its contribution accounting for 4.1 per cent of consumption on the EU agreed basis (see chapter 6).
- In 2012 within electricity generation, there was a switch in the main sources of electricity generation from gas to coal. Generation from gas declined sharply, with fuel use down by 30 per cent, due to high gas prices throughout the year. This fall was offset by a 32 increase in coal use, which was at its highest level since 2006. (see chapter 5).

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 6.

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, 2012. 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. A new table 1.J has been included this year presenting information on revisions made to earlier data in this year's Digest. 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

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 6.7, and are available on the internet version, Annex I, of this publication at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes.

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 2012, based on the latest available data from the Office for National Statistics (ONS).:

- 3.5 per cent of GDP in 2012;
- 10.1 per cent of total investment in 2010;
- 51.8 per cent of industrial investment in 2010;
- 176,000 people directly employed (7 per cent of industrial employment);
- Many others indirectly employed (eg an estimated 207,000 in support of UK Continental Shelf activities).

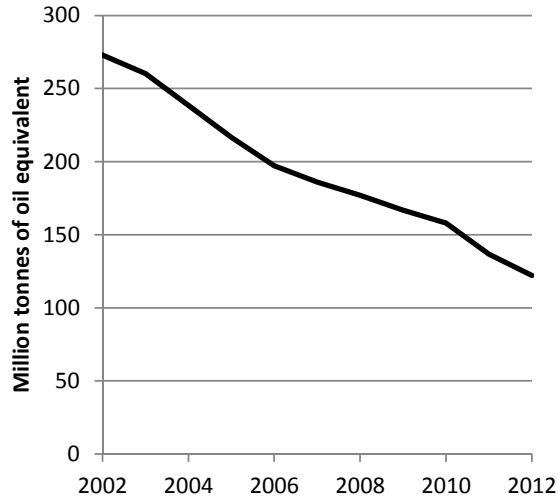
Aggregate energy balance (Tables 1.1, 1.2 and 1.3)

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 1.28.

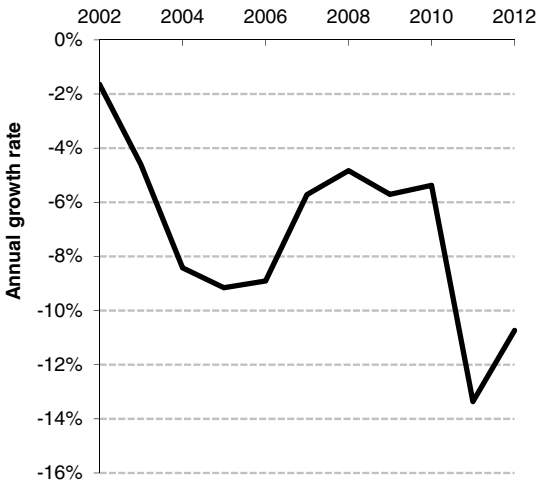
1.6 In 2012, the primary supply of fuels was 213.9 million tonnes of oil equivalent, a 1.6 per cent increase compared to 2011. Indigenous production in 2012 was down 10.7 per cent on the low level in 2011, which itself was down a record 13.4 per cent on 2010. UK energy production has fallen in each year since 1999 (chart 1.1), due to the longer term decline in UK Continental Shelf (UKCS) output and is down by 59 per cent over this period. The large fall in 2012, as in 2011, was mainly due to reduced production from the UKCS as a number of oil and gas production facilities were affected by maintenance issues.

Chart 1.1: UK energy production

Level

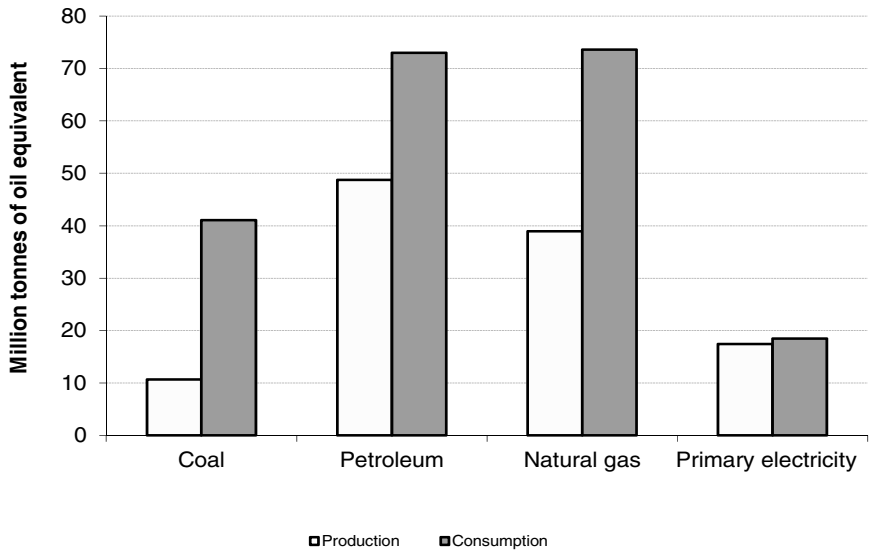


Annual growth rate



1.7 Chart 1.2 illustrates the figures for the production and consumption of individual primary fuels in 2012. In 2012, 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 2012 the UK imported more coal, crude oil, electricity and gas than it exported; however, the UK remained a net exporter of petroleum products, though to a smaller degree than in previous years. This was due to the closure of the Coryton refinery, and is covered in more detail in chapter 3. In 2012, net imports accounted for 43 per cent of energy used in the UK.

Chart 1.2: Production and consumption of primary fuels 2012



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.

1.8 Total primary energy demand was 1.4 per cent higher in 2012 than in 2011 at 214.3 million tonnes of oil equivalent. The very small difference between demand and supply is classed as the statistical difference, which is explained in paragraph 1.62. The increase in demand is mainly due to the colder weather in 2012, which was on average 1.0 degree cooler than the temperatures in 2011. There has though been a general trend since 2005, for underlying demand to fall. Primary energy consumption (primary supply less non energy use) was up by 2.1 per cent in 2012. On a temperature corrected basis, primary energy consumption was estimated to have fallen by 0.6 per cent. A table showing temperature corrected demand is shown in table 1.1.4 in the internet annex on long term trends, with chart 1.3 shown below, which shows the continued fall in primary energy consumption. Chart 1.4 shows the composition of primary demand in 2012.

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 3,861 thousand tonnes of oil equivalent of coal feeds into the production of 3,508 thousand tonnes of oil equivalent of coke, representing a loss of 354 thousand tonnes of oil equivalent in the manufacture of coke in 2012. In 2012, energy losses during the production of electricity and other secondary fuels amounted to 49.4 million tonnes of oil equivalent, (23 per cent of primary supply) shown in the transformation row in Table 1.1.

1.10 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.

Chart 1.3: Primary energy consumption

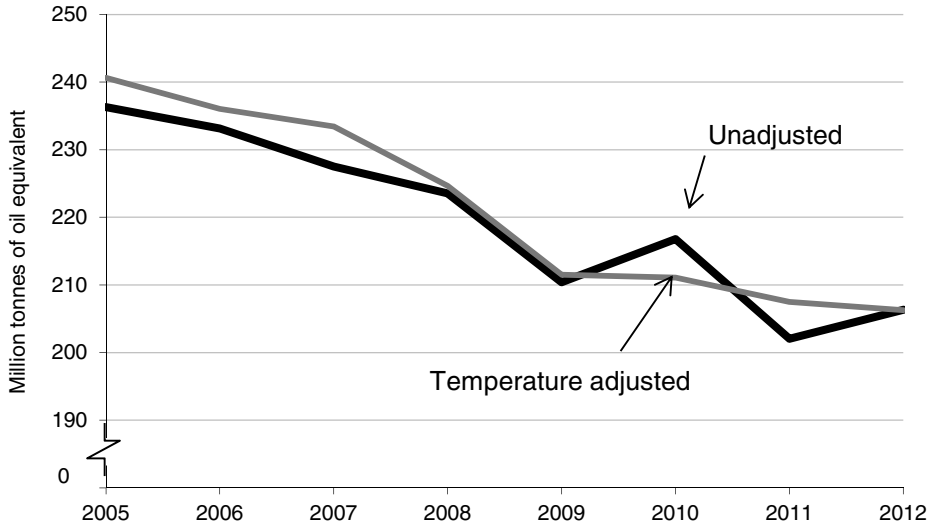
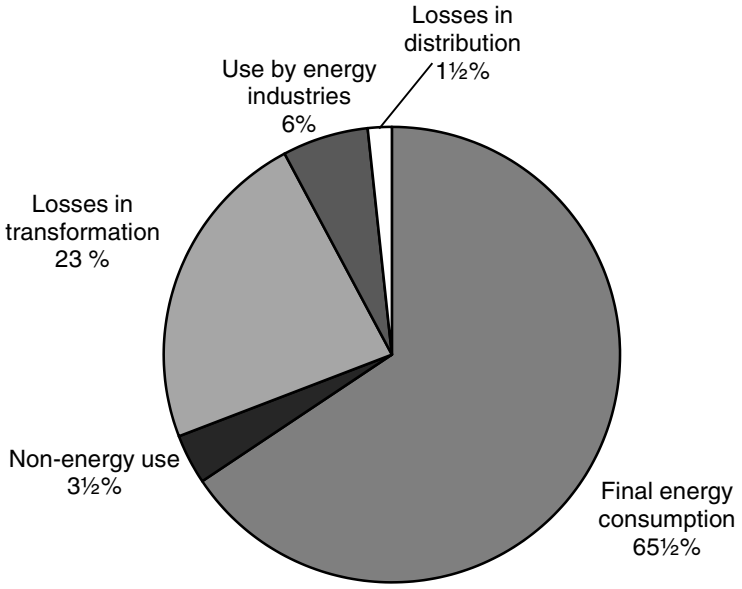


Chart 1.4: Primary demand 2012



Primary demand: 214.3 million tonnes of oil equivalent

1.11 In 2012, there was a switch in the main sources of electricity generation from gas to coal. Generation from gas declined sharply, with fuel use down by 30 per cent, due to high gas prices throughout the year. This fall was offset by a 32 increase in coal use, which was at its highest level since 2006. Generation from nuclear sources increased in 2012, with the higher efficiency levels achieved in 2012, resulting in a fall in nuclear heat as recorded in the main energy balance. Generation from wind increased sharply with 32 per cent greater capacity more than offsetting the reduced wind speeds in 2012. Hydro output was down due to lower rainfall where the main UK hydro stations are located.

1.12 Higher coal use contributed to the increase in carbon dioxide emissions between 2011 and 2012. Provisional DECC estimates suggest that emissions rose by 20.5 million tonnes of carbon

dioxide (MtCO2) (4.5 per cent) to 479.1 MtCO2 between 2011 and 2012. The other main factor contributing to the rise was increased domestic gas use reflecting the colder weather in 2012. More details of carbon dioxide emissions are available in a Statistical Release, published in March, which is available on the DECC website at www.gov.uk/government/publications/provisional-uk-emissions-estimates.

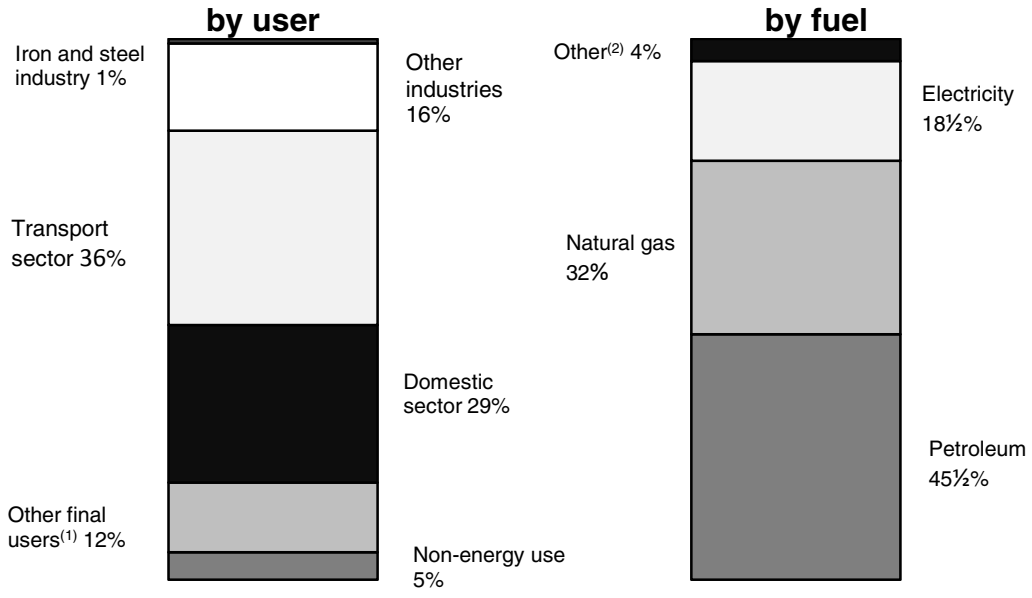
1.13 The energy industry use section of the table represents use of fuels by the energy industries themselves. This section also includes consumption by those parts of the iron and steel industry which behave like an energy industry i.e. they are involved in the transformation processes (see paragraph A.29 of Annex A). In 2012, energy industry use amounted to 13.1 million tonnes of oil equivalent of energy, continuing a general decline matching the fall in UK energy production.

1.14 Losses presented in the energy balance include distribution and transmission losses in the supply of manufactured gases, natural gas, and electricity. Recorded losses fell by 5.0 per cent between 2011 and 2012.

1.15 Total final consumption which includes non-energy use of fuels, in 2012 was 148.2 million tonnes of oil equivalent; this is a 2.4 million tonnes of oil equivalent increase, 1.7 per cent up, on the consumption in 2011. Consumption in the domestic sector was up 11.0 per cent due to increased gas use for heating, with that in the service sector up by 2.7 per cent. The reduced use from industry, transport and non-energy; down 2.9 per cent, 1.4 per cent and 10.0 per cent respectively; were not sufficient to offset the rise in domestic consumption. Final energy consumption in 2012 is accounted for by the transport sector (35.9 per cent), the domestic sector (29.1 per cent), the industrial sector (17.0 per cent), the services sector (12.8 per cent) and non-energy use (5.1 per cent). These figures are illustrated in Chart 1.5. Recent trends in industrial consumption are shown in Table 1.8 and are discussed in paragraphs 1.25 to 1.26. Final energy consumption on a temperature corrected basis is estimated to be down 0.7 per cent in 2012, continuing the downward trend of the last eight years.

1.16 The main fuels used by final consumers in 2012 were petroleum products (45.4 per cent), natural gas (32.1 per cent) and electricity (18.4 per cent). The amount of heat that was bought for final consumption accounted for 0.8 per cent of the total final energy consumption.

Chart 1.5: Final energy consumption 2012



Total: 148.2 million tonnes of oil equivalent

(1) Includes services and agricultural sectors.
(2) Includes coal, manufactured fuels, renewables & waste, and heat sold.

1.17 Of the petroleum products consumed by final users 10.5 per cent was for non-energy purposes; for natural gas 1.1 per cent was consumed for non-energy purposes. Non-energy use of fuels includes use as chemical feedstocks and other uses such as lubricants. Non-energy use of fuels for 2012 are shown in Table 1A. Further details of non-energy use are given in Chapter 3, paragraph 3.40 and Chapter 4, paragraph 4.35.

Table 1A: Non-energy use of fuels 2012

Thousand tonnes of oil equivalent

	Petroleum	Natural gas
Petrochemical feedstocks	3,970	512
Other	3,123	-
Total	**7,094**	**512**

1.18 The data in the energy balances (Table 1.1), can be viewed in a number of ways, with a number of other statistics derived to produce different descriptions of the UK energy market. Recently greater focus has been given to looking at import dependency and also on fossil fuel dependency. Import dependency (Table 1B) is calculated by dividing net imports by adjusted primary supply, where an addition is made for energy supplied to marine bunkers.

Table 1B: Net import dependency 2010 to 2012

Thousand tonnes of oil equivalent

	2010	2011	2012
Net imports	65,158	78,398	93,511
Primary energy supply + bunkers	229,458	214,306	217,257
Net import dependency	**28.4%**	**36.6%**	**43.0%**

1.19 The energy used in the UK can also be classified by whether its source was from fossil fuels, low-carbon sources or other (Table 1C). The main fossil fuel sources in the UK are coal, gas and oil. The low carbon sources include nuclear and renewables such as wind; hydro; and biofuels. In 2012, the share of energy from low-carbon sources fell back marginally from having a 12.1 per cent to an 11.9 per cent share. The largest component of this series is currently nuclear; its share of energy supplied decreased from 7.7 per cent to 7.4 per cent in 2012. This calculation uses the heat supplied from nuclear fission, which in 2012 was down 2.7 per cent; reflecting that the nuclear fleet in 2012 operated at a record efficiency level. The 2.1 per cent rise in electricity generated from nuclear was produced using less nuclear heat. There was a rise in the shares from renewables; with the rise in wind output more than offsetting a slight reduction is use of liquid biofuels. The other category, shown for completeness, includes net imports of electricity, as imports and exports could come from either of the previous categories, and non-biodegradable wastes. Headline data, taken from Table 6.7 later in this publication, show that renewables had a "normalised" 4.1 per cent share of energy consumption in 2012 (the normalisation process takes out weather effects from this statistic see paragraph 6.33). There are a range of measures of renewables contribution to energy and these are discussed in more detail in Chapter 6.

Table 1C: Fossil fuel and low carbon dependencies 2010 to 2012

Per cent

	2010	2011	2012
Fossil fuel	89.7%	87.5%	87.3%
Low-carbon	9.9%	12.0%	11.9%
Other	0.3%	0.5%	0.8%

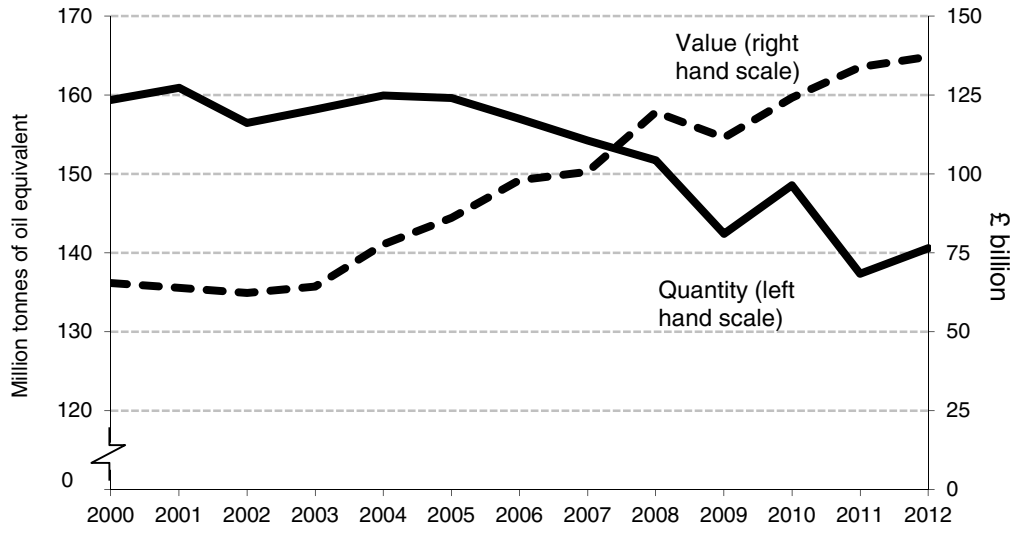
Value balance of traded energy (Tables 1.4, 1.5 and 1.6)

1.20 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 (from the industrial and domestic sectors) through transformation processes and other energy sector users. The balances only contain values of energy which are traded, ie where a transparent market price is applicable. Further technical

notes are given in paragraphs 1.28 to 1.63. 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.

1.21 Total expenditure by final consumers in 2012 is estimated at £137,150 million, (£136,385 million shown as actual final consumption and £765 million of coal consumed by the iron and steel sector in producing coke for their own consumption). This is up by 2.5 per cent on 2011, with the most significant change being the increased consumption of domestic gas in 2012. In 2012, crude oil prices averaged around $112 per barrel, broadly unchanged compared to 2011, which was up sharply compared to an average price of $80 per barrel in 2010. Chart 1.6 shows energy consumption and expenditure by final users.

Chart 1.6: Energy consumption and estimated expenditure on energy by final users



1.22 The value balance provides a guide on how the value chain works in the production and consumption of energy. For example, in 2012, £22,975 million of crude oil was indigenously produced, of which £17,995 million was exported, and £31,315 million of crude oil was imported. Allowing for stock changes, this provides a total value of UK inland crude oil supply of £36,040 million. This fuel was then completely consumed within the petroleum industry in the process of producing £44,990 million of petroleum products. Again some external trade and stock changes took place before arriving at a basic value of petroleum products of £43,265 million. In supplying the fuel to final consumers distribution costs were incurred and some profit was made amounting to £2,580 million, whilst duty and tax meant a further £37,020 million was added to the basic price to arrive at the final market value of £82,865 million. This was the value of petroleum products purchased, of which industry purchased £2,680 million, domestic consumers for heating purposes purchased £1,740 million, with the vast majority purchased within the transportation sector, £73,860 million.

1.23 Of the total final expenditure on energy in 2012 (£137,150 million), the biggest share, 56 per cent, fell to the transport sector. Industry purchased 10 per cent (£13,685 million), the domestic sector purchased 24 per cent (£33,485 million), with the remaining 10 per cent (£13,835 million) purchased by the service sector.

Sales of electricity and gas by sector (Table 1.7)

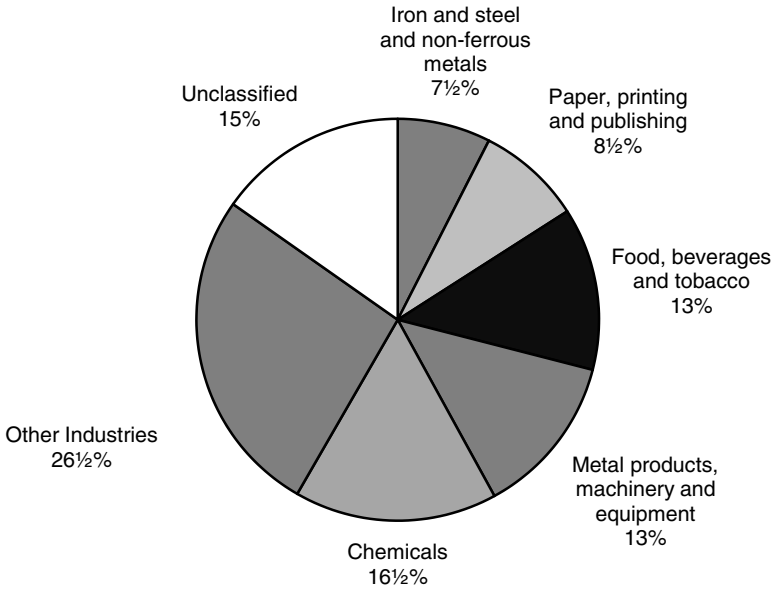
1.24 Table 1.7 shows broad estimates for the total value of electricity and gas to final consumption. Net selling values provide some indication of typical prices paid in broad sectors and can be of use to supplement more detailed and accurate information contained in the rest of this chapter. More detailed information on energy prices is available in Quarterly Energy Prices, available on DECC's energy statistics website at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/quarterly-energy-prices

Energy consumption by main industrial groups (Table 1.8)

1.25 This table presents final energy consumption for the main industrial sub-sectors over the last five years. So far as is practicable, the user categories have been regrouped this year on the basis of the 2007 Standard Industrial Classification (see paragraphs 1.56 to 1.60). 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).

1.26 In 2012, 25.2 million tonnes of oil equivalent were consumed by the main industrial groups. The largest consuming groups were chemicals (16.3 per cent), metal products, machinery and equipment (13.0 per cent), food, beverages and tobacco (13.1 per cent), iron and steel and non-ferrous metals (7.5 per cent), and paper, printing and publishing (8.5 per cent). The figures are illustrated in Chart 1.7. The large other industries sector includes mineral products (10.4 per cent) as well as a number of the smaller energy consuming sectors.

Chart 1.7: Energy consumption by main industrial groups 2012



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

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

1.27 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 1.33 and 1.34. 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 1.34.

Technical notes and definitions

I Units and measurement of energy

Units of measurement

1.28 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)

1.29 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

1.30 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.gov.uk/government/organisations/department-of-energy-climate-change/series/total-energy-statistics) 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 1.54).

1.31 Estimated gross and net calorific values for 2012 are given on page 231. 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 232 and 233. This year, some revisions have again 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 229.

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 229.

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 (39.8 per cent in 2012). (See Chapter 5, paragraphs 5.74 and 5.82).

Non-energy uses of fuel

1.32 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 3.40.

Autogeneration of electricity

1.33 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.

1.34 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 7 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 7 paragraphs 7.41 to 7.43. 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

1.35 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.

1.36 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

1.37 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes, 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)

1.38 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

1.39 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

1.40 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.

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

Fuel definitions in value balances

1.42 **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

1.43 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

1.44 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes). 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)

1.45 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

1.46 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

1.47 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 1D presents shares of final consumption on this basis. The final consumption figures are presented on this basis throughout Chapter 1.

1.48 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 1E presents shares of final consumption on this basis.

Final consumption - useful energy basis

1.49 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

1.50 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 2012 are presented in Table 1D. For comparison, Table 1E presents shares of final consumption on a primary fuel input basis.

Table 1D: Primary and secondary fuels consumed by final users in 2012 – energy supplied basis

	Percentage of each fuel						Percentage of each sector					
	Industry	Transport	Domestic	Others	Total		Solid fuels	Petr-oleum	Gas	Electricity	Bio-energy	Total
Solid fuels	70	0	29	1	100	Industry	7	17	39	35	2	100
Petroleum	7	86	4	2	100	Transport	0	98	-	1	2	100
Gas	20	-	62	18	100	Domestic	2	6	68	23	2	100
Electricity	31	1	36	32	100	Others	0	7	45	47	1	100
Bioenergy	20	40	28	12	100							
All fuels	**17**	**38**	**31**	**13**	**100**	**All users**	**2**	**43**	**34**	**20**	**2**	**100**

Table 1E: Total primary fuel consumption by final users in 2012 - primary input basis

	Percentage of each fuel						Percentage of each sector					
	Industry	Transport	Domestic	Others	Total		Coal	Petr-oleum	Gas	Primary electricity	Bio-energy	Total
Coal	33	1	36	30	100	Industry	31	11	40	13	5	100
Petroleum	7	85	5	3	100	Transport	1	97	-	0	2	100
Gas	24	-	53	22	100	Domestic	22	5	59	10	4	100
Primary electricity	31	1	36	32	100	Others	32	4	43	16	5	100
Bioenergy	28	13	33	26	100							
All fuels	**21**	**28**	**32**	**18**	**100**	**All users**	**20**	**32**	**35**	**9**	**4**	**100**

1.51 In 2012, every 1 toe of secondary electricity consumed by final users required, on average, 1.2 toe of coal, 0.6 toe of natural gas, 0.5 toe of primary electricity (nuclear, wind, natural flow hydro and imports) and 0.2 toe of oil and bioenergy combined. The extent of this primary consumption is hidden in Table 1D, 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 1E, 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.

1.52 Another view comes from shares of users' expenditure on each fuel (Table 1F 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 1F: Value of fuels purchased by final users in 2012

Percentage of each sector

	Solid fuels	Petroleum	Gas	Secondary electricity	Heat	Biofuels	Total
Industry	9	20	19	49	2	-	100
Transport	-	97	-	-	-	3	100
Domestic	1	5	46	47	-	1	100
Others	-	7	19	73	1	-	100
All users	**1**	**58**	**15**	**24**	**0**	**2**	**100**

Systems of measurement - international statistics

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

Net calorific values

1.54 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 13.9 GJ at 25 per cent moisture content and 18.6 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

1.55 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 5.66 to 5.72.

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 6.

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 2.5 and 2.6.

Coke and breeze – Coke, oven coke and hard coke breeze. Further details are given in Chapter 2, Table 2.5.

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, Table 2.5.
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, Table 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, Table 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

1.56 The Digest has been prepared, as far as is practicable, on the basis of the *Standard Industrial Classification (SIC)2007* (www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/standard-industrial-classification/index.html). Table 1G shows the categories of consumers together with their codes in SIC 2007. SIC(2007) replaced SIC(2003) on 1 January 2008, with energy statistics being compiled on the new basis from 2010.

Table 1G: SIC 2007 classifications

Fuel producers	05-07, 09, 19, 24.46, 35
Final consumers:	
Industrial	
Unclassified	See paragraph 1.58
Iron and steel	24, (*excluding* 24.4, 24.53, 24.54)
Non-ferrous metals	24.4, (*excluding* 24.46), 24.53, 24.54
Mineral products	08, 23
Chemicals	20-21
Mechanical engineering and metal products	25, 28
Electrical and instrument engineering	26-27
Vehicles	29-30
Food, beverages & tobacco	10-12
Textiles, clothing, leather, & footwear	13-15
Paper, printing & publishing	17-18
Other industries	16, 22, 31-33, 36-39
Construction	41-43
Transport	49-51 (part*)
Other final users	
Domestic	Not covered by SIC 2007
Public administration	84-88
Commercial	45-47, 49-51 (part*), 52-53, 55-56, 58-66, 68-75, 77-82
Agriculture	01-03
Miscellaneous.	90-99

* Note – transport sector includes only energy used for motion/traction purposes. Other energy used by transport companies is classified to the commercial sector.

SIC(2003) was introduced at the start of 2003; the previous classification SIC(1992) was used from 1995. Between 1986 and 1994 data in the Digest were prepared on the basis of SIC(1980). The changes in classification between SIC(1992), SIC(2003) and SIC(2007) 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.

1.57 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.

1.58 There is also an 'unclassified' category in the industry sector (see Table 1G). 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.

1.59 In Tables 7.8 and 7.9 of Chapter 7 the following abbreviated grouping of industries, based on SIC 2007, is used in order to prevent disclosure of information about individual companies.

Table 1H: Abbreviated grouping of Industry

Iron and steel and non-ferrous metal	24
Chemicals	20-21
Oil refineries	19.2
Paper, printing and publishing	17-18
Food, beverages and tobacco	10-12
Metal products, machinery and equipment	25, 26, 27, 28, 29, 30
Mineral products, extraction, mining and agglomeration of solid fuels	05, 06, 08, 23
Sewage Treatment	(parts of 36 and 37)
Electricity supply	35.1
Other industrial branches	07, 13, 14, 15,16, 19.1, 24.46, 22, 31, 32, 33, 35.2, 36 & 37 (remainder) 41, 42, 43
Transport, commerce, and administration	1, 2, 3, 45 to 99 (except 93)
Other	35.3, 93

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

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

Iron and steel and non-ferrous metals	24
Chemicals	20-21
Paper, printing and publishing	17-18
Food, beverages and tobacco	10-12
Metal products, machinery and equipment	25-30
Other (including construction)	08, 13-16, 19, 22-23, 31-33, 36-39, 41-43

VII Monthly and quarterly data

1.61 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.gov.uk/government/organisations/department-of-energy-climate-change/series/total-energy-statistics. 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

1.62 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.

IX Revisions

1.63 Table 1J below shows a summary of the revisions made to the major energy aggregates between this year's edition of DUKES and the immediately preceding version. This year, the revisions window for DUKES was 2008, with changes to methodology and revised data allowed back to that date. Key methodological changes this year included a reassessment of sea transport data that suggested that too much energy had been allocated to national navigation at the expense of international marine bunkers. This reallocation has resulted in the reductions of supply, demand and final consumption in the tables below – as fuel used by international marine bunkers are not included within these aggregates. More details of this are provided in chapter 3, paragraph 3.63. There was also a reallocation between some energy use between the industrial and services sectors.

Table 1J: Revisions since DUKES 2012

Thousand tonnes of oil equivalent

	2007	2008	2009	2010	2011	Percentage revisions to 2011 data
Indigenous production	-	-39	-6	37	-163	-0.1%
Primary supply	-	-1,511	-427	-1,106	-1,209	-0.6%
Primary demand	-	-2,021	-357	-776	-1,000	-0.5%
Transformation	-	-150	-518	-252	43	-0.1%
Energy industry use	-	-2	-23	-105	268	2.0%
Final consumption	-	-1,733	-851	-917	-1,230	-0.8%
Industry	-	-675	-429	-821	-1,241	-4.6%
Transport	-	-1,413	-1,219	-1,114	-1,181	-2.1%
Other	-	82	664	897	1,414	2.5%
Non energy use	-	273	133	120	-222	-2.6%

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1.1 Aggregate energy balance 2012
Gross calorific values

Thousand tonnes of oil equivalent

	Coal	Manufactured fuel *(1)*	Primary oils	Petroleum products	Natural gas *(2)*	Bioenergy & waste *(3)*	Primary electricity	Electricity	Heat sold	Total
Supply										
Indigenous production	10,634	-	48,756	-	38,934	6,372	17,446	-	-	122,142
Imports	29,061	149	66,181	28,436	47,059	1,725	-	1,186	-	173,797
Exports	-368	-395	-37,151	-29,533	-12,384	-306	-	-150	-	-80,286
Marine bunkers	-	-	-	-3,317	-	-	-	-	-	-3,317
Stock change *(4)*	+1,946	+67	-532	+146	-23	-	-	-	-	+1,603
Primary supply	**41,273**	**-180**	**77,254**	**-4,267**	**73,587**	**7,791**	**17,446**	**1,036**	**-**	**213,939**
Statistical difference *(5)*	+148	-17	-180	-108	-184	-	-	-31	-	-372
Primary demand	**41,125**	**-163**	**77,434**	**-4,160**	**73,771**	**7,791**	**17,446**	**1,067**	**-**	**214,312**
Transfers	-	+5	-2,286	+2,240	-5	-	-2,241	+2,241	-	-46
Transformation	**-39,528**	**1,777**	**-75,148**	**74,280**	**-20,339**	**-5,399**	**-15,205**	**28,788**	**1,400**	**-49,372**
Electricity generation	-34,319	-800	-	-770	-18,413	-5,286	-15,205	28,788	-	-46,005
Major power producers	-33,655	-	-	-397	-15,684	-1,766	-15,205	26,147	-	-40,561
Autogenerators	-664	-800	-	-372	-2,729	-3,520	-	2,642	-	-5,444
Heat generation	-368	-51	-	-72	-1,925	-114	-	-	1,400	-1,130
Petroleum refineries	-	-	-75,148	75,122	-	-	-	-	-	-26
Coke manufacture	-3,861	3,508	-	-	-	-	-	-	-	-354
Blast furnaces	-750	-1,080	-	-	-	-	-	-	-	-1,830
Patent fuel manufacture	-229	201	-	-	-	-	-	-	-	-28
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**700**	**-**	**5,103**	**4,790**	**-**	**-**	**2,300**	**168**	**13,065**
Electricity generation	-	-	-	-	-	-	-	1,548	-	1,548
Oil and gas extraction	-	-	-	659	4,167	-	-	49	-	4,875
Petroleum refineries	-	-	-	4,444	282	-	-	372	168	5,265
Coal extraction	3	-	-	-	11	-	-	71	-	85
Coke manufacture	-	386	-	-	-	-	-	7	-	393
Blast furnaces	-	314	-	-	23	-	-	32	-	368
Patent fuel manufacture	-	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	87	-	87
Other	-	-	-	-	308	-	-	136	-	444
Losses	**-**	**87**	**-**	**-**	**1,055**	**-**	**-**	**2,489**	**-**	**3,631**
Final consumption	**1,595**	**832**	**-**	**67,258**	**47,583**	**2,392**	**-**	**27,307**	**1,233**	**148,198**
Industry	**1,060**	**630**	**-**	**4,261**	**9,520**	**487**	**-**	**8,411**	**795**	**25,164**
Unclassified	-	182	-	3,164	2	487	-	-	-	3,834
Iron and steel	36	448	-	5	417	-	-	289	-	1,196
Non-ferrous metals	13	-	-	-	241	-	-	433	-	687
Mineral products	684	-	-	49	1,299	-	-	580	-	2,612
Chemicals	48	-	-	313	1,908	-	-	1,483	350	4,102
Mechanical engineering etc	8	-	-	0	573	-	-	608	-	1,188
Electrical engineering etc	3	-	-	2	245	-	-	532	-	782
Vehicles	35	-	-	23	808	-	-	436	-	1,302
Food, beverages etc	31	-	-	461	1,843	-	-	955	3	3,292
Textiles, leather etc	43	-	-	102	426	-	-	250	-	821
Paper, printing etc	69	-	-	64	1,064	-	-	925	4	2,126
Other industries	85	-	-	40	554	-	-	1,791	438	2,908
Construction	5	-	-	38	141	-	-	128	-	312
Transport *(6)*	**12**	**-**	**-**	**51,927**	**-**	**958**	**-**	**352**	**-**	**53,248**
Air	-	-	-	12,408	-	-	-	-	-	12,408
Rail	12	-	-	683	-	-	-	349	-	1,044
Road	-	-	-	38,508	-	958	-	2	-	39,468
National navigation	-	-	-	328	-	-	-	-	-	328
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**524**	**202**	**-**	**3,975**	**37,551**	**947**	**-**	**18,544**	**438**	**62,180**
Domestic	507	202	-	2,705	29,156	669	-	9,862	52	43,153
Public administration	8	-	-	319	4,128	108	-	1,624	383	6,571
Commercial	4	-	-	390	3,185	27	-	6,725	3	10,333
Agriculture	1	-	-	306	132	142	-	333	-	914
Miscellaneous	4	-	-	255	950	0	-	-	-	1,209
Non energy use	-	-	-	**7,094**	**512**	-	-	-	-	**7,605**

(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 5.12 regarding electricity use in transport and 6.28 regarding renewables use in transport.

1.2 Aggregate energy balance 2011
Gross calorific values

Thousand tonnes of oil equivalent

	Coal	Manufactured fuel *(1)*	Primary oils	Petroleum products	Natural gas *(2)*	Bioenergy & waste *(3)*	Primary electricity	Electricity	Heat sold	Total
Supply										
Indigenous production	11,580	-	56,902	-	45,291r	5,585r	17,469r	-	-	136,827r
Imports	21,399	35	63,471r	24,769r	50,251	1,854r	-	747	-	162,525r
Exports	-370	-357	-36,910	-30,299r	-15,794	-184	-	-212	-	-84,126r
Marine bunkers	-	-	-	-3,804r	-	-	-	-	-	-3,804r
Stock change *(4)*	+535	-386	+667	+210	-1,945	-	-	-	-	-919
Primary supply	**33,144**	**-708**	**84,130r**	**-9,125r**	**77,802**	**7,255r**	**17,469r**	**535**	**-**	**210,502r**
Statistical difference *(5)*	-26r	-15	-351r	-17r	-343r	-	-	-57r	-	-808r
Primary demand	**33,170r**	**-693**	**84,481r**	**-9,108r**	**78,145r**	**7,255r**	**17,469r**	**592r**	**-**	**211,310r**
Transfers	-	+5	-2,518r	+2,496r	-5	-	-1,844r	+1,844r	-	-22r
Transformation	**-31,479r**	**2,304r**	**-81,963r**	**80,875r**	**-28,381r**	**-4,760r**	**-15,625**	**29,502r**	**1,388r**	**-48,139r**
Electricity generation	-26,015r	-678r	-	-776r	-26,409r	-4,663r	-15,625	29,502r	-	-44,665r
Major power producers	-25,221	-	-	-341r	-23,697	-1,263r	-15,625	26,839	-	-39,307r
Autogenerators	-794r	-678r	-	-435r	-2,713r	-3,401r	-	2,663r	-	-5,358r
Heat generation	-348r	-51	-	-75r	-1,972r	-97r	-	-	1,388r	-1,155r
Petroleum refineries	-	-	-81,963r	81,726r	-	-	-	-	-	-237r
Coke manufacture	-4,121	3,788	-	-	-	-	-	-	-	-333
Blast furnaces	-759	-980	-	0	-	-	-	-	-	-1,739
Patent fuel manufacture	-236	225	-	-	-	-	-	-	-	-10
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**660**	**-**	**5,418r**	**5,098r**	**-**	**-**	**2,185r**	**182r**	**13,545r**
Electricity generation	-	-	-	-	-	-	-	1,412r	-	1,412r
Oil and gas extraction	-	-	-	578r	4,571	-	-	50	-	5,198r
Petroleum refineries	-	-	-	4,840r	312r	-	-	403r	182r	5,737r
Coal extraction	3	-	-	-	7	-	-	73	-	83
Coke manufacture	-	386	-	-	-	-	-	7	-	393
Blast furnaces	-	274	-	-	39	-	-	22	-	334
Patent fuel manufacture	-	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	81	-	81
Other	-	-	-	-	168	-	-	138	-	306
Losses	**-**	**151**	**-**	**-**	**1,252**	**-**	**-**	**2,420r**	**-**	**3,822r**
Final consumption	**1,689r**	**806r**	**-**	**68,845r**	**43,409r**	**2,495r**	**-**	**27,332r**	**1,206r**	**145,781r**
Industry	**1,111**	**590r**	**-**	**4,363r**	**9,765r**	**505r**	**-**	**8,800r**	**769r**	**25,903r**
Unclassified	-	184	-	2,892	2	505r	-	-	-	3,583r
Iron and steel	38	405r	-	4r	479r	-	-	330	-	1,256r
Non-ferrous metals	14	-	-	0r	209r	-	-	599	-	822r
Mineral products	697	-	-	229r	1,256r	-	-	603	-	2,784r
Chemicals	50	-	-	189r	2,033r	-	-	1,517r	350r	4,138r
Mechanical engineering etc	8	-	-	1r	569r	-	-	624r	-	1,202r
Electrical engineering etc	3	-	-	0r	247r	-	-	549r	-	799r
Vehicles	37	-	-	163r	789r	-	-	446	-	1,436r
Food, beverages etc	32	-	-	573r	1,887r	-	-	973r	2	3,467r
Textiles, leather etc	45	-	-	112r	439r	-	-	257	-	853r
Paper, printing etc	71	-	-	61r	1,133r	-	-	938r	1	2,204r
Other industries	110	-	-	9r	572r	-	-	1,832r	417	2,940r
Construction	6	-	-	131r	150r	-	-	132	-	420r
Transport *(6)*	**11**	**-**	**-**	**52,517r**	**-**	**1,128**	**-**	**351**	**-**	**54,006r**
Air	-	-	-	12,802	-	-	-	-	-	12,802
Rail	11	-	-	692r	-	-	-	349	-	1,052r
Road	-	-	-	38,646	-	1,128	-	2	-	39,775
National navigation	-	-	-	376r	-	-	-	-	-	376r
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**567r**	**216**	**-**	**4,029r**	**33,132r**	**862r**	**-**	**18,181r**	**437r**	**57,424r**
Domestic	540	216	-	2,669r	25,228r	592r	-	9,596r	52	38,893r
Public administration	18	-	-	366	3,895r	96r	-	1,582r	382r	6,338r
Commercial	4	-	-	433	2,976r	17r	-	6,663	3	10,096r
Agriculture	1	-	-	303	153r	156r	-	339	-	953r
Miscellaneous	5	-	-	259r	881r	0	-	-	-	1,145r
Non energy use	-	-	-	**7,936r**	**512r**	-	-	-	-	**8,447r**

(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 5.12 regarding electricity use in transport and 6.28 regarding renewables use in transport.

1.3 Aggregate energy balance 2010
Gross calorific values

Thousand tonnes of oil equivalent

	Coal	Manufactured fuel *(1)*	Primary oils	Petroleum products	Natural gas *(2)*	Bioenergy & waste *(3)*	Primary electricity	Electricity	Heat sold	Total
Supply										
Indigenous production	11,470	-	68,983	-	57,187	5,177r	15,112r	-	-	157,929r
Imports	17,120r	88	60,135r	25,800r	50,688	1,928r	-	614	-	156,373r
Exports	-537	-370	-46,153	-28,412r	-15,168	-189	-	-385	-	-91,215r
Marine bunkers	-	-	-	-3,552r	-	-	-	-	-	-3,552r
Stock change *(4)*	+4,606r	-153	-41	+646r	+1,313	-	-	-	-	+6,371r
Primary supply	**32,659r**	**-435**	**82,924r**	**-5,518r**	**94,020**	**6,916r**	**15,112r**	**229**	**-**	**225,906r**
Statistical difference *(5)*	+7r	-15	-43r	+107r	-218r	-0	-	-37r	-	-200r
Primary demand	**32,652**	**-420**	**82,967r**	**-5,625r**	**94,238r**	**6,916r**	**15,112r**	**266r**	**-**	**226,106r**
Transfers	-	+23	-2,661r	+2,661r	-23	-	-1,187r	+1,187r	-	-0r
Transformation	**-30,935**	**2,180**	**-80,306r**	**78,663r**	**-34,161**	**-4,435r**	**-13,925**	**31,368r**	**1,361**	**-50,191r**
Electricity generation	-25,556	-673	-	-1,146r	-32,123	-4,394r	-13,925	31,368r	-	-46,449r
Major power producers	-24,774	-	-	-604r	-29,420	-1,013	-13,925	28,701	-	-41,035r
Autogenerators	-782	-673	-	-542	-2,703	-3,380r	-	2,667r	-	-5,414r
Heat generation	-289	-51	-	-66	-2,038	-41r	-	-	1,361	-1,125r
Petroleum refineries	-	-	-80,306r	79,879r	-	-	-	-	-	-427r
Coke manufacture	-4,124	3,768	-	-	-	-	-	-	-	-356
Blast furnaces	-714	-1,110	-	-4	-	-	-	-	-	-1,828
Patent fuel manufacture	-253	247	-	-	-	-	-	-	-	-5
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**680**	**-**	**5,196r**	**5,937r**	**-**	**-**	**2,222**	**94**	**14,133r**
Electricity generation	-	-	-	-	-	-	-	1,385	-	1,385
Oil and gas extraction	-	-	-	536r	5,256	-	-	48	-	5,840r
Petroleum refineries	-	-	-	4,660r	330r	-	-	433	94	5,517r
Coal extraction	3	-	-	-	7	-	-	82	-	93
Coke manufacture	-	395	-	-	-	-	-	8	-	403
Blast furnaces	-	285	-	-	55	-	-	25	-	366
Patent fuel manufacture	-	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	91	-	91
Other	-	-	-	-	288	-	-	150	-	438
Losses	**-**	**168**	**-**	**-**	**1,611**	**-**	**-**	**2,325**	**-**	**4,104**
Final consumption	**1,713**	**935**	**-**	**70,502r**	**52,507r**	**2,481r**	**-**	**28,274r**	**1,266**	**157,678r**
Industry	**1,136**	**685**	**-**	**4,934r**	**9,837r**	**449r**	**-**	**8,987**	**822**	**26,850r**
Unclassified	-	200	-	2,888r	2	449r	-	-	-	3,539r
Iron and steel	43	485	-	6r	501	-	-	330	-	1,365r
Non-ferrous metals	15	-	-	0r	227r	-	-	578	-	820r
Mineral products	702	-	-	289r	1,328r	-	-	625	-	2,943r
Chemicals	51	-	-	312r	1,861r	-	-	1,587	415	4,225r
Mechanical engineering etc	9	-	-	0r	551r	-	-	658	-	1,218r
Electrical engineering etc	3	-	-	0r	262r	-	-	572	-	838r
Vehicles	36	-	-	85r	751r	-	-	454	-	1,326r
Food, beverages etc	29	-	-	1,074r	1,878r	-	-	991	1	3,973r
Textiles, leather etc	47	-	-	81r	454r	-	-	262	-	844r
Paper, printing etc	71	-	-	104r	1,263r	-	-	942	1	2,382r
Other industries	127	-	-	59r	598r	-	-	1,848	405	3,037r
Construction	3	-	-	36r	161r	-	-	139	-	339r
Transport *(6)*	**14**	**-**	**-**	**52,458r**	**-**	**1,217r**	**-**	**350**	**-**	**54,040r**
Air	-	-	-	12,288	-	-	-	-	-	12,288
Rail	14	-	-	660r	-	-	-	349	-	1,022r
Road	-	-	-	39,159	-	1,217r	-	2	-	40,378r
National navigation	-	-	-	351r	-	-	-	-	-	351r
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**564**	**250**	**-**	**4,685r**	**41,974r**	**815r**	**-**	**18,936r**	**444**	**67,669r**
Domestic	536	250	-	3,428r	33,499	510r	-	10,218r	52	48,493r
Public administration	20	-	-	314r	4,261r	102r	-	1,642	382	6,721r
Commercial	2	-	-	382r	3,127r	16r	-	6,729r	10	10,267r
Agriculture	1	-	-	313r	169	187r	-	346	-	1,016r
Miscellaneous	4	-	-	250r	917r	0	-	-	-	1,172r
Non energy use	-	-	-	**8,424r**	**696r**	-	-	-	-	**9,120r**

(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 5.12 regarding electricity use in transport and 6.28 regarding renewables use in transport.

1.4 Value balance of traded energy in 2012[(1)]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	970	355	22,975	44,990	7,855	16,160	575	2,250	96,125
Imports	3,305	40	31,315	16,015	9,830	675	-	515	61,695
Exports	-65	-125	-17,995	-16,015	-3,075	-100	-	-	-37,375
Marine bunkers	-	-	-	-1,790	-	-	-	-	-1,790
Stock change	190	-55	-255	65	-5	-	-	-	-60
Basic value of inland consumption	**4,405**	**220**	**36,040**	**43,265**	**14,600**	**16,730**	**575**	**2,765**	**118,600**
Tax and margins									
Distribution costs and margins	**800**	**20**	**-**	**2,580**	**11,545**	**16,070**	**-**	**95**	**31,115**
Electricity generation	415	-	-	30	-	-	-	-	445
Solid fuel manufacture	200	-	-	-	-	-	-	-	200
of which iron & steel sector	175	-	-	-	-	-	-	-	175
Iron & steel final use	35	5	-	-	-	-	-	-	40
Other industry	40	5	-	400	-	-	-	-	445
Air transport	-	-	-	190	-	-	-	-	190
Rail and national navigation	-	-	-	25	-	-	-	-	25
Road transport	-	-	-	1,315	-	-	-	95	1,410
Domestic	105	15	-	155	-	-	-	-	270
Agriculture	-	-	-	25	-	-	-	-	25
Commercial and other services	5	-	-	80	-	-	-	-	85
Non energy use	-	-	-	360	140	-	-	-	500
VAT and duties	**10**	**5**	**-**	**37,020**	**735**	**740**	**-**	**1,160**	**39,670**
Electricity generation	-	-	-	45	-	-	-	-	45
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	250	-	-	-	-	250
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	120	-	-	-	-	120
Road transport	-	-	-	36,360	-	-	-	1,140	37,505
Domestic	10	5	-	100	735	740	-	15	1,610
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	115	-	-	-	-	115
Climate Change Levy	**5**	**-**	**-**	**-**	**190**	**445**	**-**	**-**	**640**
Total tax and margins	**820**	**25**	**-**	**39,600**	**12,470**	**17,260**	**-**	**1,255**	**71,425**
Market value of inland consumption	**5,225**	**245**	**36,040**	**82,865**	**27,070**	**33,990**	**575**	**4,020**	**190,025**
Energy end use									
Total energy sector	**4,640**	**-**	**36,040**	**790**	**6,220**	**1,225**	**70**	**1,635**	**50,620**
Transformation	4,640	-	36,040	410	5,040	885	-	1,635	48,650
Electricity generation	3,720	-	-	375	4,560	885	-	1,635	11,175
of which from stocks	60	-	-	-	-	-	-	-	60
Heat Generation	40	-	-	35	480	-	-	-	555
Petroleum refineries	-	-	36,040	-	-	-	-	-	36,040
Solid fuel manufacture	880	-	-	-	-	-	-	-	880
of which iron & steel sector	765	-	-	-	-	-	-	-	765
Other energy sector use	**-**	**-**	**-**	**380**	**1,180**	**335**	**70**	**-**	**1,970**
Oil & gas extraction	-	-	-	380	1,035	45	-	-	1,460
Petroleum refineries	-	-	-	-	70	225	70	-	365
Coal extraction	-	-	-	-	-	65	-	-	65
Other energy sector	-	-	-	-	75	-	-	-	75
Total non energy sector use	**585**	**245**	**-**	**79,195**	**20,705**	**32,765**	**505**	**2,385**	**136,385**
Industry	**330**	**135**	**-**	**2,680**	**2,635**	**6,755**	**325**	**65**	**12,920**
Iron & steel final use	165	120	-	5	120	210	-	-	615
Other industry	165	15	-	2,675	2,520	6,545	325	65	12,305
Transport	**-**	**-**	**-**	**73,860**	**-**	**335**	**-**	**1,950**	**76,145**
Air	-	-	-	7,345	-	-	-	-	7,345
Rail and national navigation	-	-	-	680	-	335	-	-	1,015
Road	-	-	-	65,835	-	-	-	1,950	67,785
Other final users	**255**	**110**	**-**	**2,655**	**18,070**	**25,675**	**180**	**370**	**47,320**
Domestic	250	110	-	1,740	15,445	15,570	20	345	33,485
Agriculture	-	-	-	195	50	420	-	30	690
Commercial and other services	5	-	-	720	2,575	9,685	155	-	13,145
Total value of energy end use	**5,225**	**245**	**36,040**	**79,985**	**26,925**	**33,990**	**575**	**4,020**	**187,005**
Value of non energy end use	**-**	**-**	**-**	**2,880**	**140**	**-**	**-**	**-**	**3,020**
Market value of inland consumption	**5,225**	**245**	**36,040**	**82,865**	**27,070**	**33,990**	**575**	**4,020**	**190,025**

(1) For further information see paragraphs 1.39 to 1.45.

1.5 Value balance of traded energy in 2011[1]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	1,140r	290	24,585r	47,215r	8,415r	14,830r	570r	1,325r	98,370r
Imports	3,050	10	30,115r	13,410r	9,630r	465r	-	655	57,340r
Exports	-65	-100	-16,780r	-15,800r	-3,555r	-140	-	-	-36,440r
Marine bunkers	-	-	-	-1,895r	-	-	-	-	-1,895r
Stock change	55	-10	320r	95	-385	-	-	-	75r
Basic value of inland consumption	**4,180r**	**190**	**38,240**	**43,025r**	**14,105r**	**15,160r**	**570r**	**1,980r**	**117,450r**
Tax and margins									
Distribution costs and margins	**955**	**30**	**-**	**3,020r**	**9,780r**	**15,550r**	**-**	**110**	**29,440r**
Electricity generation	505	-	-	35r	-	-	-	-	540r
Solid fuel manufacture	265	-	-	-	-	-	-	-	265
of which iron & steel sector	230	-	-	-	-	-	-	-	230
Iron & steel final use	45	15	-	-	-	-	-	-	60
Other industry	30	5	-	415r	-	-	-	-	450r
Air transport	-	-	-	265r	-	-	-	-	265r
Rail and national navigation	-	-	-	40r	-	-	-	-	40r
Road transport	-	-	-	1,560r	-	-	-	110	1,665r
Domestic	105	15	-	200r	-	-	-	-	320r
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	5	-	-	85	-	-	-	-	90r
Non energy use	-	-	-	400r	130r	-	-	-	525r
VAT and duties	**10**	**5**	**-**	**38,830r**	**585**	**690r**	**-**	**1,295r**	**41,415r**
Electricity generation	-	-	-	45r	-	-	-	-	45r
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	235r	-	-	-	-	235r
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	125r	-	-	-	-	125r
Road transport	-	-	-	38,170r	-	-	-	1,275	39,445r
Domestic	10	5	-	100	585	690r	-	15r	1,410r
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	125	-	-	-	-	125
Climate Change Levy	**5**	**-**	**-**	**-**	**175**	**500**	**-**	**-**	**680**
Total tax and margins	**970**	**35**	**-**	**41,850r**	**10,540r**	**16,740r**	**-**	**1,400r**	**71,535r**
Market value of inland consumption	**5,150r**	**230**	**38,240**	**84,875r**	**24,645r**	**31,900r**	**570r**	**3,380r**	**188,985r**
Energy end use									
Total energy sector	**4,510r**	**-**	**38,240**	**725r**	**7,430r**	**1,105r**	**75r**	**795r**	**52,875r**
Transformation	4,510r	-	38,240	410r	6,305r	785r	-	795r	51,045r
Electricity generation	3,315	-	-	375r	5,865r	785r	-	795r	11,135r
of which from stocks	110	-	-	-	-	-	-	-	110
Heat Generation	45r	-	-	35	440r	-	-	-	520r
Petroleum refineries	-	-	38,240	-	-	-	-	-	38,240
Solid fuel manufacture	1,150	-	-	-	-	-	-	-	1,150
of which iron & steel sector	1,010	-	-	-	-	-	-	-	1,010
Other energy sector use	**-**	**-**	**-**	**315r**	**1,125r**	**315r**	**75r**	**-**	**1,830r**
Oil & gas extraction	-	-	-	315r	1,020r	45	-	-	1,375r
Petroleum refineries	-	-	-	-	70r	210r	75r	-	355r
Coal extraction	-	-	-	-	-	65	-	-	65
Other energy sector	-	-	-	-	35	-	-	-	35
Total non energy sector use	**640r**	**230**	**-**	**81,010r**	**17,085r**	**30,795r**	**495r**	**2,585r**	**132,840r**
Industry	**375r**	**115**	**-**	**2,570r**	**2,475r**	**6,545**	**315r**	**80r**	**12,475r**
Iron & steel final use	205	105	-	-	125r	230r	-	-	665r
Other industry	170r	10	-	2,570r	2,350r	6,315r	315r	80r	11,810r
Transport	**-**	**-**	**-**	**75,820r**	**-**	**300**	**-**	**2,150**	**78,275r**
Air	-	-	-	7,595	-	-	-	-	7,595
Rail and national navigation	-	-	-	700r	-	300	-	-	1,000r
Road	-	-	-	67,525r	-	-	-	2,150	69,680r
Other final users	**270**	**115**	**-**	**2,620r**	**14,610r**	**23,950r**	**180r**	**355r**	**42,095r**
Domestic	260	115	-	1,690r	12,325r	14,480r	20r	320r	29,210r
Agriculture	-	-	-	185	55	405	-	35r	675r
Commercial and other services	5	-	-	745	2,235r	9,070	155r	-	12,210r
Total value of energy end use	**5,150r**	**230**	**38,240**	**81,740r**	**24,515r**	**31,900r**	**570r**	**3,380r**	**185,720r**
Value of non energy end use	**-**	**-**	**-**	**3,135r**	**130r**	**-**	**-**	**-**	**3,265r**
Market value of inland consumption	**5,150r**	**230**	**38,240**	**84,875r**	**24,645r**	**31,900r**	**570r**	**3,380r**	**188,985r**

(1) For further information see paragraphs 1.39 to 1.45.

1.6 Value balance of traded energy in 2010[(1)]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	1,035r	330	22,610r	36,360r	7,755r	14,720r	530r	1,205r	84,550r
Imports	2,080	20	21,165r	10,530r	7,120r	325	-	515	41,755r
Exports	-85	-110	-16,025r	-11,450r	-2,505r	-205	-	-	-30,385r
Marine bunkers	-	-	-	-1,385r	-	-	-	-	-1,385r
Stock change	350r	-15	-15r	295r	200	-	-	-	815r
Basic value of inland consumption	**3,380**	**225**	**27,735**	**34,350r**	**12,570r**	**14,840r**	**530r**	**1,720r**	**95,355r**
Tax and margins									
Distribution costs and margins	**750**	**25**	**-**	**2,545r**	**12,060r**	**15,220r**	**-**	**100**	**30,705r**
Electricity generation	350	-	-	30	-	-	-	-	380
Solid fuel manufacture	200	-	-	-	-	-	-	-	200
of which iron & steel sector	175	-	-	-	-	-	-	-	175
Iron & steel final use	35	5	-	-	-	-	-	-	40r
Other industry	25	5	-	460r	-	-	-	-	490r
Air transport	-	-	-	180	-	-	-	-	180
Rail and national navigation	-	-	-	30r	-	-	-	-	30r
Road transport	-	-	-	1,220	-	-	-	100	1,320
Domestic	140	15	-	245	-	-	-	-	400
Agriculture	-	-	-	15	-	-	-	-	15
Commercial and other services	-	-	-	50	-	-	-	-	50
Non energy use	-	-	-	310	145	-	-	-	455
VAT and duties	**10**	**5**	**-**	**37,090r**	**680r**	**670**	**-**	**1,270r**	**39,730r**
Electricity generation	-	-	-	65	-	-	-	-	65
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	300r	-	-	-	-	300r
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	115r	-	-	-	-	115r
Road transport	-	-	-	36,365	-	-	-	1,255	37,620
Domestic	10	5	-	105	680r	670	-	15r	1,485r
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	110	-	-	-	-	110
Climate Change Levy	**5**	**-**	**-**	**-**	**180r**	**485**	**-**	**-**	**670**
Total tax and margins	**765**	**30**	**-**	**39,640r**	**12,920r**	**16,375r**	**-**	**1,370r**	**71,100r**
Market value of inland consumption	**4,145**	**255**	**27,735**	**73,990r**	**25,490r**	**31,220r**	**530r**	**3,090r**	**166,455r**
Energy end use									
Total energy sector	**3,470**	**-**	**27,735**	**670r**	**6,795r**	**1,050r**	**35r**	**705r**	**40,465r**
Transformation	3,470	-	27,735	455r	5,795	730	-	705r	38,890r
Electricity generation	2,570	-	-	430r	5,450	730	-	705r	9,880r
of which from stocks	85	-	-	-	-	-	-	-	85
Heat Generation	30	-	-	25	345	-	-	-	405
Petroleum refineries	-	-	27,735	-	-	-	-	-	27,735
Solid fuel manufacture	875	-	-	-	-	-	-	-	875
of which iron & steel sector	765	-	-	-	-	-	-	-	765
Other energy sector use	**-**	**-**	**-**	**215**	**1,000r**	**320r**	**35r**	**-**	**1,570r**
Oil & gas extraction	-	-	-	215	895r	40	-	-	1,145r
Petroleum refineries	-	-	-	-	55r	215r	35r	-	305
Coal extraction	-	-	-	-	-	70	-	-	70
Other energy sector	-	-	-	-	50	-	-	-	50
Total non energy sector use	**675**	**255**	**-**	**70,875r**	**18,550r**	**30,165**	**495r**	**2,385r**	**123,405r**
Industry	**420**	**130**	**-**	**2,355r**	**2,055r**	**6,335**	**325r**	**70r**	**11,690r**
Iron & steel final use	150	115	-	5	110	205r	-	-	585r
Other industry	270	15	-	2,350r	1,950r	6,130r	325r	70r	11,110r
Transport	**-**	**-**	**-**	**66,115r**	**-**	**280**	**-**	**1,990**	**68,385r**
Air	-	-	-	5,940	-	-	-	-	5,940
Rail and national navigation	-	-	-	535r	-	280	-	-	815r
Road	-	-	-	59,645	-	-	-	1,990	61,635
Other final users	**255**	**125**	**-**	**2,405**	**16,495r**	**23,555**	**170r**	**325r**	**43,325r**
Domestic	250	125	-	1,730	14,275	14,085	20r	285r	30,770r
Agriculture	-	-	-	150	55	405	-	40r	650r
Commercial and other services	5	-	-	530	2,165r	9,060	150r	-	11,910r
Total value of energy end use	**4,145**	**255**	**27,735**	**71,545r**	**25,345r**	**31,220r**	**530r**	**3,090r**	**163,865r**
Value of non energy end use	**-**	**-**	**-**	**2,445r**	**145**	**-**	**-**	**-**	**2,590r**
Market value of inland consumption	**4,145**	**255**	**27,735**	**73,990r**	**25,490r**	**31,220r**	**530r**	**3,090r**	**166,455r**

(1) For further information see paragraphs 1.39 to 1.45.

1.7 Sales of electricity and gas by sector

United Kingdom

	2008	2009	2010	2011	2012
Total selling value (£ million)[1]					
Electricity generation - Gas	6,185	5,032	5,449	5,867r	4,560
Industrial - Gas	3,165	2,285	2,048r	2,466r	2,629
- Electricity	9,078	7,163	6,656r	6,860r	7,092
of which:					
Fuel industries	359	389	322r	315r	337
Industrial sector	8,719	6,774	6,334	6,545	6,755
Domestic sector - Gas	11,497	12,007	13,595	11,738r	14,710
- Electricity	13,569	13,843	13,413	13,788r	14,827
Other - Gas	2,472	2,305	2,377r	2,379r	2,734
- Electricity	8,229	10,018	9,750	9,773	10,442
of which:					
Agricultural sector	416	396	407	403	420
Commercial sector	6,182	7,777	7,776	7,762	8,257
Transport sector	289	335	280	302r	336
Public lighting	177	173	147	151	164
Public admin. and other services	1,165	1,337	1,139	1,155	1,265
Total, all consumers	**54,195**	**52,654**	**53,287r**	**52,872r**	**56,994**
of which gas	**23,320**	**21,629**	**23,469r**	**22,451r**	**24,633**
of which electricity	**30,875**	**31,025**	**29,819r**	**30,421r**	**32,361**
Average net selling value per kWh sold (pence)[1]					
Electricity generation - Gas	1.644	1.403	1.461	1.914	2.136
Industrial - Gas	2.283	1.963	1.790	2.172	2.375
- Electricity	8.454	7.540	6.726r	7.141r	7.585
of which:					
Fuel industries	7.564	8.570	7.106r	7.390r	8.048
Industrial sector	8.495	7.488	6.707	7.130	7.563
Domestic sector - Gas	3.198	3.611	3.490	4.001r	4.338
- Electricity	11.326	11.678	11.289	12.368r	12.989
Other - Gas	2.585	2.753	2.412r	2.588r	2.800
- Electricity	7.861	9.995	9.545	9.725r	10.364
of which:					
Agricultural sector	10.232	10.410	10.110	10.220	10.840
Commercial sector	7.883	10.410	10.110	10.220	10.840
Transport sector	7.329	8.290	6.880	7.390	8.210
Public lighting	7.775	8.540	7.510	7.910	8.600
Public admin. and other services	7.291	8.540	7.510	7.910	8.600
Average, all consumers	**4.163**	**4.369**	**4.114r**	**4.749r**	**5.330**
of which gas	**2.404**	**2.427**	**2.406r**	**2.787r**	**3.237**
of which electricity	**9.303**	**9.887**	**9.321r**	**9.876r**	**10.493**

(1) Excludes VAT where payable - see paragraph 1.45 for a definition of average net selling value.

1.8 Final energy consumption by main industrial groups[1]

Thousand tonnes of oil equivalent

	2008	2009	2010	2011	2012
Iron and steel and non-ferrous metals					
Coal	69	60	58	51	49
Manufactured solid fuels *(2)*	378	332	301	281	369
Blast furnace gas	40	29	87	64r	24
Coke oven gas	92	49	97	60r	55
Natural gas	847r	625r	728r	688r	659
Petroleum	12r	9r	6r	4r	5
Electricity	1,036	833	909	930	722
Total iron and steel and non-ferrous metals	**2,473r**	**1,938r**	**2,186r**	**2,078r**	**1,883**
Chemicals					
Coal	65	49	51	50	48
Natural gas	2,426r	2,065r	1,861r	2,033r	1,908
Petroleum	247r	216r	312r	189r	313
Electricity	1,744	1,522	1,587	1,517r	1,483
Heat purchased from other sectors *(3)*	592	347	415	350r	350
Total chemicals	**5,075r**	**4,199r**	**4,225r**	**4,138r**	**4,102**
Metal products, machinery and equipment					
Coal	48	45	48	48r	46
Natural gas	1,729r	1,370r	1,564r	1,605r	1,626
Petroleum	177r	278r	85r	164r	25
Electricity	1,876	1,647	1,685	1,619	1,576
Heat purchased from other sectors *(3)*	4	-	-	-	-
Total metal products, machinery and equipment	**3,835r**	**3,340r**	**3,382r**	**3,437r**	**3,273**
Food, beverages and tobacco					
Coal	28	33	29	32	31
Natural gas	1,978r	1,845r	1,878r	1,887r	1,843
Petroleum	690r	838r	1,074r	573r	461
Electricity	1,054	924	991	973r	955
Heat purchased from other sectors *(3)*	10	1	1	2	3
Total food, beverages and tobacco	**3,760r**	**3,641r**	**3,973r**	**3,467r**	**3,292**

(1) Industrial categories used are described in Table 1I. 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

	2008	2009	2010	2011	2012
Paper, printing and publishing					
Coal	105	71	71	71	69
Natural gas	1,436r	1,284r	1,263r	1,133r	1,064
Petroleum	187r	130r	104r	61r	64
Electricity	1,106	952	942	938r	925
Heat purchased from other sectors *(3)*	1		1	1	4
Total paper, printing and publishing	**2,836r**	**2,437r**	**2,382r**	**2,204r**	**2,126**
Other industries					
Coal	981	893	879	859	817
Natural gas	3,097r	2,536r	2,541r	2,417r	2,420
Petroleum	923r	446r	465r	481r	229
Electricity	2,998	2,698	2,875	2,824r	2,750
Heat purchased from other sectors *(3)*	413	415	405	417	438
Total other industries	**8,412r**	**6,988r**	**7,164r**	**6,997r**	**6,653**
Unclassified					
Manufactured solid fuels *(2)*	239	207	200	184	182
Coke oven gas	-	-	-	-	-
Natural gas	3	2	2	2	2
Petroleum	3,085r	2,998r	2,888r	2,892r	3,164
Bioenergy & waste	414r	415r	449r	505r	487
Total unclassified	**3,742r**	**3,623r**	**3,539r**	**3,583r**	**3,834**
Total					
Coal	1,296	1,152	1,136	1,111	1,060
Manufactured solid fuels *(2)*	617	539	502	466	551
Blast furnace gas	40	29	87	64r	24
Coke oven gas	92	49	97	60r	55
Natural gas	11,516r	9,728r	9,837r	9,765r	9,520
Petroleum	5,321r	4,916r	4,934r	4,363r	4,261
Bioenergy & waste	414r	415r	449r	505r	487
Electricity	9,815	8,576	8,987	8,800r	8,411
Heat purchased from other sectors *(3)*	1,021	763	822	769r	795
Total	**30,132r**	**26,166r**	**26,850r**	**25,903r**	**25,164**

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

Thousand tonnes of oil equivalent
(except where shown otherwise)

	2008	2009	2010	2011	2012
Iron and steel and non-ferrous metals					
Coal	801	706	633	651	521
Blast furnace gas	664	546	453	454r	594
Coke oven gas	168	200	196	196r	179
Natural gas	57	43	40	37r	40
Petroleum	44	54	9	7r	7
Other (including renewables) *(2)*	54	55	50r	60	63
Total fuel input *(3)*	**1,789**	**1,605**	**1,381**	**1,404r**	**1,403**
Electricity generated by iron & steel and non-ferrous metals *(4)*	**485**	**459**	**425**	**429r**	**371**
(in GWh)	5,637	5,337	4,946	4,983r	4,309
Electricity consumed by iron and steel and non-ferrous metals from own generation *(5)*	**388**	**326**	**335**	**349r**	**187**
(in GWh)	4,509	3,795	3,895	4,065	2,176
Chemicals					
Coal	110	109	110	109r	109
Natural gas	719	684	731	718r	716
Petroleum	7	6	11	6	6
Other (including renewables) *(2)*	89	94	51r	68r	68
Total fuel input *(3)*	**925**	**892**	**937r**	**900r**	**900**
Electricity generated by chemicals *(4)*	**401r**	**376**	**407**	**379r**	**381**
(in GWh)	4,669	4,372	4,729	4,404r	4,427
Electricity consumed by chemicals from own generation *(5)*	**243**	**170**	**224**	**239r**	**224**
(in GWh)	2,821	1,979	2,610	2,783r	2,604
Metal products, machinery and equipment					
Coal	-	-	-	-	-
Natural gas	81	72	58	42r	40
Petroleum	6	6	6	6	6
Other (including renewables) *(2)*	44r	49r	50r	48r	48
Total fuel input *(3)*	**131r**	**127r**	**114r**	**96r**	**94**
Electricity generated by metal products, machinery and equipment *(4)*	**49**	**46**	**37**	**22r**	**21**
(in GWh)	573	530	435	251r	247
Electricity consumed by metal products, machinery and equipment from own generation *(5)*	**47**	**38**	**32**	**21r**	**20**
(in GWh)	550	443	376	241r	236
Food, beverages and tobacco					
Coal	3	4	4	4	4
Natural gas	350	374	375	361r	346
Petroleum	3	5	6	4	3
Other (including renewables) *(2)*	0	1r	4r	6r	8
Total fuel input *(3)*	**356**	**384r**	**388r**	**375r**	**362**
Electricity generated by food, beverages and tobacco *(4)*	**172**	**186**	**184**	**186r**	**184**
(in GWh)	2,005r	2,162	2,139	2,157r	2,142
Electricity consumed by food, beverages and tobacco from own generation *(5)*	**113**	**82r**	**109**	**110r**	**112**
(in GWh)	1,316	959	1,264	1,277r	1,306

(1) Industrial categories used are described in Table 1l.
(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)

	2008	2009	2010	2011	2012
Paper, printing and publishing					
Coal	52	48	32	30	30
Natural gas	561	502r	382	368r	361
Petroleum	1	1	1	0	0
Other (including renewables) *(2)*	35r	64r	75r	83r	90
Total fuel input *(3)*	**649r**	**615r**	**489r**	**480r**	**482**
Electricity generated by paper, printing and publishing *(4)*	**285r**	**249**	**200**	**195r**	**190**
(in GWh)	3,320	2,898r	2,326	2,264r	2,208
Electricity consumed by paper, printing and publishing	**186**	**163**	**111**	**126r**	**132**
from own generation *(5)* *(in GWh)*	2,168	1,894	1,292	1,468r	1,539
Other industries					
Coal	-	-	-	-	-
Coke oven gas	26	25	25	28	28
Natural gas	159	122	103	79r	77
Petroleum	5	4	4	6r	6
Other (including renewables) *(2)*	1,827r	1,815r	1,881r	1,921r	1,926
Total fuel input *(3)*	**2,016r**	**1,966r**	**2,012r**	**2,034r**	**2,037**
Electricity generated by other industries *(4)*	**138**	**121**	**118**	**116r**	**117**
(in GWh)	1,610	1,412	1,373r	1,344r	1,364
Electricity consumed by other industries from own	**71**	**77**	**102r**	**102r**	**107**
generation *(5)* *(in GWh)*	827	899	1,182r	1,189r	1,239
Total					
Coal	966	867	778	794r	664
Blast furnace gas	664	546	453	454r	594
Coke oven gas	195	226	221	224r	206
Natural gas	1,927	1,798	1,687	1,605r	1,581
Petroleum	66	75	35	28r	28
Other (including renewables) *(2)*	2,049r	2,077r	2,145r	2,184r	2,204
Total fuel input *(3)*	**5,866r**	**5,589r**	**5,320r**	**5,289r**	**5,277**
Electricity generated *(4)*	**1,532**	**1,437**	**1,371**	**1,325r**	**1,264**
(in GWh)	17,815	16,710	15,949r	15,404r	14,696
Electricity consumed from own generation *(5)*	**1,048**	**857**	**913**	**948r**	**782**
(in GWh)	12,191	9,969	10,618r	11,023r	9,100

(4) Combined heat and power (CHP) generation (i.e. electrical output from Table 7.8) 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	**2008**	**2009**	**2010**	**2011**	**2012**
All industry	5,866	5,589	5,320	5,289	5,277
Fuel industries	1,159	1,225	1,350	1,735	1,664
Transport, Commerce and Administration	271	336	284	284	338
Services	1,005	1,369	1,509	1,419	1,569
Total fuel input	**8,301**	**8,519**	**8,463**	**8,727**	**8,848**
Electricity generated	**2,895**	**2,956**	**2,921**	**3,022**	**3,072**
Electricity consumed	**1,569**	**1,398**	**1,514**	**1,545**	**1,457**
					GWh
Electricity generated	**33,663**	**34,378**	**33,974**	**35,142**	**35,730**
Electricity consumed	**18,244**	**16,254**	**17,609**	**17,969**	**16,940**

Chapter 2
Solid fuels and derived gases

Key points

- Figures for 2012 show that coal production (including an estimate for slurry) decreased by 8 per cent on 2011 to an all-time low of 17 million tonnes in 2012 (Table 2.4).
- Coal imports have exceeded UK coal production since 2003. In 2012 UK imports were 45 million tonnes (similar to levels last seen in 2008), an increase of 38 per cent on 2011 (33 million tonnes) but 11 per cent lower than the 2006 record. (Table 2.4).
- Since 2005, nearly half of the UK's coal imports (mainly steam coal) have come from Russia, with Colombia and the US being the other main suppliers (Table 2B).
- There was a significant increase in the average demand for coal between 2011 and 2012, increasing by 24 per cent from 52 million tonnes in 2011 to 64 million tonnes in 2012 (Table 2.4), driven by a 33 per cent increase in the use of coal for electricity generation.
- During the last ten years, around 80 per cent of demand for coal has been from major power producers for electricity generation with around a further 10 per cent used for the manufacture of coke (Table 2.4).
- Following the high levels seen at the end of 2009, total stock levels have declined and were 13 million tonnes at the end of 2012, 3.0 million tonnes less than total stocks held at the end of 2011 (Table 2.4).

Introduction

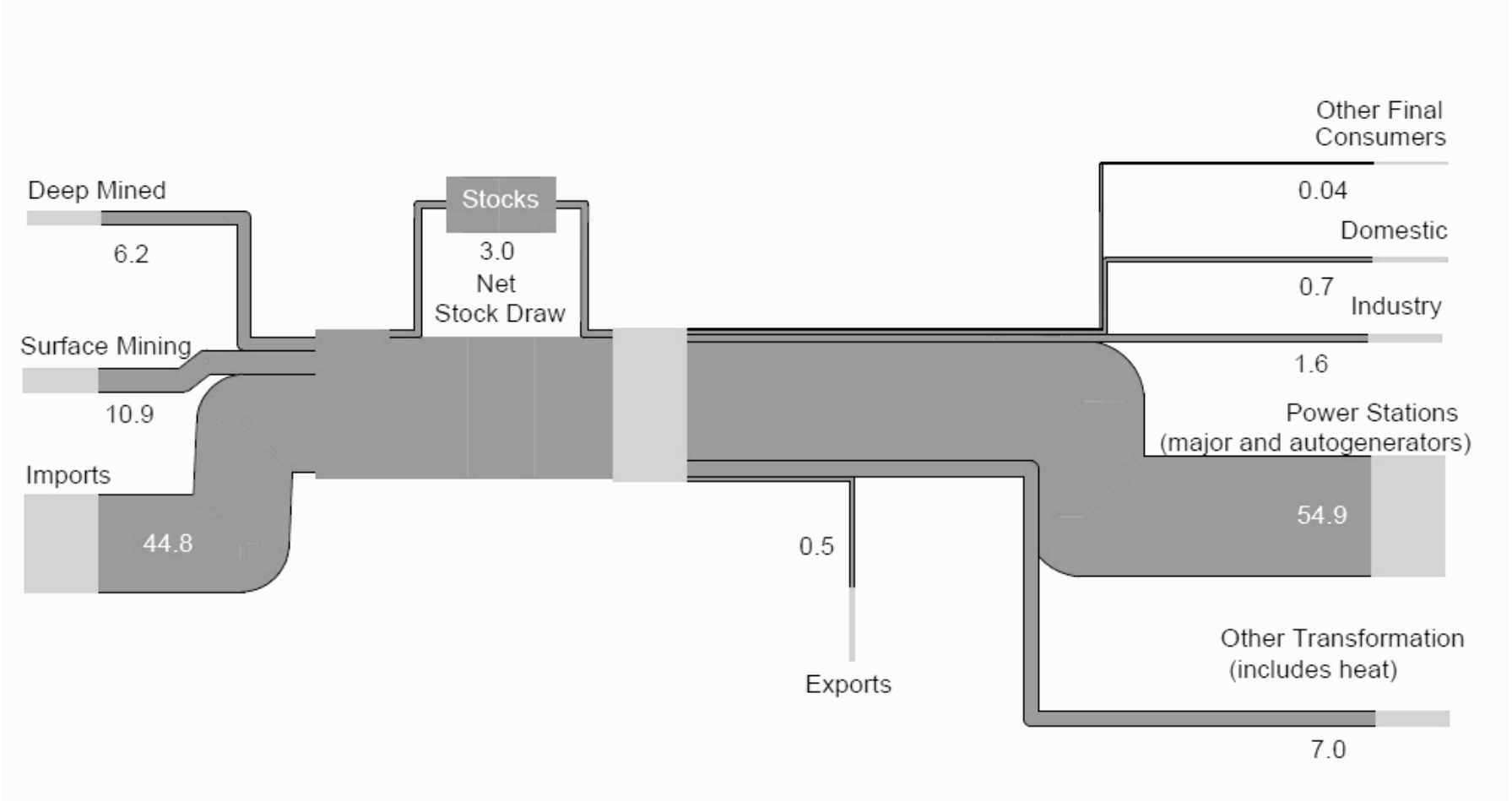
2.1 This chapter presents statistics on supply and demand for coal during the period 2010 to 2012 by grade of coal (steam coal, anthracite and coking coal). These are shown as commodity balances in Tables 2.1 to 2.3. Table 2.4 shows the same data as published in Table 2.1 to 2.3 at an aggregated level, i.e. not split by grade of coal, for the latest five years.

2.2 Energy flow chart for 2012 (page 42), showing the flows of coal from production and imports through to consumption. It is a way of simplifying the figures that can be found in the commodity balance for coal in Table 2.4. It illustrates the flow of coal from the point at which it becomes available from home production or imports (on the left) to the eventual final use of coal (on the right).

2.3 Supply and demand for manufactured solid fuels, including coke oven coke, coke breeze, other manufactured solid fuels (patent fuel), coke oven gas, blast furnace gas and benzole and tar. These are shown in the commodity balances in Tables 2.5 and 2.6 for the latest five years.

2.4 Other data in the chapter shows UK production and employment categorised by type of mine and devolved administration during 2010 to 2012 (Table 2A); and Imports of coal in 2012 split by grade of coal and country of origin (Table 2B), whilst Map 2A presents all UK coal production sites and ports of entry for international trade.

Coal flow chart 2012 (million tonnes of coal)



Notes:
This flow chart is based on the data that appear in Tables 2.1 and 2.4.
Surface mining includes slurry and recovered coal.

2.5 Information on long-term trends on coal production, consumption and stocks (Tables 2.1.1 and 2.1.2) are available on the DECC energy statistics web site at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

2.6 Detailed statistics on imports and exports of solid fuels are shown in Annex G (Table G5), available on the DECC energy statistics web site at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

Coal (Tables 2.1, 2.2, 2.3 and 2.4)

Coal Production and Trade

2.7 UK coal production has seen a general decline since 1952, when levels peaked at 228 million tonnes. The miners' strike in 1984 saw a large fall for a year before a more substantial fall in the early 1990's and a gradual decline thereafter. Figures for 2012 show that coal production (including an estimate for slurry) decreased by 8.5 per cent on 2011 to an all-time low of 17 million tonnes in 2012 (Chart 2.1).

2.8 **Deep mined** production, which contributed 10 per cent to UK coal supply in 2012 (36 per cent of total UK production), fell by 16 per cent on 2011. There has been an overall decline in production in all operating deep mines, with production levels falling significantly in some of the major deep mines as a result of operational issues. Similarly, **surface mine** production (including an estimate for **slurry**) decreased by 3.7 per cent and contributed 17 per cent to UK coal supply. Together, production accounted for 27 per cent of UK coal supply.

2.9 **Steam coal**, mainly used by coal-fired power stations, accounted for 90 per cent of total production in 2012, with 7.6 per cent **anthracite** production and the remainder **coking coal**.

2.10 Table 2A shows how production of coal is divided between England, Wales and Scotland. In 2012, 55 per cent of coal output was in England, 29 per cent in Scotland and 15 per cent in Wales. There has been no deep mining of coal in Scotland since Longannet mine closed in 2002 (Map 2A).

Table 2A: Output from UK coal mines and employment in UK coal mines [1, 2]

		Million tonnes			Number		
		Output			Employment		
		2010	2011	2012	2010	2011	2012
Deep mined	England	7.3	7.2	6.0	3,158	3,184	3,114
	Wales	0.0	0.1	0.1	388	511	327
	Total	7.4	7.3	6.2	3,546	3,695	3,441
Surface mining	England	2.7	2.9	3.0	775	580	767
	Scotland	6.0	5.5	4.8	1,149	1,103	924
	Wales	1.7	2.1	2.4	544	594	695
	Total	10.4	10.6	10.1	2,468	2,277	2,386
Total	England	10.0	10.2	9.0	3,933	3,764	3,881
	Scotland	6.0	5.5	4.8	1,149	1,103	924
	Wales	1.7	2.2	2.5	932	1,105	1,022
	Total	17.8	17.9	16.3	6,014	5,972	5,827

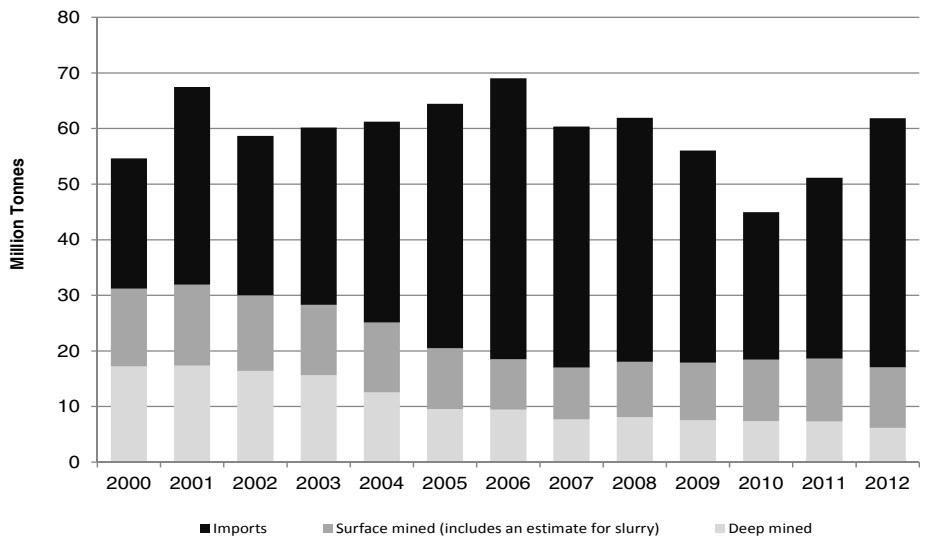
Source: The Coal Authority

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.*

2.11 Employment in the coal industry has followed a similar pattern to UK production levels. Table 2A also shows how numbers employed in the production of coal have changed over the last three years. During 2012 total employment, including contractors, was 2.4 per cent lower than in 2011. At 31 December 2012, 67 per cent of the 5,827 people employed in UK coal mining worked in England, while 16 per cent were employed in Scotland and 18 per cent in Wales.

2.12 Based on comparative EU statistics for 2011[1], Poland had the highest production, contributing 61 per cent (76 million tonnes) to the EU total. The UK was the second largest EU hard coal producer accounting for 14 per cent of total EU production (124 million tonnes). Other EU countries such as Germany have higher lignite and brown coal production.

Chart 2.1: Coal production and imports 2000 to 2012



2.13 Since 1970, UK coal imports have grown steadily. UK imports (36 million tonnes) exceeded UK production (32 million tonnes) for the first time in 2001. Rapid growth in imports continued and they reached a new record of 51 million tonnes in 2006 before generally declining. However, in 2012 UK imports were 45 million tonnes (similar to levels last seen in 2008), an increase of 38 per cent on 2011 (33 million tonnes) but 11 per cent lower than the 2006 record.

Table 2B: Imports of coal in 2012[1]

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Russia	17,459	595	-	18,053
Colombia	11,749	-	-	11,749
United States of America	8,858	1,932	0	10,790
Australia	-	2,360	-	2,360
European Union[2]	583	4	106	693
Republic of South Africa	546	-	7	553
Canada	153	154	-	307
Other countries	272	25	-	297
People's Republic of China	0	0	13	13
Total all countries	**39,619**	**5,071**	**125**	**44,815**

Source: H M Revenue and Customs, ISSB

1. Country of origin basis.

2. Includes non-EU coal routed through the Netherlands.

[1] *EU statistics for 2012 are not yet available on the Eurostat website http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home. The statistics being referenced refer to hard coal (steam coal, anthracite and coking coal).*

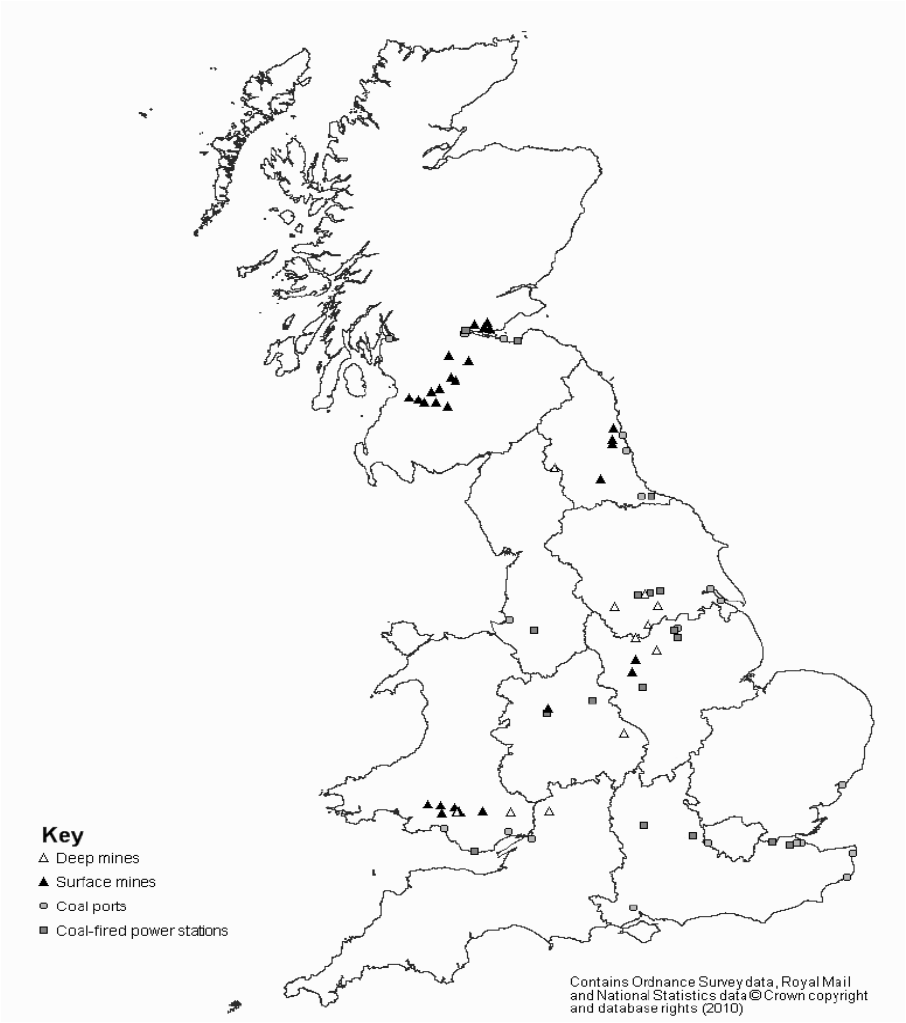
2.14 Table 2B shows that, in 2012, 40 per cent (18 million tonnes) of the United Kingdom's coal imports came from Russia and another 56 per cent (25 million tonnes) from Colombia, the USA and Australia combined.

2.15 Steam coal accounted for 88 per cent of the total imports, 11 per cent was coking coal, with anthracite accounting for just a small amount. Coal imports from Russia grew rapidly over the last decade and, in 2006, peaked at around 23 million tonnes. Imports from Russia increased by 46 per cent in 2012 compared to 2011, from 12 million tonnes to 18 million tonnes. In 2012, Russia accounted for 44 per cent (17 million tonnes) of total steam coal imports. A further 52 per cent (21 million tonnes) came from a combination of Colombia and the USA. The United Kingdom imported 47 per cent (2.4 million tonnes) of coking coal from Australia with a further 38 per cent (1.9 million tonnes) from the USA. The small volume of imported anthracite coal (0.1 million tonnes) was mainly from the European Union (85 per cent) and China (10 per cent).

2.16 The UK and Germany have consistently been the top two coal importing countries in the EU. In 2011, these two countries accounted for 15 and 22 per cent respectively of total EU imports (218 million tonnes). The Netherlands followed with an 11 per cent (24 million tonnes) share of the total[2].

2.17 Since 1983 the volume of coal exported from the UK is significantly less than the levels imported and in 2012, 0.5 million tonnes of coal were exported, broadly unchanged from levels in 2011.

Map 2A: UK coal production sites and ports

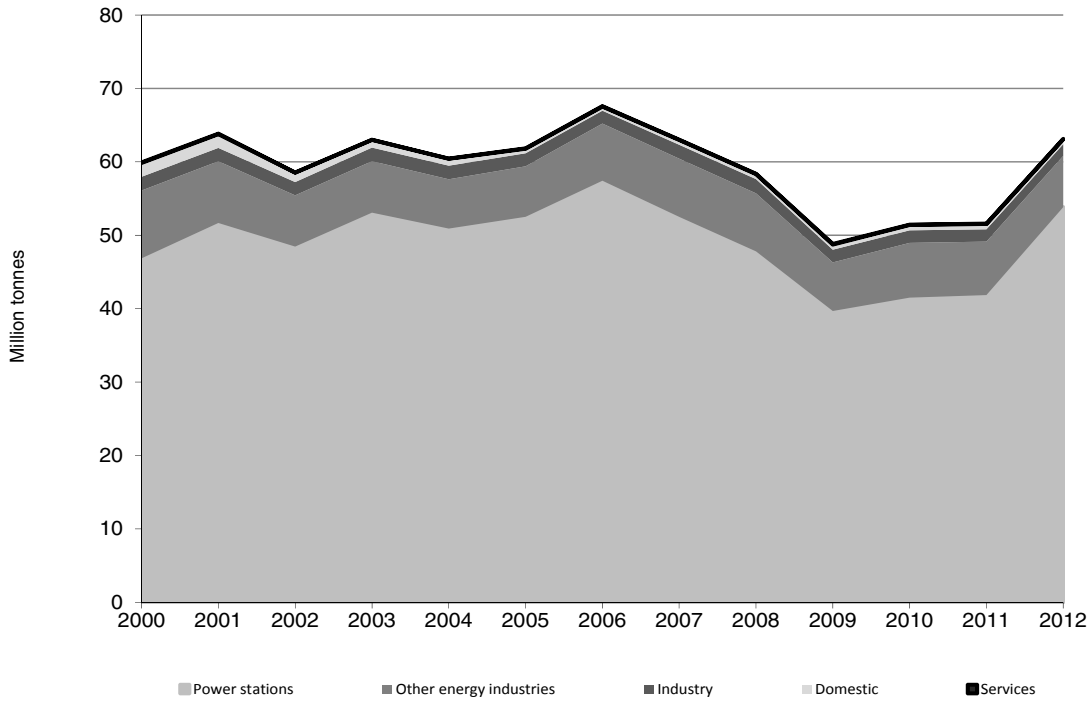


[2] *EU statistics for 2012 are not yet available on the Eurostat website http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home. The statistics being referenced refer to hard coal (steam coal, anthracite and coking coal).*

Coal Consumption

2.18 As with coal production, coal consumption in the UK has seen a general decline over the last 30 years as the UK's energy mix has become more diverse, along with environmental regulations and high coal prices have generally made natural gas more attractive to purchase for generation use. However, there was a significant increase in the average demand for coal between 2011 and 2012, increasing by 24 per cent from 52 million tonnes in 2011 to 64 million tonnes in 2012 (Chart 2.2). This was largely due to a decrease in the cost of coal and an increase in gas prices, which led to a 33 per cent (13.3 million tonnes) increase in coal use for electricity generation. Eighty-nine per cent (57 million tonnes) of this demand was for steam coal, 9.3 per cent (6.0 million tonnes) was for coking coal and the remaining 1.9 per cent (1.2 million tonnes) was for anthracite.

Chart 2.2: Coal consumption, 2000 to 2012



2.19 The transformation sector represented 96 per cent (62 million tonnes) of overall demand for coal in 2012 (64 million tonnes), similar to the level seen in 2007. Electricity generation accounted for 95 per cent of demand for steam coal and 39 per cent of demand for anthracite. Coking coal was used in coke ovens (83 per cent) and blast furnaces (17 per cent) in the UK iron and steel industry. These splits remained similar to 2011.

2.20 Coal consumption by final consumers accounted for 3.6 per cent (2.3 million tonnes) of total demand in 2012, where it was used for steam raising, space or hot water heating, or heat for processing, a decrease of 5.5 per cent from 2011. Steam coal accounted for 86 per cent of this final consumption (unchanged from 2011).

2.21 The industrial sector is the largest final consumer (accounting for 69 per cent of total final consumption in 2012, unchanged from 2011), despite consumption in 2012 falling by 4.7 per cent from 2011 (1.7 million tonnes). Ninety-two per cent of coal use in the industrial sector was for steam coal, with mineral products (e.g. cement, glass and brick production) being the largest users.

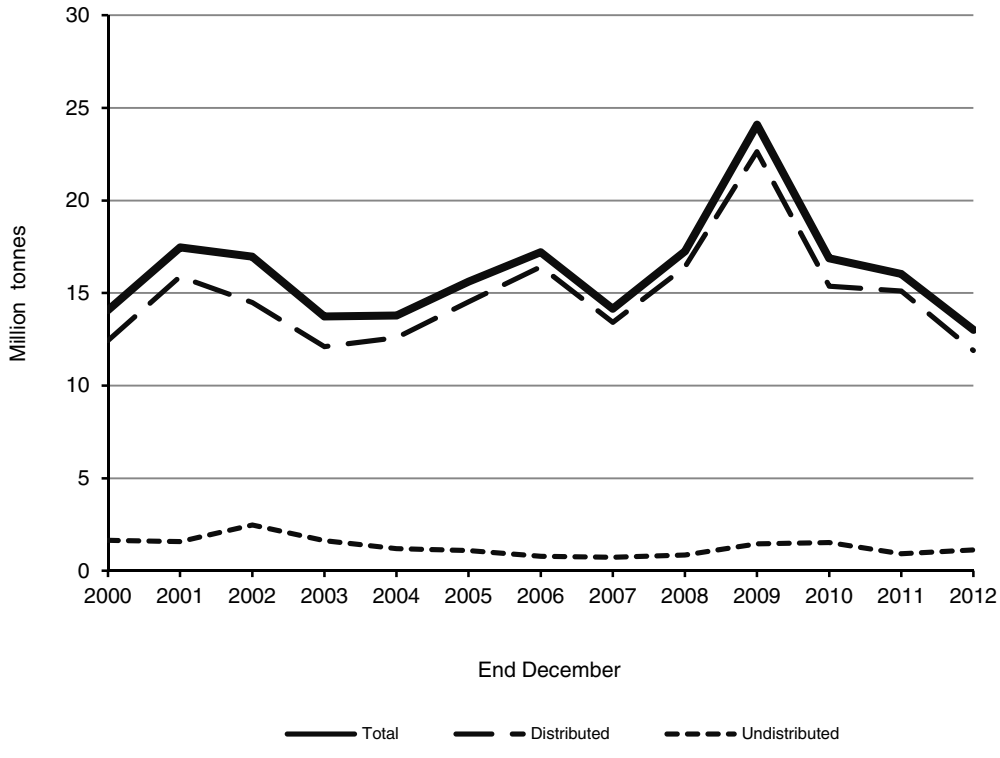
2.22 The domestic sector accounted for 29 per cent of the final consumption of coal, with 71 per cent of this demand being for steam coal and the remainder for anthracite. Coal use in the commercial and public sector decreased by 46 per cent from 31 thousand tonnes in 2011 to 17 thousand tonnes in 2012.

2.23 In 2011, the UK was the third largest consumer of coal among the EU countries for the eleventh year running, accounting for 16 per cent (316 million tonnes) of total coal consumption in the EU. The top two consumers were Poland and Germany, accounting for 26 per cent (84 million tonnes) and 18 per cent (58 million tonnes) of total EU consumption, respectively[3].

Coal Stocks

2.24 Total coal stocks were less than 20 million tonnes before 1960. Since then distributed stocks increased substantially (mainly due to electricity generators) and, in 1983, total stocks reached a record high of 58 million tonnes, of which 59 per cent was distributed. Thereafter, although there have been year-on-year fluctuations, stock levels have declined back to under 20 million tonnes a year, with the exception of 2009 when total stocks were 24 million tonnes (Chart 2.3), the highest since 1994 (27 million tonnes). Total stock levels have declined since then and were around 13 million tonnes at the end of 2012, 3.0 million tonnes less than total stocks held at the end of 2011. Stocks held at collieries and surface mine sites at the end of 2012 were 0.2 million tonnes higher than a year earlier (0.9 million tonnes) but stocks at major power stations and coke ovens, as a whole, decreased by 4.4 million tonnes and accounted for 80 per cent of total stocks in 2012.

Chart 2.3: Coal stocks in the UK 2000 to 2012



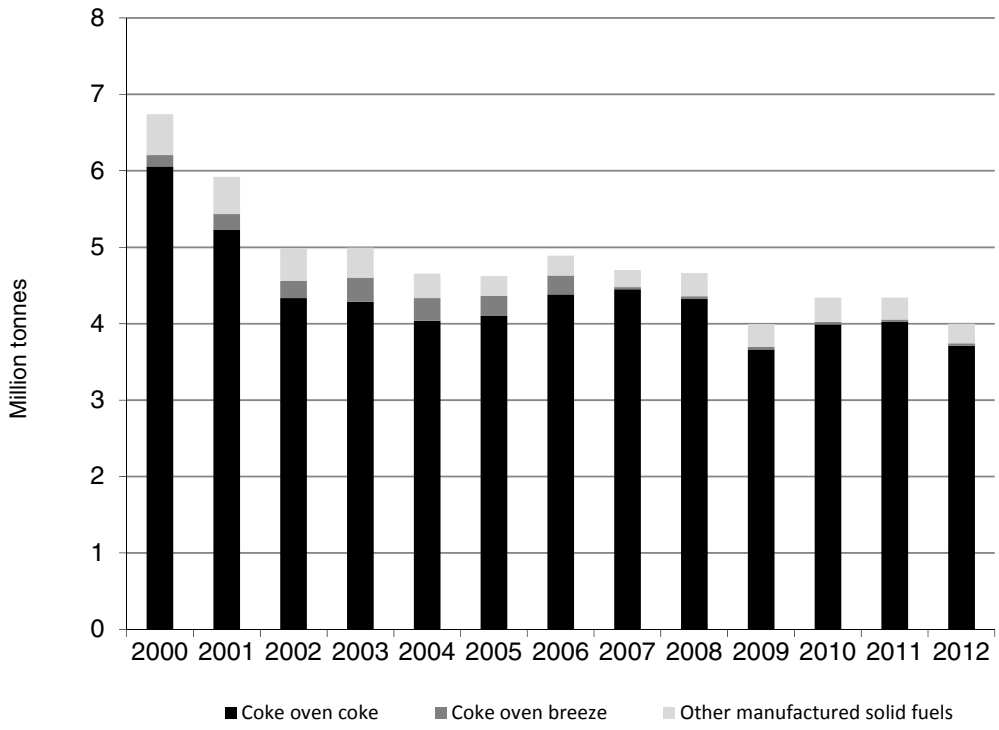
[3] *EU statistics for 2012 are not yet available on the Eurostat website http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home. The statistics being referenced refer to hard coal (steam coal, anthracite and coking coal).*

Manufactured Solid Fuels (Tables 2.5 and 2.6)

Production, Trade and Consumption

2.25 In 2012, around 93 per cent of manufactured solid fuel production was **coke oven coke**, a proportion that has remained the same for the past 15 years. In 2012, 96 per cent of the UK's supply of coke oven coke was home produced, with the remaining being imported from other countries. Between 2011 and 2012, home produced coke oven coke declined by 7.7 per cent to 3.7 million tonnes. Export levels at 0.5 million tonnes have remained relatively unchanged when compared to 2011.

Chart 2.4: Total manufactured solid fuels production in the UK 2000 to 2012



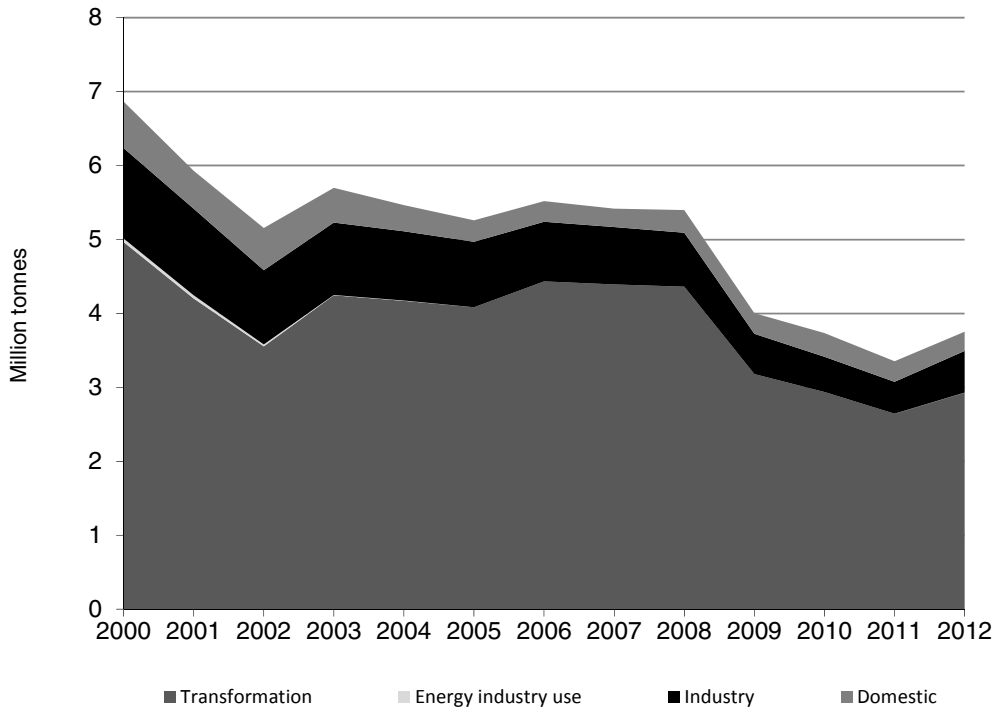
2.26 The main purpose of coke oven coke is for use in blast furnaces in the UK iron and steel industry. In 2012, this represented 98 per cent of total demand (2.7 million tonnes), and was 17 per cent higher than the demand for coke oven coke in 2011 (2.3 million tonnes) with the rest of production added to stocks.

2.27 Most of the supply of **coke breeze** is from re-screened coke oven coke, with direct production accounting for only 4.0 per cent of total supply in 2012. In 2012, 33 per cent was used in blast furnaces (0.3 million tonnes) for transformation and 67 per cent used for final consumption (Chart 2.5). From 2009, the calorific value for coke breeze has been set the same as for coke oven coke. This is following information from the Iron and Steel industry on the similarities between the two types of manufactured fuels.

2.28 Other manufactured solid fuels (patent fuels) are manufactured smokeless fuels, produced mainly for the domestic market. A small amount of these fuels (only 6.0 per cent of total supply in 2011) was imported, but exports generally exceed this. Imports and exports of manufactured smokeless fuels can contain small quantities of non-smokeless fuels.

2.29 The carbonisation and gasification of solid fuels in coke ovens produces coke oven gas as a by-product. In 2012, production of coke oven gas was 6.6 per cent lower than in 2011 (8.8 TWh). Some of this (45 per cent) was used to fuel the coke ovens themselves and, of the rest, 29 per cent was used for electricity generation, 15 per cent for iron and steel and other industrial processes (including heat production), 8.9 per cent in blast furnaces and 2.3 per cent was lost.

Chart 2.5: Total manufactured solid fuels consumption in the UK 2000 to 2012



2.30 **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 2012 used 59 per cent of total blast furnace gas and BOS gas, while 30 per cent was used in coke ovens and blast furnaces themselves, 1.5 per cent used in general heat production, 7.0 per cent was lost or burned as waste and a further 2.4 per cent was used in the iron and steel industry. Demand for **benzole and tars** decreased by 6.9 per cent from 2011 (1.7 TWh), to 1.5TWh in 2012, all of which was met by domestic production.

2.31 A flow chart showing the use of coal, manufactured fuels and derived gases in the UK Iron and Steel industry can be found in the quarterly publication, Energy Trends for June 2011. This is available on the DECC energy statistics web site, www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-trends.

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 1.28 to 1.63. 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.gov.uk/government/organisations/department-of-energy-climate-change/series/coal-statistics.
For notes on the commodity balances and definitions of the terms used in the row headings see Annex A. 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 website.

Coal production

2.33 **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.

2.34 **Surface** mines: 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. The term 'surface mining' has now replaced opencast production as defined in DUKES pre-2011. Opencast production is a particular type of surface mining technique.

2.35 **Other sources/Slurry**: Estimates of slurry etc recovered and disposed of from dumps, ponds, rivers, etc.

Steam coal, coking coal and anthracite

2.36 **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.

2.37 **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.

2.38 **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.

Allocation of imported coal

2.39 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 website at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/coal-statistics.

Coal consumption

2.40 Figures for actual consumption of coal are available for all fuels 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.

2.41 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 2012 is estimated at 51.0 thousand tonnes. This estimate is included in the domestic steam coal and domestic anthracite figures.

Stocks of coal

2.42 Undistributed stocks are those held at collieries and surface mine 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 5.66 and 5.67), coke ovens, low temperature carbonisation plants and patent fuel plants.

Coke oven coke (hard coke), hard coke breeze and other manufactured fuels

2.43 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 2.45, below). Breeze (as defined in paragraph 2.46) is excluded from the figures for coke oven coke.

2.44 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.

2.45 The coke screened out by producers as breeze and fines 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. 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.

2.46 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

2.47 However, in Table 2.5, 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

2.48 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 Table 2.5.

2.49 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.

2.50 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.

Blast furnace gas, coke oven gas, benzole and tars

2.51 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. See 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 Table 2.6 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 2012

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	14,691	386	1,210	16,287
Other sources	680	-	80	760
Imports	39,619	5,071	125	44,815
Exports	-365	-13	-110	-488
Marine bunkers	-	-	-	-
Stock change *(1)*	+2,585	+510	-141	+2,953
Transfers	-	-	-	-
Total supply	**57,209**	**5,953**	**1,165**	**64,327**
Statistical difference *(2)*	+160	1	-41	+120
Total demand	**57,049**	**5,952**	**1,206**	**64,206**
Transformation	**55,056**	**5,952**	**878**	**61,886**
Electricity generation	54,436	-	470	54,906
Major power producers	53,367	-	470	53,837
Autogenerators	1,069	-	-	1,069
Heat generation	592	-	-	592
Petroleum refineries	-	-	-	-
Coke manufacture	-	4,965	114	5,079
Blast furnaces	-	987	-	987
Patent fuel manufacture and low temperature carbonisation	28	-	294	322
Energy industry use	**4**	**-**	**-**	**4**
Electricity generation	-	-	-	-
Oil and gas extraction	-	-	-	-
Petroleum refineries	-	-	-	-
Coal extraction	4	-	-	4
Coke manufacture	-	-	-	-
Blast furnaces	-	-	-	-
Patent fuel manufacture	-	-	-	-
Pumped storage	-	-	-	-
Other	-	-	-	-
Losses	-	-	-	-
Final consumption	**1,989**	**-**	**328**	**2,317**
Industry	**1,473**	**-**	**129**	**1,602**
Unclassified	-	-	-	-
Iron and steel	2	-	49	51
Non-ferrous metals	21	-	-	21
Mineral products	1,033	-	0	1,033
Chemicals	76	-	-	76
Mechanical engineering etc	11	-	-	11
Electrical engineering etc	5	-	-	5
Vehicles	50	-	-	50
Food, beverages etc	27	-	17	44
Textiles, leather, etc	62	-	-	62
Paper, printing etc	119	-	-	119
Other industries	62	-	63	125
Construction	6	-	-	6
Transport	**16**	**-**	**-**	**16**
Air	-	-	-	-
Rail *(3)*	16	-	-	16
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**500**	**-**	**199**	**698**
Domestic	475	-	199	674
Public administration	12	-	-	12
Commercial	5	-	-	5
Agriculture	1	-	-	1
Miscellaneous	6	-	-	6
Non energy use	**-**	**-**	**-**	**-**

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

(2) Total supply minus total demand.

(3) Estimate revised following research carried out into heritage railways.

2.2 Commodity balances 2011

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	16,336r	383	1,173r	17,892r
Other sources	660	-	75	735
Imports	26,472	5,908	148	32,527
Exports	-391	-3	-97	-491
Marine bunkers	-	-	-	-
Stock change *(1)*	+874	-17	-20	+836
Transfers	-	-	-	-
Total supply	**43,951r**	**6,270**	**1,279r**	**51,500**
Statistical difference *(2)*	-85r	-7	+0r	-91r
Total demand	**44,035r**	**6,277**	**1,279r**	**51,591r**
Transformation	**41,936r**	**6,277**	**923r**	**49,135r**
Electricity generation	41,345r	-	505r	41,850r
Major power producers	40,061r	-	505r	40,566
Autogenerators	1,284r	-	-	1,284r
Heat generation	562r	-	-	562r
Petroleum refineries	-	-	-	-
Coke manufacture	-	5,282	116r	5,398r
Blast furnaces	-	995	-	995
Patent fuel manufacture and low temperature carbonisation	29r	-	302	331r
Energy industry use	**4r**	**-**	**-**	**4r**
Electricity generation	-	-	-	-
Oil and gas extraction	-	-	-	-
Petroleum refineries	-	-	-	-
Coal extraction	4r	-	-	4r
Coke manufacture	-	-	-	-
Blast furnaces	-	-	-	-
Patent fuel manufacture	-	-	-	-
Pumped storage	-	-	-	-
Other	-	-	-	-
Losses	**-**	**-**	**-**	**-**
Final consumption	**2,096r**	**-**	**356r**	**2,452r**
Industry	**1,541r**	**-**	**141r**	**1,682r**
Unclassified	-	-	-	-
Iron and steel	2r	-	51	53r
Non-ferrous metals	23r	-	-	23r
Mineral products	1,056	-	0	1,056
Chemicals	78r	-	-	78r
Mechanical engineering etc	11r	-	-	11r
Electrical engineering etc	5r	-	-	5r
Vehicles	53r	-	-	53r
Food, beverages etc	26r	-	20	45r
Textiles, leather, etc	64r	-	-	64r
Paper, printing etc	122r	-	-	122r
Other industries	94r	-	70r	164r
Construction	7r	-	-	7r
Transport	**15**	**-**	**-**	**15**
Air	-	-	-	-
Rail *(3)*	15	-	-	15
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**540r**	**-**	**215r**	**755r**
Domestic	501r	-	215r	716r
Public administration	26r	-	-	26r
Commercial	5r	-	-	5r
Agriculture	1r	-	-	1r
Miscellaneous	7r	-	-	7r
Non energy use	**-**	**-**	**-**	**-**

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

(2) Total supply minus total demand.

(3) Estimate revised following research carried out into heritage railways.

2.3 Commodity balances 2010

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	16,397	270	1,150	17,817
Other sources	530	-	70	600
Imports	19,751	6,634	155	26,541
Exports	-624	-1	-90	-715
Marine bunkers	-	-	-	-
Stock change *(1)*	+7,817r	-531	-79	+7,206r
Transfers	-	-	-	-
Total supply	**43,871**	**6,372**	**1,206**	**51,448**
Statistical difference *(2)*	-0r	-6	+0	-6r
Total demand	**43,871**	**6,378**	**1,206**	**51,455**
Transformation	**41,737**	**6,378**	**843**	**48,958**
Electricity generation	41,225	-	272	41,498
Major power producers	39,958	-	272	40,230
Autogenerators	1,268	-	-	1,268
Heat generation	477	-	-	477
Petroleum refineries	-	-	-	-
Coke manufacture	-	5,399	254	5,654
Blast furnaces	-	978	-	978
Patent fuel manufacture and low temperature carbonisation	34	-	317	351
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	**2,129**	**-**	**363**	**2,492**
Industry	**1,567**	**-**	**149**	**1,716**
Unclassified	-	-	-	-
Iron and steel	2	-	58	60
Non-ferrous metals	24	-	-	24
Mineral products	1,063	-	0	1,063
Chemicals	79	-	-	79
Mechanical engineering etc	13	-	-	13
Electrical engineering etc	5	-	-	5
Vehicles	51	-	-	51
Food, beverages etc	24	-	18	42
Textiles, leather, etc	67	-	-	67
Paper, printing etc	123	-	-	123
Other industries	112	-	73	186
Construction	4	-	-	4
Transport	**19**	**-**	**-**	**19**
Air	-	-	-	-
Rail *(3)*	19	-	-	19
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**544**	**-**	**214**	**757**
Domestic	504	-	214	718
Public administration	28	-	-	28
Commercial	4	-	-	4
Agriculture	1	-	-	1
Miscellaneous	6	-	-	6
Non energy use	**-**	**-**	**-**	**-**

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

(2) Total supply minus total demand.

(3) Estimate revised following research carried out into heritage railways.

2.4 Supply and consumption of coal

Thousand tonnes

	2008	2009	2010	2011	2012
Supply					
Production	17,604	17,374	17,817	17,892	16,287
Deep-mined	8,096	7,520	7,390	7,312	6,153
Surface mining *(1)*	9,509	9,854	10,426	10,580	10,134
Other sources *(2)*	449	500	600	735	760
Imports	43,875	38,167	26,541	32,527	44,815
Exports	-599	-646	-715	-491	-488
Stock change *(3)*	-3,110	-6,608	+7,206r	+836	+2,953
Total supply	**58,219**	**48,786**	**51,448**	**51,500**	**64,327**
Statistical difference *(4)*	-166	-35	-6r	-91r	+120
Total demand	**58,385**	**48,821**	**51,455**	**51,591r**	**64,206**
Transformation	**55,707**	**46,290**	**48,958**	**49,135r**	**61,886**
Electricity generation	47,808	39,681	41,498	41,850r	54,906
Major power producers	46,252	38,262	40,230	40,566	53,837
Autogenerators	1,555	1,419	1,268	1,284r	1,069
Heat generation	503	482	477	562r	592
Coke manufacture	5,875	4,936	5,654	5,398r	5,079
Blast furnaces	1,170	852	978	995	987
Patent fuel manufacture and low temperature carbonisation	352	341	351	331r	322
Energy industry use	**5**	**5**	**5**	**4r**	**4**
Coal extraction	5	5	5	4r	4
Final consumption	**2,672**	**2,525**	**2,492**	**2,452r**	**2,317**
Industry	**1,940**	**1,742**	**1,716**	**1,682r**	**1,602**
Unclassified	-	-	-	-	-
Iron and steel	69	60	60	53r	51
Non-ferrous metals	33	28	24	23r	21
Mineral products	1,150	1,077	1,063	1,056	1,033
Chemicals	102	77	79	78r	76
Mechanical engineering etc	14	14	13	11r	11
Electrical engineering etc	6	5	5	5r	5
Vehicles	49	46	51	53r	50
Food, beverages etc	39	48	42	45r	44
Textiles, clothing, leather, etc	76	69	67	64r	62
Pulp, paper, printing etc	149	124	123	122r	119
Other industries	212	191	186	164r	125
Construction	43	4	4	7r	6
Transport *(5)*	**19**	**19**	**19**	**15**	**16**
Other	**713**	**765**	**757**	**755r**	**698**
Domestic	683	689	718	716r	674
Public administration	13	24	28	26r	12
Commercial	10	49	4	5r	5
Agriculture	5	0	1	1r	1
Miscellaneous	1	3	6	7r	6
Non energy use	-	-	-	-	-
Stocks at end of year *(6)*					
Distributed stocks	16,392	22,640	15,366	15,113	11,896
Of which:					
Major power producers	14,863	21,770	13,370	13,496	9,561
Coke ovens	1,065	806	1,338	1,355	846
Undistributed stocks	854	1,450	1,517	926	1,120
Total stocks *(7)*	**17,246**	**24,090**	**16,883**	**16,039**	**13,016**

(1) The term 'surface mining' has now replaced opencast production. Opencast production is a surface mining technique.
(2) Estimates of slurry etc. recovered from ponds, dumps, rivers, etc.
(3) Stock fall (+), stock rise (-).
(4) Total supply minus total demand.
(5) Estimate revised following research carried out into heritage railways.
(6) Excludes distributed stocks held in merchants' yards, etc., mainly for the domestic market, and stocks held by the industrial sector.
(7) For some years, closing stocks may not be consistent with stock changes, due to additional stock adjustments.

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

Thousand tonnes

	2008	2009	2010	2011	2012
Coke oven coke					
Supply					
Production	4,324	3,663	3,990	4,021	3,712
Imports	503	140	44	-	147
Exports	-111	-97	-437	-427	-450
Stock change *(1)*	+287	-79	-145r	-520r	+341
Transfers	-1,104	-784	-833	-744	-1,021
Total supply	**3,899**	**2,843**	**2,619r**	**2,331r**	**2,728**
Statistical difference *(2)*	-0	**-**	**-**	**-**	**-**
Total demand	**3,900**	**2,843**	**2,619**	**2,331**	**2,728**
Transformation	**3,796**	**2,755**	**2,554**	**2,287**	**2,674**
Blast furnaces	3,796	2,755	2,554	2,287	2,674
Energy industry use	**-**	**-**	**-**	**-**	**-**
Final consumption	**104**	**88**	**66**	**44**	**55**
Industry	**91**	**78**	**55**	**35**	**48**
Unclassified	78	71	48	28	35
Iron and steel	13	7	7	7	13
Non-ferrous metals	**-**	**-**	**-**	**-**	**-**
Other	**12**	**10**	**10**	**9**	**7**
Domestic	12	10	10	9	7
Stocks at end of year *(3)*	**326**	**319**	**464r**	**972r**	**393**
Coke breeze					
Supply					
Production *(4)*	35	29	32	31	31
Imports	219	38	69	26	46
Exports	-74	-49	-46	-40	-71
Stock change *(1)*	-79	+89	-83r	-8r	-255
Transfers	1,104	784	833	744	1,021
Total supply	**1,205**	**892**	**805r**	**753r**	**772**
Statistical difference *(2)*	+0	**-**	**-**	**-**	**-**
Total demand	**1,204**	**892**	**805**	**753**	**772**
Transformation	**567**	**426**	**384**	**358**	**256**
Coke manufacture	**-**	**-**	**-**	**-**	**-**
Blast furnaces	567	426	384	358	256
Energy industry use	**-**	**-**	**-**	**-**	**-**
Final consumption	**638**	**466**	**421**	**395**	**516**
Industry	**638**	**466**	**421**	**395**	**516**
Unclassified	16	7	4	7	10
Iron and steel	621	460	416	388	506
Stocks at end of year *(3)*	**553**	**246**	**279r**	**210r**	**437**
Other manufactured solid fuels					
Supply					
Production	302	303	318	289	258
Imports	16	6	10	21	15
Exports	-25	-31	-35	-32	-32
Stock change *(1)*	+6	-10	+13	-13	+7
Total supply	**299**	**268**	**306**	**265**	**248**
Statistical difference *(2)*	+4	-1	-5	-4	-5
Total demand	**294**	**269**	**311**	**270**	**253**
Transformation	**-**	**-**	**-**	**-**	**-**
Energy industry use	**-**	**-**	**-**	**-**	**-**
Patent fuel manufacture	**-**	**-**	**-**	**-**	**-**
Final consumption	**294**	**269**	**311**	**270**	**253**
Industry	**-**	**-**	**-**	**-**	**-**
Unclassified	**-**	**-**	**-**	**-**	**-**
Other	**294**	**269**	**311**	**270**	**253**
Domestic	294	269	311	270	253
Stocks at end of year *(3)*	**24**	**33**	**18**	**32**	**24**

(1) Stock fall (+), stock rise (-).
(2) Total supply minus total demand.
(3) Producers stocks and distributed stocks.
(4) See paragraph 2.29.

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

GWh

	2008	2009	2010	2011	2012
Coke oven gas					
Supply					
Production	9,410	7,956	8,822	8,847	8,266
Imports	-	-	-	-	-
Exports	-	-	-	-	-
Transfers *(1)*	+71	+366	+274	+62	+60
Total supply	**9,481**	**8,322**	**9,096**	**8,909**	**8,326**
Statistical difference *(2)*	-8	-62	-62	-62r	-97
Total demand	**9,489**	**8,383**	**9,158**	**8,971**	**8,423**
Transformation	**2,681**	**3,044**	**2,984**	**3,019r**	**2,820**
Electricity generation	2,263	2,626	2,566	2,601r	2,402
Heat generation	418	418	418	418	418
Other	-	-	-	-	-
Energy industry use	**5,117**	**4,471**	**4,235**	**4,300**	**4,576**
Coke manufacture	4,349	3,888	3,861	3,832	3,823
Blast furnaces	768	583	374	469	753
Other	-	-	-	-	-
Losses	**413**	**75**	**617**	**758**	**192**
Final consumption	**1,278**	**794**	**1,321**	**894r**	**836**
Industry	**1,278**	**794**	**1,321**	**894r**	**836**
Unclassified	207	230	198	200	198
Iron and steel	1,071	564	1,123	694r	638
Blast furnace gas					
Supply					
Production	15,345	11,199	11,404	10,503	11,692
Imports	-	-	-	-	-
Exports	-	-	-	-	-
Transfers *(1)*	-3	-15	-11	-2	-4
Total supply	**15,342**	**11,184**	**11,393**	**10,501**	**11,688**
Statistical difference *(2)*	-110	-66	-71	-70	-59
Total demand	**15,452**	**11,250**	**11,464**	**10,571**	**11,747**
Transformation	**7,900**	**6,531**	**5,444**	**5,462r**	**7,083**
Electricity generation	7,721	6,352	5,265	5,283r	6,904
Heat generation	179	179	179	179	179
Other	-	-	-	-	-
Energy industry use	**4,759**	**3,657**	**3,674**	**3,370**	**3,569**
Coke manufacture	639	506	732	657	672
Blast furnaces	4,121	3,151	2,943	2,713	2,897
Other	-	-	-	-	-
Losses	**2,332**	**724**	**1,335**	**993**	**817**
Final consumption	**461**	**337**	**1,010**	**746r**	**278**
Industry	**461**	**337**	**1,010**	**746r**	**278**
Unclassified	-	-	-	-	-
Iron and steel	461	337	1,010	746r	278
Benzole and tars *(3)*					
Supply					
Production	1,816	1,536	1,696	1,657r	1,543
Final consumption *(4)*	**1,816**	**1,536**	**1,696**	**1,657r**	**1,543**
Unclassified	1,816	1,536	1,696	1,657r	1,543
Iron and steel	-	-	-	-	-

(1) To and from synthetic coke oven gas, see paragraph 2.53.
(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.

2.7 Deep mines and surface mines in production at 31 December 2012

Deep mines[1]

Licensee	Site Name	Location
Ayle Colliery Company Ltd	Ayle Colliery	Northumberland
Eckington Colliery Partnerships	Eckington Colliery	Derbyshire
Grimebridge Colliery Company Ltd	Hill Top Colliery	Lancashire
Maltby Colliery Ltd	Maltby Colliery	Rotherham
Hatfield Colliery Ltd	Hatfield Colliery	Doncaster
Ray Ashly, Richard Daniels and Neil Jones	Monument Colliery	Gloucestershire
UK Coal Operations Ltd	Daw Mill Colliery	Warwickshire
	Kellingley Colliery	North Yorkshire
	Thoresby Colliery	Nottinghamshire
Unity Mine Ltd	Unity Mine	Neath Port Talbot

Surface mines[2]

Licensee	Site Name	Location
Aardvark TMC Ltd	Glenmuckloch	Dumfries & Galloway
(trading as ATH Resources)	Glenmuckloch Samsiston Area	Dumfries & Galloway
	Laigh Glenmuir Site	East Ayrshire
	Muir Dean	Fife
	Netherton	East Ayrshire
Benhar Developments Ltd	Mossband Farm Quarry	North Lanarkshire
Bryn Bach Coal Ltd	Glan Lash	Carmarthenshire
Celtic Energy Ltd	East Pit	Neath Port Talbot
	Nant Helen	Powys
	Selar	Neath Port Talbot
Energybuild Ltd	Nant-y-Mynydd Site	Neath Port Talbot
H J Banks & Company Ltd	Brenkley Lane	Newcastle upon Tyne
	Shotton	Northumberland
Hall Construction Services Ltd	Earlseat	Fife
	Wilsontown	South Lanarkshire
Kier Minerals Ltd	Greenburn Project	East Ayrshire
Land Engineering Services Ltd	Comrie Colliery Site	Fife
Miller Argent (South Wales) Ltd	Ffos-y-Fran Land Reclamation Scheme	Merthyr Tydfil
Newcastle Science Central LLP	Science Central	Newcastle upon Tyne
The Scottish Coal Company Ltd	Blair House	Fife
	Broken Cross	South Lanarkshire
	Dalfad	East Ayrshire
	Dunstonhill	East Ayrshire
	House of Water	East Ayrshire
	Mainshill	South Lanarkshire
	Spireslack Complex (Airdsgreen)	East Ayrshire
	St Ninians	Fife
Tower Regeneration Ltd	Tower Colliery Surface Mining Site	Rhondaa Cyon Taff
UK Coal Mining Ltd	Butterwell Disposal Point	Northumberland
	Huntington Lane	Telford & Wrekin
	Lodge House	Derbyshire
	Minorca	Leicestershire
	Park Wall North	Durham
	Potland Burn	Northumberland

(1) In addition, there were 4 deep mines in development:
Rusha Site owned by H J Banks & Company Ltd, in West Lothian; Temple Quarry owned by Holgate Aggregates Ltd, in Kirklees;
Caughley Quarry owned by Parkhill Estates Ltd, in Shropshire; Chalmerston owned by The Scottish Coal Company Ltd, in East Ayrshire.

(2) In addition, there was 1 surface mine in development:
Aberpergwn Colliery, owned by Energybuild Mining Ltd,
in Neath Port Talbot

Source: The Coal Authority

Chapter 3
Petroleum

Key points

- Production of crude oil and Natural Gas Liquids from the UK's North Sea fields decreased by around 14 per cent between 2011 and 2012. Production is at just under a third of the UK's peak production recorded in 1999 (table 3.1, chart 3.1);
- Whilst crude oil exports were broadly stable, imports of crude oil and Natural Gas Liquids rose by 9 per cent during 2012 with much of this increase driven by larger volumes received from OPEC countries. Crude oil and Natural Gas Liquids imports now substantially exceed domestic production. In 2012 (table 3.1, chart 3.1);
- The closure of the Coryton refinery in 2012 contributed to a reduction in the petroleum products produced in the UK, down from 74.7 million tonnes to 68.7 million tonnes. UK production is around a fifth lower than in 2000 (table 3.2, chart 3.4);
- The UK is a net exporter of petroleum products but in 2012, product exports decreased by around 3 per cent on 2011 (table 3.2, chart 3.4). Imports increased by 15 per cent on 2011, with petrol and diesel imports showing substantial increases to meet the shortfall in indigenous refinery production;
- The UK's demand for petroleum products is no longer aligned with refinery production. Transport accounted for over two thirds of the UK's total 67 million tonnes demand, with refinery production meeting around 73 per cent of diesel demand and 51 per cent of aviation fuel demand. UK refineries continue to produce substantial volumes of petrol, nearly 18 million tonnes, more than sufficient to meet UK demand with significant volumes going to export.

Introduction

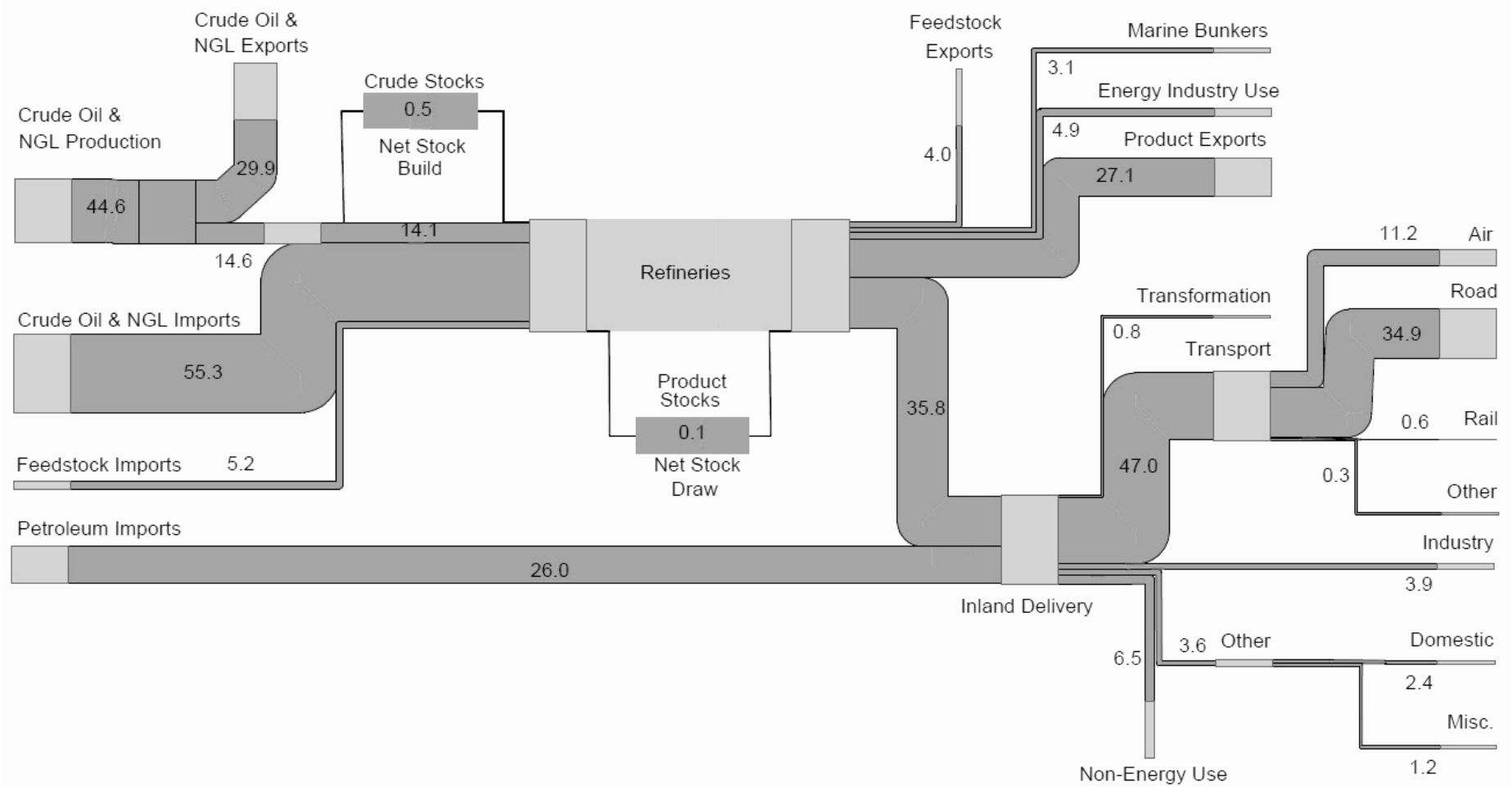
3.1 This chapter covers the supply and demand of primary oils and petroleum products. The first part of the chapter covers the supply and demand of primary oils, crude oils and Natural Gas Liquids (NGLs), and feedstocks. The second part of the chapter covers the supply and demand of petroleum products.

3.2 The supply and demand of primary oils and petroleum products are shown as commodity balances at the end of the chapter, in Tables 3.1 and 3.2 to 3.4 respectively. Additional tables show information on refinery capacity, as well as additional detail on deliveries into consumption.

3.3 In addition to the information in this chapter, there is considerable data on DECC's website. 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. These tables are only available in the internet version of this publication which can be found on the DECC's website at www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes.

3.4 A flow chart of the movement of crude oil, other refinery feedstocks and petroleum products for 2012 is provided, showing the flow from indigenous production and imports to eventual uses. The flows are measured in million tonnes and the widths of the bands are approximately proportional to the size of the flow they represent.

Petroleum Flow Chart 2012 (million tonnes)



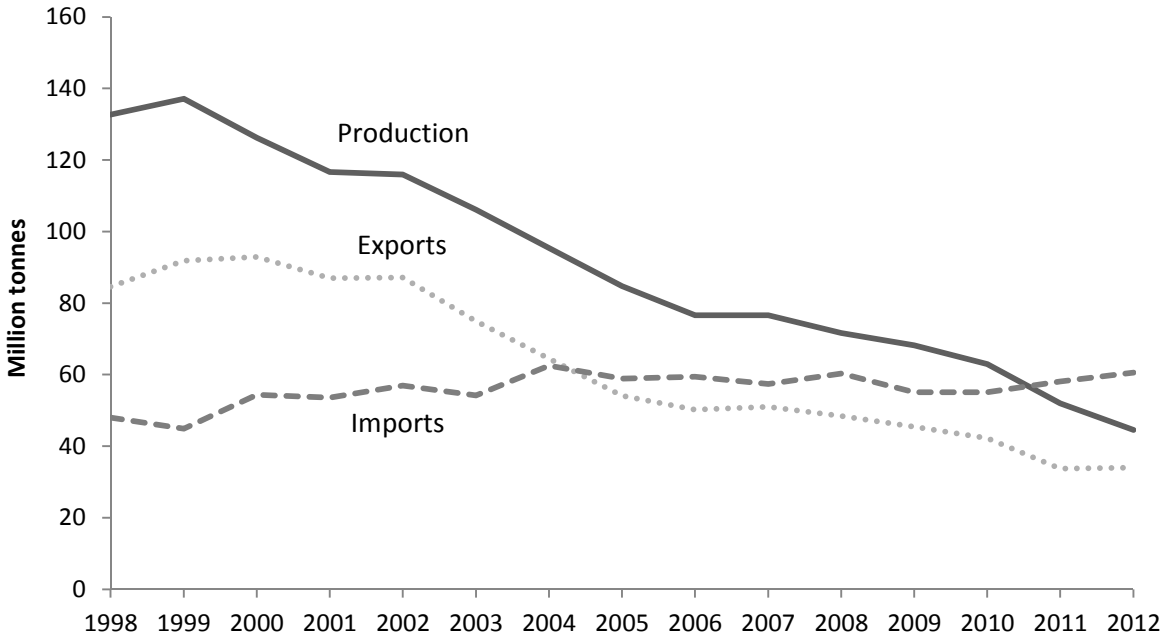
Note:
This flow chart is based on the data that appear in Tables 3.1 and 3.2.
The numbers on either side of the flow chart will not match due to losses in transformation.
Biofuels are not included.

Supply and demand for primary oil (Table 3.1)

3.5 Table 3.1 shows details of the production, supply and disposals of primary oils, crude oil and NGLs, and feedstocks in 2010, 2011 and 2012. The table examines the supply chain from the production of oil and NGLs, recorded by individual oil terminals and oil fields, to their disposal either to UK refineries or to export. It also covers the use of these primary oils as recorded by the refineries.

3.6 The chart below summarises the main trends since 1998. Production from the United Kingdom Continental Shelf (UKCS) peaked in 1999 and has been in decline since.

Chart 3.1: Production, imports and exports of primary oils 1998 to 2012



3.7 Production of primary oils in 2012 showed a 14 per cent reduction on 2011, and production is now at 44.6 million tonnes, just under a third of 1999 peak oil production. On average, year-on-year primary oil production has been decreasing by around 8 per cent a year since 1999. In 2011 a number of unexpected slowdowns saw a record reduction of 17 per cent which has been followed by a reduction of 14 per cent in 2012, the second highest contraction since the 1999 peak. In addition to the normal rate of decline, production was constrained through maintenance on the very large Buzzard field and the St Fergus associated gas terminal along with production constraints in the Elgin area because of a gas leak from March 2012.

3.8 DECC's Energy Development Unit publishes data on field-by-field production. These are available three months in arrears owing to the need to protect commercially sensitive data. These data can be accessed at www.gov.uk/oil-and-gas-uk-field-data.

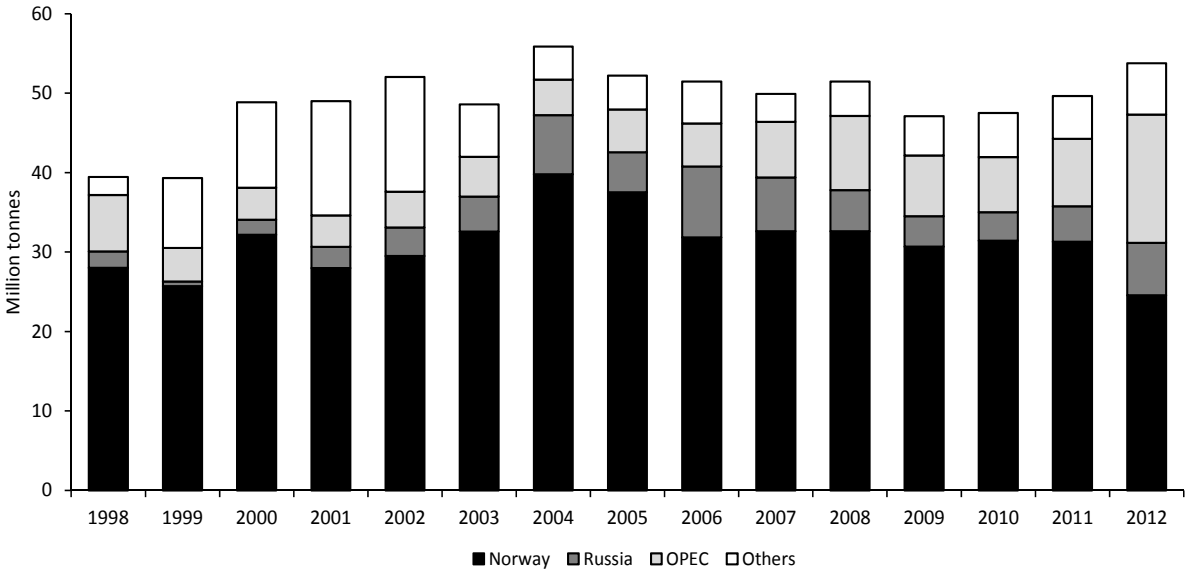
3.9 Whilst the UK is a net importer of crude oils, North Sea production remains significant. The UK's production capacity is the largest in the EU, and the second largest in the EEA after Norway.

3.10 Whilst the UK's production of crude oil and NGLs would be sufficient to meet nearly two thirds of refinery demand, there is an active trade in oil which leads to significant volumes of oil being imported and exported to meet global and UK demand. Further declines in exports and increases in imports will be seen as indigenous production continues to decline - 2011 was the first year where imports exceeded production and the trend continued in 2012. However, primary oil continues to make a significant contribution to the UK economy.

3.11 The sources of crude oil imports from other countries are shown in Chart 3.2. The principal source of the UK's imports has consistently been Norway, historically accounting for around 65 per cent of all

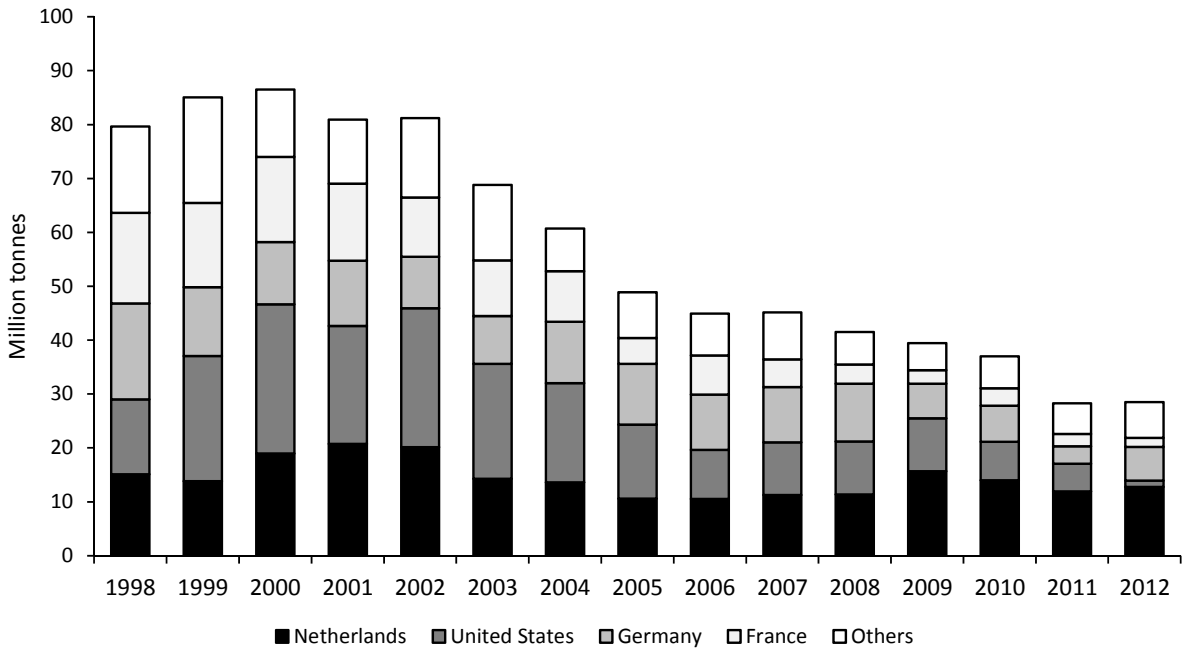
imports given not only its proximity to the UK but also the similarity in its crude types. The proportion of crude oil sourced from Norway decreased to 46 per cent in 2012, with imports from the OPEC countries of Nigeria, Algeria, Angola and Libya all increasing substantially – again due to similarities in crude types but also increased infrastructure development and regional stability. These trade data are provisional and subject to revision.

Chart 3.2: Source of UK oil imports 1998 to 2012



3.12 Chart 3.3 shows the decrease in crude oil exports from its peak of 87 million tonnes in 2000 to 29 million tonnes in 2012. Exports decreased sharply between 2002 and 2005 and were at a relatively steady level until a large decrease in 2011. Crude oil is principally exported to the Netherlands, Germany, France and historically the US. In 2012 45 per cent of all crude oil exports were destined for the Netherlands and 22 per cent to Germany. Exports to the US and France have decreased over recent years and account for only 4 per cent and 6 per cent of exports respectively.

Chart 3.3: Destination of UK oil exports 1998 to 2012



UK refineries

3.13 A significant proportion of the UK's primary oil was processed into petroleum products by the UK's seven refineries. Data for refinery capacity as at the end of 2012 are presented in table 3A, with the location of these refineries illustrated in Map 3A. Capacity per annum is derived by applying the rated capacity of the plant per day when on stream by the number of days the plant was on stream during the year.

3.14 Refinery capacity in 2012 was lower than 2011 due to the closure of the Petroplus operated Coryton refinery in the middle of 2012. This follows the suspension of the Petroplus Teeside refinery in 2009.

Map 3A: Distribution of UK refineries active as at end 2012

Symbols relate to refinery details given in Table 3A. White circles denote petrochemical refinery operations.

Table 3A: UK refinery processing capacity as at end 2012

Million tonnes per annum

(Symbols relate to Map 3A)		**Distillation**	**Reforming**	**Cracking and Conversion**
❶	Stanlow – Essar Energy PLC	11.8	1.5	3.9
❷	Fawley – ExxonMobil Co. Ltd	16.8	3.9	5.0
❸	Grangemouth – Ineos Refining Ltd	10.2	1.9	3.5
❹	Lindsey Oil Refinery Ltd – Total (UK)	10.1	1.4	3.8
❺	Pembroke – Valero Energy Ltd	10.1	1.8	6.1
❻	Killingholme – Phillips 66 UK	11.5	2.7	5.5
❼	Milford Haven - Murco Pet. Ltd	6.5	1.5	2.0
①	Harwich – Petrochem Carless Ltd	0.4	-	-
②	Eastham – Eastham Refinery Ltd	1.2	-	-
③	Dundee (Camperdown) – Nynas UK AB	0.7	-	-
Total all refineries		**76.0**	**14.7**	**29.8**

Supply and demand for petroleum products (Tables 3.2 to 3.4)

3.15 These tables show details of the production, supply and disposal of petroleum products into the UK market in 2010, 2011 and 2012.

3.16 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.

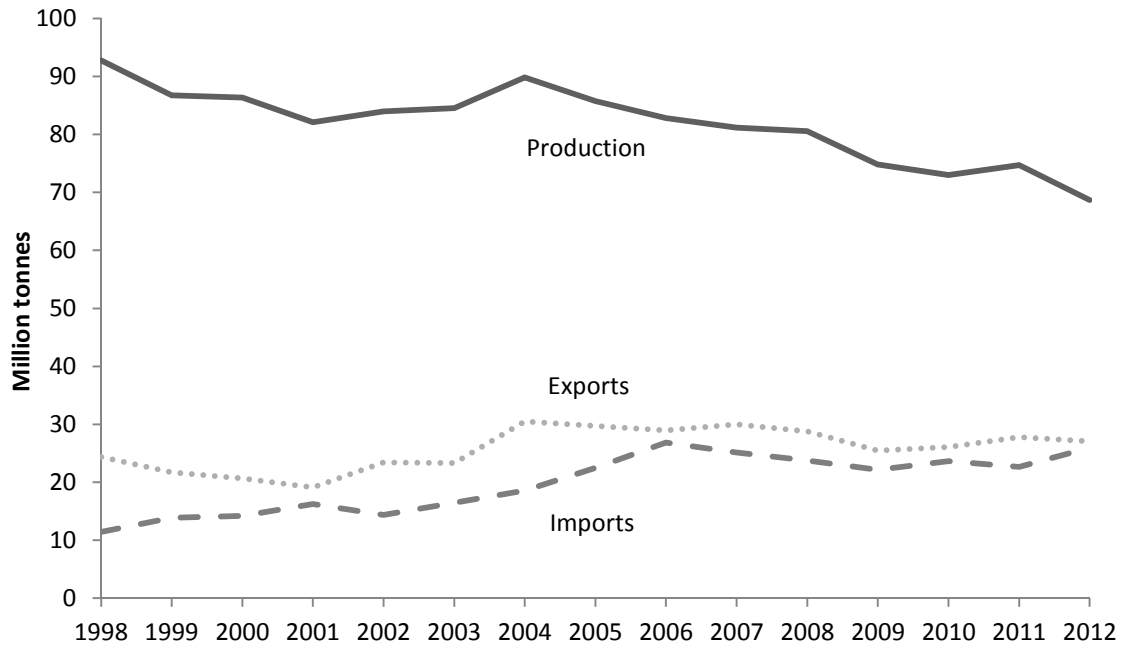
3.17 The lower half of the table reports the demand side and covers the uses made of the different products, including the uses made within refineries of fuels in the refining process, and details of the amounts reported by oil companies within the UK as delivered for final consumption.

Supply of petroleum products

3.18 Chart 3.4 below shows the production output of petroleum products since 1998. In 2012, the UK's refineries produced almost 68.7 million tonnes, down 8 per cent on last year but down 20 per cent on 2000. The closure of the Coryton refinery in the summer of 2012 along with maintenance periods in other refineries contributed to the decrease in production. Despite the closure of Coryton, the UK's refinery capacity remains substantial. Whilst final international data are not available at the time of publication, within the EU 2012 capacity is likely to be higher only in Italy and Germany.

3.19 As the chart shows, the UK has been a net exporter of petroleum products over the last decade (indeed, it has been a net exporter in almost every year since 1974). In 2012, exports of petroleum products decreased by 3 per cent, but exports have been between 25 and 30 million tonnes since 2004.

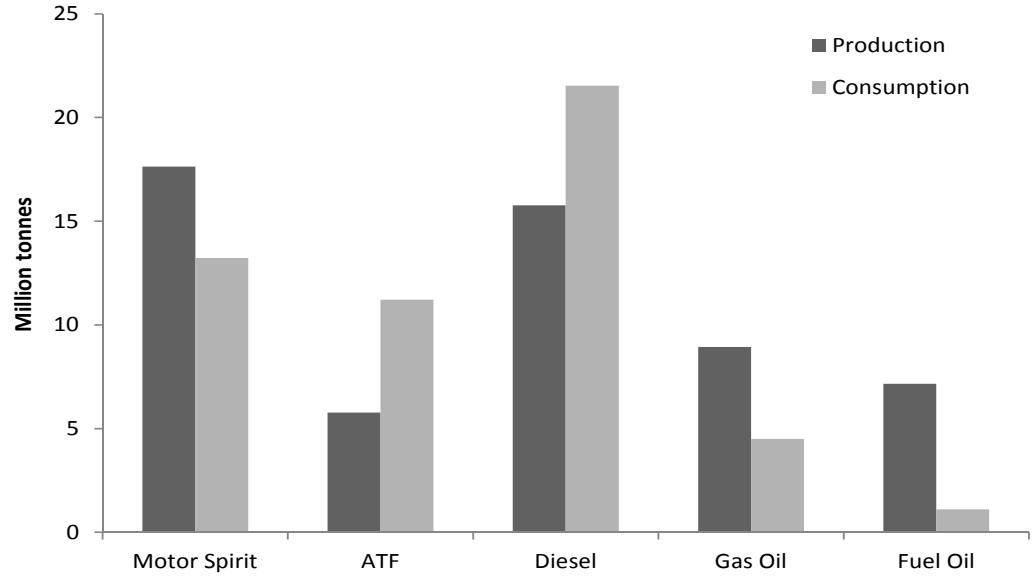
Chart 3.4: Production, imports and exports of petroleum products 1998 to 2012



3.20 Whilst UK refinery output outstrips domestic demand, the overall picture of demand and supply is not matched on a product by product basis. The UK's refineries - in common with many other European countries – are geared to produce motor spirit for domestic cars and fuel oil for electricity generation. With the increasing dieselisation of the UK's car fleet, and the switch from fuel oil to other fuels for electricity generation, UK domestic production of individual petroleum products is increasingly no longer aligned with the domestic market demand. To balance demand the UK trades widely and is one of the largest importers of ATF in the OECD and one of the largest exporters of Motor Spirit.

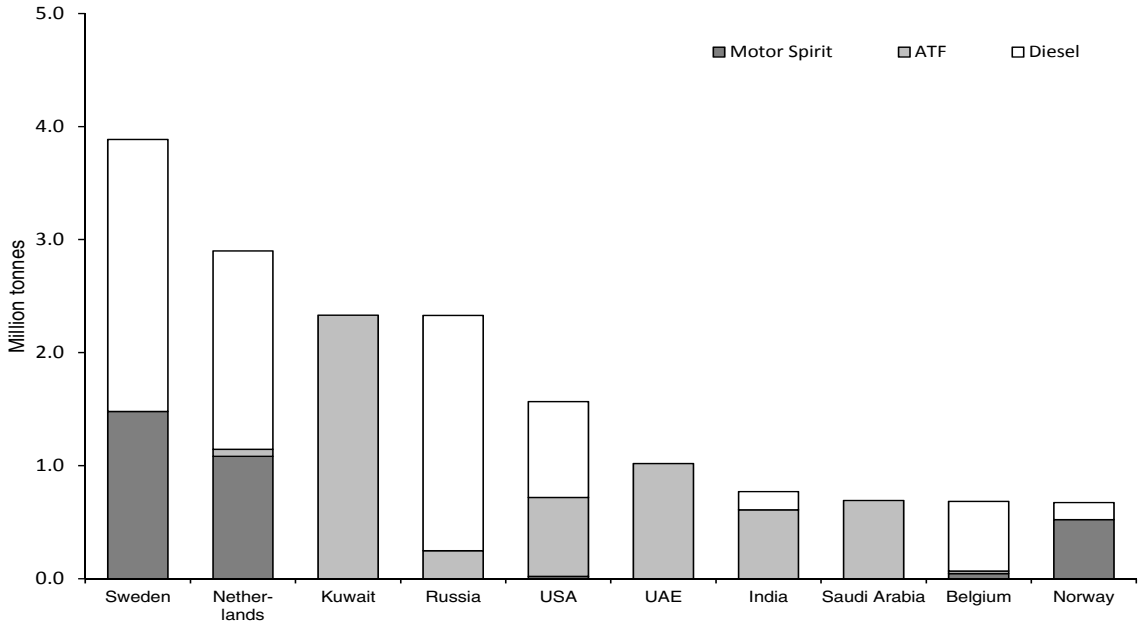
3.21 Chart 3.5 shows production and consumption figures for the key petroleum products, and illustrates the deficit for ATF and diesel road fuel (DERV), and the surpluses for motor spirit, gas oil, and fuel oil.

Chart 3.5: Production and consumption of key petroleum products 2012



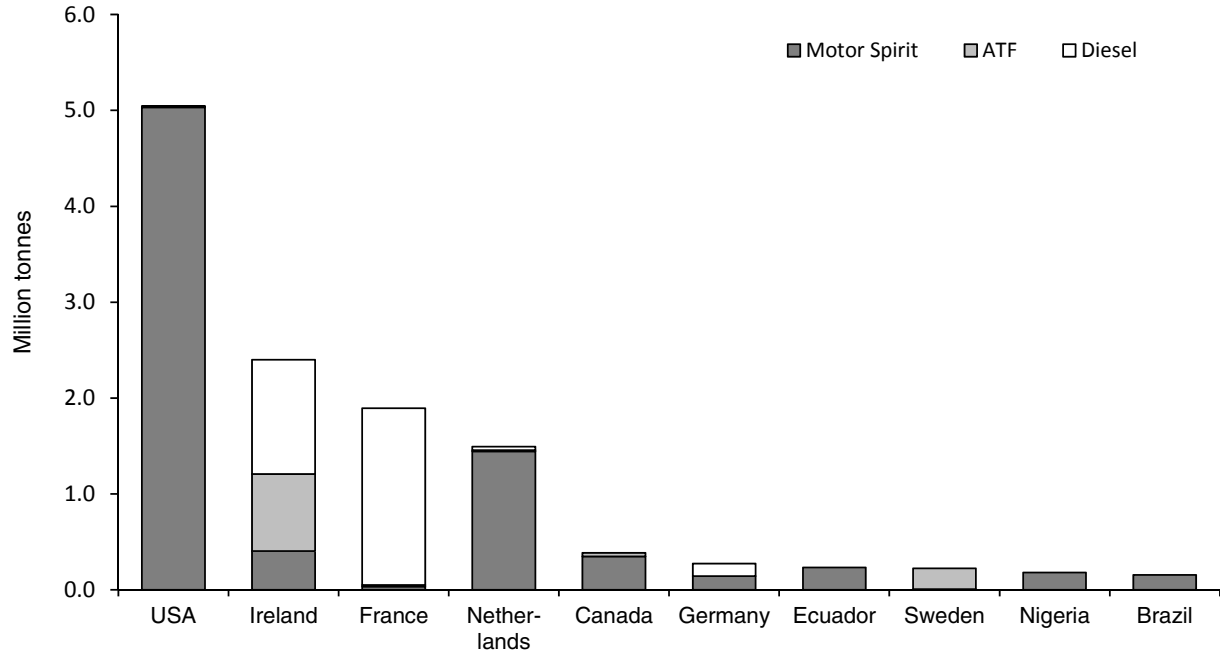
3.22 Chart 3.6 shows the source of transport fuels imported by the UK in 2012. The ten countries shown account for around 80 per cent of the total volume of imports. Historically the bulk of the products have come via the Netherlands, which acts as a major trading hub (the fuel might have originated from elsewhere in Europe or beyond) but in 2012 the largest volume of imports came from Sweden. The diversity of supply is increasing as demand for key transport fuels increases. The chart shows that there is a clear split between imports from European countries (which are mainly transport diesel) and imports from Asia (where the bulk of aviation fuel is sourced from generally more modern refinery operations than seen in Europe). These trade data are provisional and subject to change.

Chart 3.6: Source of transport fuel imports 2012



3.23 Similarly, chart 3.7 shows the exports by country or region of despatch for the principal transport fuels in 2012. The chart covers 95 per cent of these exports. A considerable portion of all UK's exports (35 per cent) are the volumes of motor spirit exported to the United States. Ireland imports a substantial volume of its products from the UK as it has no indigenous production of aviation fuel.

Chart 3.7: Destination of transport fuel exports 2012

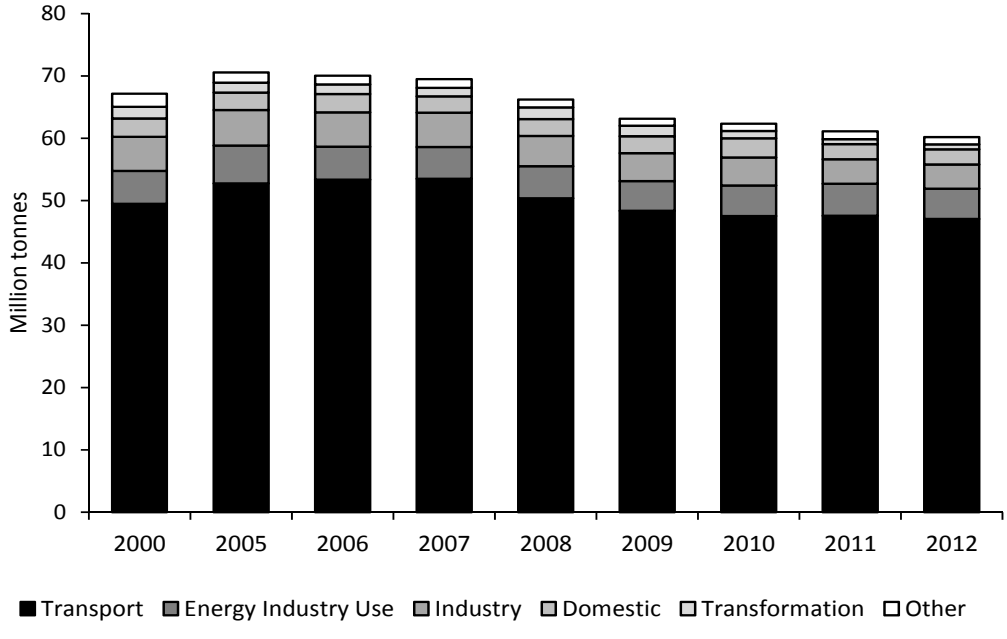


3.24 For 2008 to 2012 data, DECC have revised the volume of fuel and gas oil that are consumed by international bunkers, increasing it in line with data reported for the purposes of EU emissions monitoring. Further detail can be found in paragraphs 3.62 and 3.63.

Consumption of petroleum products

3.25 Tables 3.2 to 3.4 show the consumption of oil products during the period 2010 to 2012, by consumers and products. The chart below shows that the principal use for petroleum products is for transport use, consuming around 70 per cent of total demand in 2012.

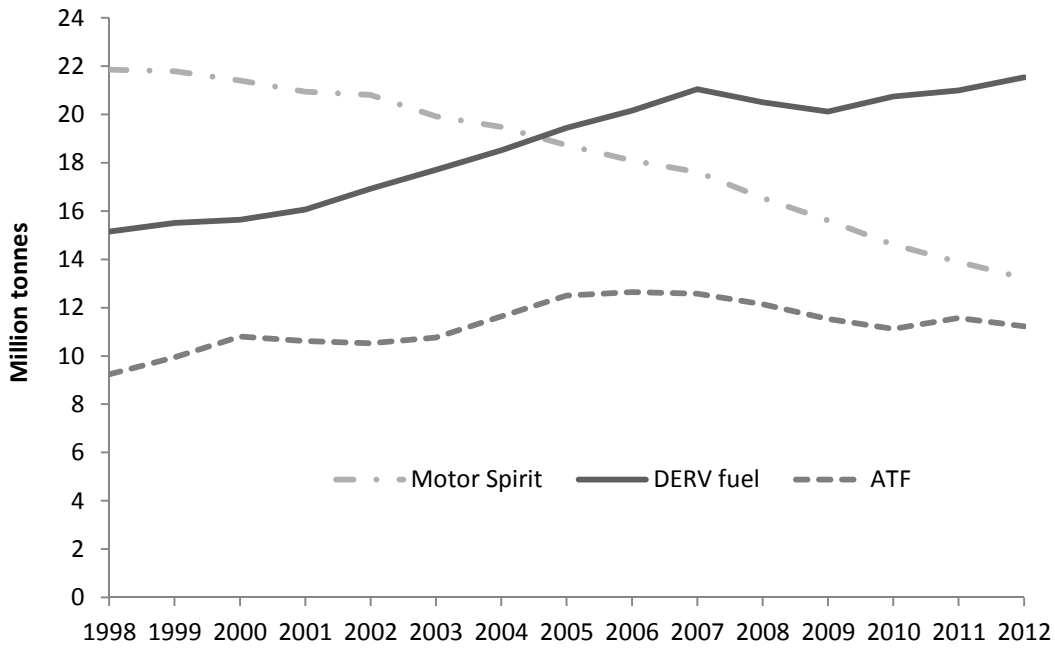
Chart 3.8: Petroleum products used for energy (share by main sector)



3.26 The three main transport fuels - aviation turbine fuel, motor spirit and diesel road fuel – account for over two-thirds of the UK's total demand of petroleum products. A very small proportion of oil – less than 1 per cent - is used for electricity generation with the remainder being used for refinery fuel and non-energy use.

3.27 Whilst the proportion of petroleum delivered to transport has remained relatively constant over time, the mix of fuels has changed greatly. The chart below shows that deliveries of motor spirit have decreased an average 4 per cent year-on-year since 2000, but deliveries of DERV have increased by just under 3 per cent year-on-year (with a downturn in deliveries during the recession) over the same period.

Chart 3.9: Motor Spirit, DERV and ATF fuel deliveries 1998 to 2012



3.28 The increase in diesel sales reflects in part the changing pattern of fuel consumption within the UK. The table below, derived from information provided by AEA, shows that the share of DERV fuel being consumed by cars and taxis doubled between 1995 and 2012.

Table 3B: Estimated consumption of road transport fuels by vehicle class

	1995	2000	2005	2011	2012
Motor spirit:					
Cars and taxis	93%	95%	97%	97%	97%
Light goods vehicles	7%	4%	2%	2%	2%
Motor cycles etc	1%	1%	1%	1%	1%
DERV:					
Cars and taxis	18%	24%	30%	36%	36%
Light goods vehicles	14%	20%	22%	22%	22%
Heavy goods vehicles	57%	45%	39%	36%	36%
Buses and coaches	8%	8%	8%	6%	6%

Source: Ricardo-AEA. Percentages exclude off road use of DERV.

3.29 ATF deliveries increased around 20 per cent between 1998 and 2012, but are down 11 per cent on the 2006 peak, with demand over recent years being relatively consistently between 11 to 11.5 million tonnes. Despite robust passenger numbers post the economic downturn, increased efficiencies in the air-line industry have meant that fuel deliveries have not kept pace with passenger numbers.

Consumption of transport fuels (Table 3.6)

3.30 Table 3.6 provides details of the consumption of motor spirit, gas oil/diesel and fuel oils for the period 2008 to 2012. The table includes information on retail and commercial deliveries of motor spirit and DERV fuel that are of interest but cannot be accommodated within the commodity balances. The table also includes additional details of the quantities of motor spirit and DERV fuel sold collectively by super/hypermarket companies in the UK.

3.31 Volumes of motor spirit and DERV sold by super/hypermarkets are in line with last year's figures, though the level of the series have been revised since last year's edition of DUKES. 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 since 2006, and accounted for 49 per cent and 44 per cent respectively in 2012.

Table 3C: Super/hypermarkets share of retail deliveries, 2006 to 2012

per cent

	Motor spirit		DERV fuel	
	Share of retail	Share of total	Share of retail	Share of total
2006	41	39	34	19
2007	40	39	34	20
2008	47	45	38	24
2009	45	43	39	25
2010	45	44	41	26
2011	48	47	44	28
2012	49	48	44	28

Biofuels in transport

3.32 Biofuels have previously not been included in the commodity balances or the supplementary tables due to limited information on them. Biofuels are now included in Table 3.6 of this chapter, and are also included in overall energy balances in Chapter 1, and are covered in the Chapter 6.

3.33 HMRC data volumes on which excise duty has been paid is shown in Table 3.D. As a percentage of road fuels, biofuels have increased significantly since 2003, and now represent 3.1 per cent of total road fuels, down from 3.5 per cent last year. Further details on biofuel consumption can be found in Chapter 6, paragraph 6.28.

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

Unit: Million litres

Year	Biodiesel	All diesel including biodiesel	Biodiesel as % diesel share	Bioethanol	All motor spirit including bioethanol	Bioethanol as % motor spirit share	Biofuels as % of road fuels
2002	3	19,767	0.0%	0	28,002	0.0%	0.0%
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	25,693	0.3%	0.2%
2006	169	24,286	0.7%	95	24,724	0.4%	0.5%
2007	347	25,501	1.4%	153	24,019	0.6%	1.0%
2008	886	25,686	3.4%	206	22,709	0.9%	2.3%
2009	1,044	25,089	4.2%	320	22,029	1.5%	2.9%
2010	1,049	25,773	4.1%	631	20,650	3.1%	3.6%
2011	925	25,926	3.6%	652	19,548	3.3%	3.5%
2012	634	26,348	2.4%	775	18,792	4.1%	3.1%

Source: HM Revenue and Customs

Stocks of oil (Table 3.7)

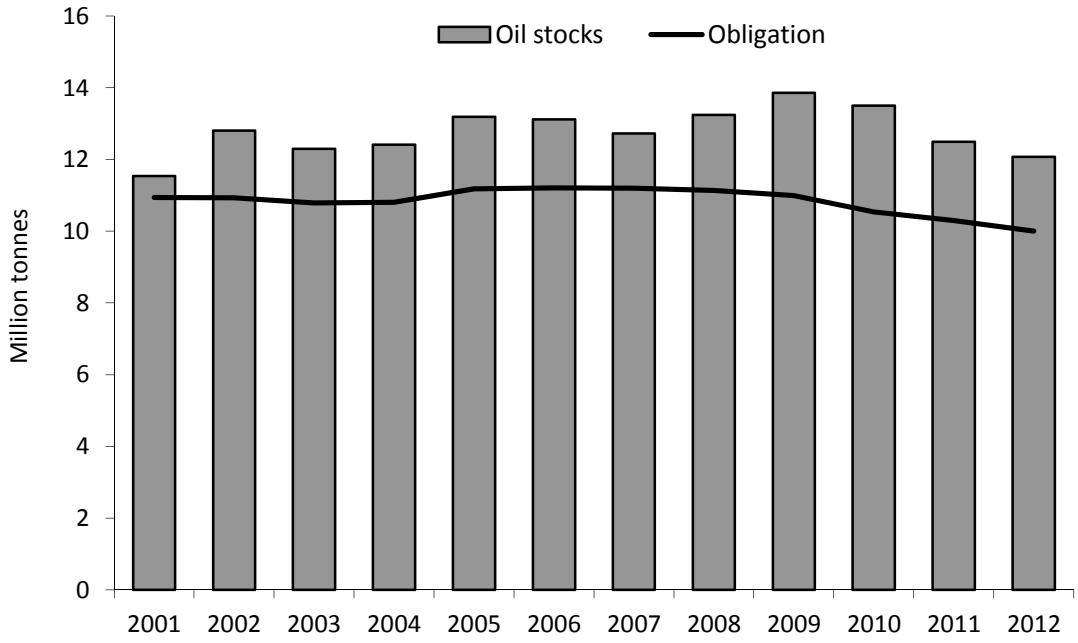
3.34 The UK holds stocks of oil to help reduce the adverse impact on the UK and the global economy of any disruptions of supplies of oil arising from domestic or international incidents. The UK is required to hold these stocks under EU and IEA qualifying arrangements.

3.35 The EU's requirements are for all member states to hold stocks equivalent to 90 days worth of annual consumption, whilst the IEA's requirement is to hold stocks equivalent to 90 days of net imports of oil products. As a major oil producing nation, the UK has a derogation which reduces its EU obligation by 25 per cent to 67.5 days of stock.

3.36 To meet these obligations, the UK Government requires companies supplying significant volumes of oil products into the UK market to maintain emergency stocks of oil.

3.37 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.

Chart 3.10: UK Oil stocks and obligation 2001 to 2012



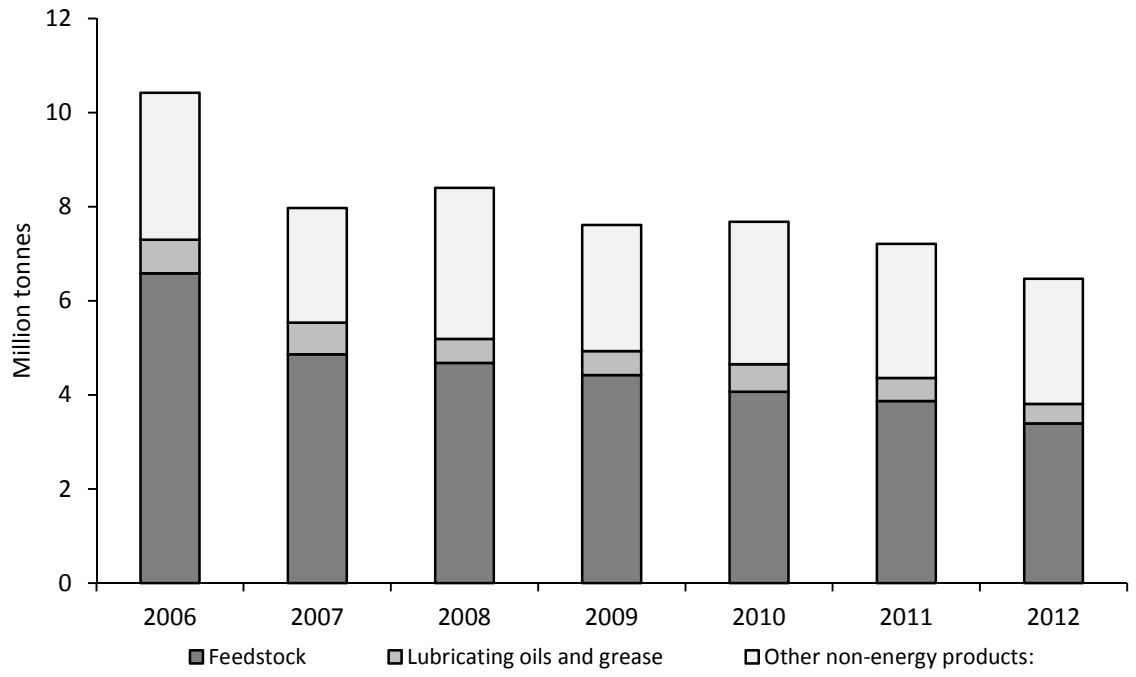
3.38 The UK held almost 12 million tonnes of petroleum products (equivalent to about 84 days of consumption) towards its EU obligation at the end of 2012. This is substantially above the level of both the EU and IEA obligations.

3.39 The overall volume of stocks held in the UK was broadly stable, but there was an increase in terminal stocks of crude oils and NGLs. Overall product stocks remained broadly stable but there were significant decreases in petrol stocks (down 14 per cent on last year) balanced by increases in gas oil and diesel road fuel stocks. The overall amount of stock held overseas on behalf of the UK increased in 2012, and now stands at around 18 per cent of total stocks.

Inland deliveries for non-energy uses (table 3.8)

3.40 Table 3.8 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. The chart below shows the principal use of non-energy products over the last six years.

Chart 3.11: Use of non-energy products 2006 to 2012



3.41 The principal product for non-energy use are gases used as feedstocks in petrochemical plants. Gases used as feedstocks accounted for over a third of the fuel put to non-energy use in 2012, and along with bitumen for road surfacing (around a fifth of non-energy use) and naphtha (around 15 per cent) are the most significant fuels.

Technical notes and definitions

3.42 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy as a whole in Chapter 1.

Indigenous production

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

Deliveries

3.44 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

3.45 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, super and hypermarket shares) or with the use of additional data (such as trade data from HM Customs and Revenue to cover import activity by non-reporting companies). In addition to these data sources, DECC make use of EU-ETS data provided on major energy users. In particular ensuring the consistency of data published on fuel used within the refineries (refinery gases and petroleum coke) and the sectoral usage of Gas oil and Fuel oil.

Statistical differences

3.46 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.

3.47 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.

3.48 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.

3.49 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.

3.50 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.

3.51 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.

3.52 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.

3.53 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.

3.54 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.).

3.55 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 3E below illustrates this.

Table 3E 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

3.56 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.

3.57 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.

3.58 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.

3.59 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

3.60 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.

3.61 We are currently undertaking a review of trade data which could result in changes to these data.

Marine bunkers

3.62 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 reviewed the provision of fuel to marine bunkers in 2009. Whilst a number of companies have reviewed their methodology there are still issues with determining the final destination of fuel when these are supplied to third parties that are not part of DECC's monitoring programme. This issue impacts on both the volumes delivered to marine vessels, and whether those vessels are engaged in domestic or international navigation.

3.63 Whilst DECC will continue to work closely with reporting companies to improve the estimation of marine fuel use, for 2012 to 2008 we have allocated fuel use to domestic and international navigation based on an estimate of 91 per cent international and 9 per cent domestic navigation. The total volume of marine fuel is also uplifted, by around 10 per cent on previously published data. The revised estimates are consistent with a detailed study of marine fuel use at:
http://naei.defra.gov.uk/reports/reports?report_id=636

Crude and process oils

3.64 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

3.65 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)

3.66 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. agricultural vehicles, fishing vessels, construction equipment used off road and usually coloured with a red marker dye). Gasoil used for oil and gas extraction is included from 2005 onwards.

(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)

3.67 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, but 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. DUKES Table 3.8 (prior to 2010, table 3D, within the main text) provides limited information on the use of lubricants and grease. The information which was published under the heading of “Motors” has been amended to now include “Gear Oils and Transmission” to give a full picture of the lubricants used by vehicles.

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 as it has a higher energy content than coal, though a lower energy content than fuel oils.

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

Main classes of consumer

3.68 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 section, as opposed to other uses of refinery fuels that are recorded in the Energy Industry Use section. From the 2009 chapter 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 of civilian aviation turbine fuel use is for domestic consumption. A further 5 per cent is estimated to be consumed by the military.

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

3.69 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 website, at: www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics

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3.1 Commodity balances 2010 - 2012[(1)]

Primary oil

Thousand tonnes

	Crude oil	Ethane	Propane	Butane	Condensate	Total NGL	Feedstock	Total primary oil
2010								
Supply								
Production (2)	58,047	866	1,479	1,159	1,412	4,915	-	62,962
Imports	47,497	159	203	123	449r	934r	6,633	55,064r
Exports	-36,986	-9	-950	-439	-855	-2,253	-2,957	-42,196
Stock change (3)	+166	..	..	..	..	+56	-261	-39
Transfers	-	-1,005	-716	-336	-250	-2,306	+71r	-2,235r
Total supply	**68,724**	..	..	..	..	**1,345r**	**3,486r**	**73,555r**
Statistical difference (4)(5)	+12	..	..	..	..	+0	-0	+12r
Total demand (5)	**68,711**	..	..	..	..	**1,345r**	**3,486r**	**73,543r**
Transformation (Petroleum refineries) (5)	68,711	..	..	..	..	1,345	3,486	73,543r
Energy industry use	-	-	-	-	-	-	-	-
2011								
Supply								
Production (2)	48,571	599	1,047	768	987	3,401	-	51,972
Imports	49,649	243	338	214	511r	1,305r	7,139	58,092r
Exports	-28,286	-7	-634	-348	-561	-1,550	-3,908	-33,745
Stock change (3)	+533	..	..	..	..	+10	+67	+611
Transfers	-	-834	-747	-268	-292	-2,141	+19r	-2,122r
Total supply	**70,467**	..	..	..	..	**1,025r**	**3,317r**	**74,809r**
Statistical difference (4)(5)	-224	..	..	..	..	-19	-27	-271r
Total demand (5)	**70,691**	..	..	..	..	**1,044r**	**3,345r**	**75,080r**
Transformation (Petroleum refineries) (5)	70,691	..	..	..	..	1,044	3,345	75,080r
Energy industry use	-	-	-	-	-	-	-	-
2012								
Supply								
Production (2)	42,052	422	759	566	761	2,508	-	44,561
Imports	53,763	367	463	307	440	1,577	5,218	60,559
Exports	-28,535	-6	-697	-339	-363	-1,404	-4,021	-33,961
Stock change (3)	-587	..	..	..	..	-40	+141	-486
Transfers	-	-783	-486	-254	-360	-1,882	-53	-1,934
Total supply	**66,694**	..	..	..	..	**759**	**1,285**	**68,738**
Statistical difference (4)(5)	-117	..	..	..	..	+9	-16	-124
Total demand (5)	**66,811**	..	..	..	..	**750**	**1,301**	**68,862**
Transformation (Petroleum refineries) (5)	66,811	..	..	..	..	750	1,301	68,862
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 available.

3.2 Commodity balances 2012

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,573	939	2,632	924	-	17,627	72	5,775
Other sources	783	486	254	-	360	-	-	-	-
Imports	-	207	86	-	622	19	4,184	172	7,127
Exports	-	-506	-641	-	-917	-	-8,561	-25	-1,320
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	-4	13	0	35	-2	26	-1	96
Transfers	-	-	0	23	26	-0	-54	-0	-479
Total supply	**783**	**1,756**	**650**	**2,655**	**1,049**	**17**	**13,222**	**218**	**11,199**
Statistical difference *(3)*	**-**	**11**	**-7**	**0**	**-12**	**-0**	**-8**	**-1**	**-22**
Total demand	**783**	**1,745**	**657**	**2,655**	**1,061**	**17**	**13,231**	**219**	**11,221**
Transformation	**-**	**10**	**-**	**238**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	238	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	238	-	-	-	-	-
Heat generation	-	10	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,301**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,301	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**783**	**1,735**	**657**	**116**	**1,061**	**17**	**13,231**	**219**	**11,221**
Industry	**-**	**488**	**103**	**-**	**0**	**-**	**-**	**-**	**-**
Unclassified	-	486	102	-	0	-	-	-	-
Iron & steel	-	2	0	-	-	-	-	-	-
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	**-**	**93**	**-**	**-**	**-**	**17**	**13,231**	**-**	**11,221**
Air	-	-	-	-	-	17	-	-	11,221
Rail	-	-	-	-	-	-	-	-	-
Road	-	93	-	-	-	-	13,231	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**378**	**27**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	270	27	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	108	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**783**	**776**	**527**	**116**	**1,061**	**-**	**-**	**219**	**-**

(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 3.42 to 3.43.

3.2 Commodity balances 2012 (continued)

Petroleum products

Thousand tonnes

Burning oil	DERV	Gas Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum coke	Misc. products	Total Products	
									Supply
2,268	15,772	8,941	7,164	457	1,222	2,072	1,252	68,690	Production
-	-	-	-	-	-	-	-	1,882	Other sources
702	9,541	1,186	660	443	225	624	178	25,978	Imports
-112	-3,377	-4,270	-5,300	-479	-151	-582	-841	-27,083	Exports
-	-	-1,644	-1,483	-	-	-	-	-3,126	Marine bunkers
40	-133	7	90	-11	-11	-22	6	128	Stock change *(2)*
446	-268	217	-14	-0	63	173	-78	53	Transfers
3,343	**21,535**	**4,437**	**1,117**	**410**	**1,348**	**2,264**	**518**	**66,522**	**Total supply**
14	**-3**	**-61**	**8**	**-3**	**-6**	**3**	**-24**	**-109**	**Statistical difference *(3)***
3,329	**21,538**	**4,498**	**1,109**	**412**	**1,355**	**2,261**	**541**	**66,631**	**Total demand**
-	**-**	**60**	**388**	**-**	**-**	**111**	**-**	**807**	**Transformation**
-	-	55	335	-	-	111	-	739	Electricity generation
-	-	41	261	-	-	111	-	413	Major power producers
-	-	14	74	-	-	-	-	326	Autogenerators
-	-	5	53	-	-	-	-	68	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**608**	**348**	**-**	**-**	**1,606**	**-**	**4,863**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	608	-	-	-	-	-	608	Oil & gas extraction
-	-	-	348	-	-	1,606	-	4,255	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,329	**21,538**	**3,830**	**373**	**412**	**1,355**	**545**	**541**	**60,961**	**Final Consumption**
1,332	**-**	**1,839**	**95**	**-**	**-**	**-**	**-**	**3,857**	**Industry**
1,332	-	914	8	-	-	-	-	2,842	Unclassified
-	-	-	2	-	-	-	-	5	Iron & steel
-	-	-	-	-	-	-	-	-	Non-ferrous metals
-	-	20	26	-	-	-	-	46	Mineral products
-	-	276	14	-	-	-	-	289	Chemicals
-	-	-	-	-	-	-	-	-	Mechanical engineering etc
-	-	2	-	-	-	-	-	2	Electrical engineering etc
-	-	21	-	-	-	-	-	21	Vehicles
-	-	385	42	-	-	-	-	427	Food, beverages etc
-	-	94	-	-	-	-	-	94	Textiles, leather, etc
-	-	57	2	-	-	-	-	59	Paper, printing etc
-	-	37	-	-	-	-	-	37	Other industries
-	-	34	1	-	-	-	-	35	Construction
-	**21,538**	**768**	**173**	**-**	**-**	**-**	**-**	**47,039**	**Transport**
-	-	-	-	-	-	-	-	11,238	Air
-	-	605	26	-	-	-	-	631	Rail
-	21,538	-	-	-	-	-	-	34,861	Road
-	-	163	147	-	-	-	-	309	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
1,996	**-**	**1,093**	**105**	**-**	**-**	**-**	**-**	**3,599**	**Other**
1,996	-	140	-	-	-	-	-	2,433	Domestic
-	-	260	36	-	-	-	-	295	Public administration
-	-	319	43	-	-	-	-	362	Commercial
-	-	151	14	-	-	-	-	273	Agriculture
-	-	223	12	-	-	-	-	235	Miscellaneous
-	**-**	**130**	**-**	**412**	**1,355**	**545**	**541**	**6,465**	**Non energy use *(4)***

3.3 Commodity balances 2011

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,645	953	3,018r	1,493	-	19,856	65	6,411
Other sources	834	747	268	-	292	-	-	-	-
Imports	-	158	31	-	459	20	3,259r	97	6,881
Exports	-	-545	-276	-	-1,102	-	-9,363	-20	-1,210
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	-4	-7	-	30	1	39	1	-28
Transfers	-	-	28	24	-125	-	91	-1	-491r
Total supply	**834**	**2,001**	**997**	**3,042**	**1,046**	**21**	**13,881r**	**143**	**11,562r**
Statistical difference *(3)*	**-**	**6**	**3**	**0**	**-0**	**0**	**-13**	**-0**	**-11**
Total demand	**834**	**1,994**	**994**	**3,042**	**1,046**	**21**	**13,895**	**143**	**11,574**
Transformation	**-**	**13**	**-**	**289r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	289r	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	289r	-	-	-	-	-
Heat generation	-	13	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,584r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,584r	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**834**	**1,981**	**994**	**169**	**1,046**	**21**	**13,895**	**143**	**11,574**
Industry	**-**	**421**	**375**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	421	375	-	-	-	-	-	-
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	**-**	**98**	**-**	**-**	**-**	**21**	**13,895**	**-**	**11,574**
Air	-	-	-	-	-	21	-	-	11,574
Rail	-	-	-	-	-	-	-	-	-
Road	-	98	-	-	-	-	13,895	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**360**	**27**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	259	26	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	101	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**834**	**1,102**	**593**	**169**	**1,046**	**-**	**-**	**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 3.42 to 3.43.

3.3 Commodity balances 2011 (continued)

Petroleum products

Thousand tonnes

Burning oil	DERV	Gas Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum coke	Misc. products	Total Products	
									Supply
2,377	16,801	8,683	7,907	430	1,476	2,180	1,412	74,707r	Production
-	-	-	-	-	-	-	-	2,141	Other sources
618	7,736r	1,245r	808	508	206r	496	134r	22,656r	Imports
-173	-3,127	-4,667	-5,140	-487	-151	-652	-887	-27,800	Exports
-	-	-1,566r	-2,036r	-	-	-	-	-3,602r	Marine bunkers
-2	83	43	-15	48	4	-16	12	188	Stock change *(2)*
441r	-498r	444r	-12r	2	96	55r	-73r	-19r	Transfers
3,260r	**20,994r**	**4,182**	**1,513r**	**502**	**1,630r**	**2,064**	**598r**	**68,271r**	**Total supply**
-28r	**3**	**-1r**	**-5r**	**10**	**10r**	**0**	**6r**	**-20r**	**Statistical difference *(3)***
3,288	**20,991**	**4,183r**	**1,518r**	**491**	**1,621**	**2,064**	**592**	**68,291r**	**Total demand**
-	**-**	**63**	**380r**	**-**	**-**	**48**	**-**	**792r**	**Transformation**
-	-	57r	328r	-	-	48	-	722r	Electricity generation
-	-	38r	256r	-	-	48	-	342r	Major power producers
-	-	19r	72r	-	-	-	-	380r	Autogenerators
-	-	6r	52	-	-	-	-	71r	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**533r**	**476r**	**-**	**-**	**1,526r**	**-**	**5,119r**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	533r	-	-	-	-	-	533r	Oil & gas extraction
-	-	-	476r	-	-	1,526r	-	4,586r	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,288	**20,991**	**3,588r**	**662r**	**491**	**1,621**	**490r**	**592**	**62,380**	**Final Consumption**
1,314	**-**	**1,542r**	**295r**	**-**	**-**	**-**	**-**	**3,947r**	**Industry**
1,314	-	428r	40r	-	-	-	-	2,578r	Unclassified
-	-	-	4	-	-	-	-	4	Iron & steel
-	-	-	-	-	-	-	-	-r	Non-ferrous metals
-	-	180r	32r	-	-	-	-	213r	Mineral products
-	-	93r	86r	-	-	-	-	179r	Chemicals
-	-	-	-	-	-	-	-	-	Mechanical engineering etc
-	-	-	-	-	-	-	-	-	Electrical engineering etc
-	-	150r	-	-	-	-	-	150r	Vehicles
-	-	402r	132r	-	-	-	-	534r	Food, beverages etc
-	-	103r	-	-	-	-	-	103r	Textiles, leather, etc
-	-	56r	-	-	-	-	-	56r	Paper, printing etc
-	-	8r	-	-	-	-	-	8r	Other industries
-	-	120r	1r	-	-	-	-	121r	Construction
-	**20,991**	**793r**	**201r**	**-**	**-**	**-**	**-**	**47,573r**	**Transport**
-	-	-	-	-	-	-	-	11,594	Air
-	-	638r	-	-	-	-	-	638r	Rail
-	20,991	-	-	-	-	-	-	34,984	Road
-	-	155r	201r	-	-	-	-	356r	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
1,973	**-**	**1,128**	**165**	**-**	**-**	**-**	**-**	**3,654r**	**Other**
1,973	-	142	-	-	-	-	-	2,401	Domestic
-	-	273	68	-	-	-	-	341	Public administration
-	-	341	61	-	-	-	-	402	Commercial
-	-	153	16	-	-	-	-	270r	Agriculture
-	-	219	21	-	-	-	-	240r	Miscellaneous
-	**-**	**125**	**-**	**491**	**1,621**	**490r**	**592**	**7,206r**	**Non energy use *(4)***

3.4 Commodity balances 2010

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,607	640	3,085r	1,596	-	19,918	66	5,781
Other sources	1,005	716	336	-	250	-	-	-	-
Imports	-	162	199	-	672	23	2,874r	181	7,352
Exports	-	-529	-203	-	-1,369	-	-8,619	-25	-1,487
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	-46	30	-	-2	2	291	1	116
Transfers	-	3r	-	-	-111	-	165r	-1	-647
Total supply	**1,005**	**1,914r**	**1,002**	**3,085**	**1,036**	**25**	**14,628r**	**223**	**11,114**
Statistical difference *(3)*	**-**	**17r**	**61r**	**-1**	**-25**	**4**	**27r**	**-1**	**-2**
Total demand	**1,005**	**1,897**	**941r**	**3,087**	**1,061**	**21**	**14,602**	**224**	**11,116**
Transformation	**-**	**5**	**-**	**325**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	325	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	325	-	-	-	-	-
Heat generation	-	5	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,568r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,568r	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**1,005**	**1,892**	**941**	**194**	**1,061**	**21**	**14,602**	**224**	**11,116**
Industry	**-**	**277**	**269r**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	275	269r	-	-	-	-	-	-
Iron & steel	-	1	-	-	-	-	-	-	-
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	**-**	**106**	**-**	**-**	**-**	**21**	**14,602**	**-**	**11,116**
Air	-	-	-	-	-	21	-	-	11,116
Rail	-	-	-	-	-	-	-	-	-
Road	-	106	-	-	-	-	14,602	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**469**	**45**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	349	45	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	120	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**1,005**	**1,039**	**628**	**194**	**1,061**	**-**	**-**	**224**	**-**

(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 3.42 to 3.43.

3.4 Commodity balances 2010 (continued)

Petroleum products

Thousand tonnes

Burning oil	DERV	Gas Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum coke	Misc. products	Total Products	
									Supply
2,570	15,332	9,505	7,525	412	1,276	2,106	1,557	72,977r	Production
-	-	-	-	-	-	-	-	2,306	Other sources
972	7,648r	711r	1,020	607	370	755	119	23,665r	Imports
-191	-2,121	-4,358	-4,895	-421	-187	-686	-975	-26,065	Exports
-	-	-1,583r	-1,768r	-	-	-	-	-3,351r	Marine bunkers
-5	61	95	115	-19	-88	51	-8	595r	Stock change *(2)*
655	-180	55r	-23r	-1	19	-	-7	-71r	Transfers
4,000	**20,741r**	**4,424r**	**1,974r**	**578**	**1,390**	**2,227**	**687**	**70,055r**	**Total supply**
-12	**1r**	**-33r**	**6r**	**-2**	**20**	**1**	**16**	**75r**	**Statistical difference *(3)***
4,012	**20,740**	**4,457r**	**1,968r**	**580**	**1,370**	**2,226**	**671**	**69,980r**	**Total demand**
-	**-**	**73**	**598**	**-**	**-**	**176**	**-**	**1,177r**	**Transformation**
-	-	67	541	-	-	176	-	1,110r	Electricity generation
-	-	45	411	-	-	176	-	631r	Major power producers
-	-	22	131	-	-	-	-	478	Autogenerators
-	-	5	52	-	-	-	-	63	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	4	-	-	-	-	4	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**493**	**521r**	**-**	**-**	**1,289**	**-**	**4,870r**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	493	-	-	-	-	-	493	Oil & gas extraction
-	-	-	521r	-	-	1,289	-	4,378r	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
4,012	**20,740**	**3,892r**	**850r**	**580**	**1,370**	**761**	**671**	**63,932r**	**Final Consumption**
1,489	**-**	**1,906r**	**559r**	**-**	**-**	**-**	**-**	**4,499r**	**Industry**
1,489	-	464r	99r	-	-	-	-	2,596r	Unclassified
-	-	-	4r	-	-	-	-	5	Iron & steel
-	-	-	-	-	-	-	-	-	Non-ferrous metals
-	-	231r	36r	-	-	-	-	267r	Mineral products
-	-	160r	133r	-	-	-	-	293r	Chemicals
-	-	-	-	-	-	-	-	-	Mechanical engineering etc
-	-	-	-	-	-	-	-	-	Electrical engineering etc
-	-	77r	1r	-	-	-	-	78r	Vehicles
-	-	721r	280r	-	-	-	-	1,001r	Food, beverages etc
-	-	74r	-	-	-	-	-	74r	Textiles, leather, etc
-	-	95r	-	-	-	-	-	95r	Paper, printing etc
-	-	50r	5r	-	-	-	-	54r	Other industries
-	-	33r	-	-	-	-	-	33r	Construction
-	**20,740**	**763r**	**175r**	**-**	**-**	**-**	**-**	**47,524r**	**Transport**
-	-	-	-	-	-	-	-	11,137	Air
-	-	606r	-	-	-	-	-	606r	Rail
-	20,740	-	-	-	-	-	-	35,448	Road
-	-	157r	175r	-	-	-	-	331r	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
2,523	**-**	**1,081**	**116**	**-**	**-**	**-**	**-**	**4,235**	**Other**
2,523	-	165	-	-	-	-	-	3,083	Domestic
-	-	255	35	-	-	-	-	290	Public administration
-	-	301	52	-	-	-	-	353	Commercial
-	-	147	11	-	-	-	-	278	Agriculture
-	-	213	18	-	-	-	-	230	Miscellaneous
-	**-**	**142**	**-**	**580**	**1,370**	**761**	**671**	**7,675r**	**Non energy use *(4)***

3.5 Supply and disposal of petroleum[(1)]

Thousand tonnes

	2008	2009	2010	2011	2012
Primary oils (Crude oil, NGLs and feedstocks)					
Indigenous production *(2)*	71,665	68,199	62,962	51,972	44,561
Imports	60,335r	55,056r	55,064r	58,092r	60,559
Exports *(3)*	-48,401	-45,444r	-42,196	-33,745	-33,961
Transfers - Transfers to products *(4)*	-2,800	-2,618	-2,306	-2,141	-1,882
Product rebrands (5)	+208	+16	+71r	+19r	-53
Stock change *(6)*	+234	+545	-39	+611	-486
Use during production *(7)*	-	-	-	-	-
Calculated refinery throughput *(8)*	81,241r	75,754r	73,555r	74,809r	68,738
Overall statistical difference *(9)*	208	150r	12r	-271	-124
Actual refinery throughput	**81,034r**	**75,604r**	**73,543r**	**75,080r**	**68,862**
Petroleum products					
Losses in refining process *(10)*	470r	777r	566r	373r	172
Refinery gross production *(11)*	80,563r	74,828r	72,977r	74,707r	68,690
Transfers - Transfers to products *(4)*	3,174r	2,618	2,306	2,141	1,882
Product rebrands *(5)*	-207r	-16	-71	-19	53
Imports	23,741r	22,172	23,665r	22,656r	25,978
Exports *(12)*	-28,803r	-25,491r	-26,065	-27,800	-27,083
Marine bunkers	-4,012r	-3,807r	-3,351r	-3,602r	-3,126
Stock changes *(6)* - Refineries	-77r	421	568r	46r	81
Power generators	+127r	-101r	+26	+142	+47
Calculated total supply	74,506r	70,623r	70,055r	68,270r	66,522
Statistical difference *(9)*	-110r	-121r	75r	-20r	-109
Total demand *(4)*	**74,616r**	**70,744r**	**69,980r**	**68,290r**	**66,631**
Of which:					
Energy use	66,217r	63,134r	62,305r	61,084r	60,165
Of which, for electricity generation *(13)*	1,575	1,563r	1,110r	722r	739
total refinery fuels *(13)*	4,706r	4,304r	4,378r	4,586r	4,255
Non-energy use	8,399r	7,610r	7,675r	7,206r	6,465

(1) Aggregate monthly data on oil production, trade, refinery throughput and inland deliveries are available - see paragraph 3.73 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.

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

Thousand tonnes

	2008	2009	2010	2011	2012
Motor spirit					
Retail deliveries (4)					
Hypermarkets (5)					
Lead Replacement Petrol/Super premium unleaded (6)	196	188	168	163	165
Premium unleaded	7,311r	6,544r	6,192r	6,305r	6,160
Total hypermarkets	7,508r	6,732r	6,360r	6,468r	6,325
Refiners/other traders					
Lead Replacement Petrol/Super premium unleaded (6)	560r	558	478	397	281
Premium unleaded	7,939r	7,756r	7,243r	6,565r	6,197
Total Refiners/other traders	8,499r	8,313r	7,722r	6,962r	6,478
Total retail deliveries					
Lead Replacement Petrol/Super premium unleaded (6)	757r	745	647r	560r	446
Premium unleaded	15,250r	14,300	13,435r	12,870r	12,357
Total retail deliveries	16,007r	15,045	14,082r	13,430r	12,803
Commercial consumers (7)					
Lead Replacement Petrol/Super premium unleaded (6)	12r	12	11r	11	2
Premium unleaded	523r	555	509r	454r	426
Total commercial consumers	535r	567	520r	465r	428
Total motor spirit (10)	**16,542**	**15,613**	**14,602**	**13,895**	**13,231**
Biofuels					
Bio-ethanol	151	235	460	479	569
Total Motor Spirit including Bio-ethanol	**16,693**	**15,848**	**15,062**	**14,374**	**13,800**
Bio-ethanol as % of Total Motor Spirit	0.9	1.5	3.1	3.3	4.1
Gas oil/diesel oil					
DERV fuel:					
Retail deliveries (4):					
Hypermarkets (5)	4,865r	4,979r	5,376r	5,950r	6,079
Refiners/other traders	7,912r	7,690r	7,781r	7,598r	7,886
Total retail deliveries	12,777	12,669	13,157	13,549	13,965
Commercial consumers (7)	7,724	7,443	7,583	7,442	7,573
Total DERV fuel	**20,501**	**20,112**	**20,740**	**20,991**	**21,538**
Biofuels					
Bio-diesel	739	874	880	777	531
Total DERV fuel including Bio-diesel	**21,240**	**20,986**	**21,620**	**21,768**	**22,069**
Bio-diesel as % of Total DERV fuel	3.5	4.2	4.1	3.6	2.4
Gas Oil					
Other gas oil (8)	4,974r	4,424r	4,457r	4,183r	4,498
Total gas oil/diesel oil (exc Bio-diesel)	**25,474r**	**24,536r**	**25,197r**	**25,174r**	**26,036**
Fuel oils (9)					
Light	611	374	685	713	393
Medium	247r	150r	82r	58r	119
Heavy	1,206r	1,101r	681r	271r	249
Total fuel oils	**2,063r**	**1,625r**	**1,448r**	**1,042r**	**761**

(1) Aggregate monthly data for inland deliveries of oil products are available - see paragraph 3.73 and Annex C. See also Table 3B 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 3.31.
(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

	2008	2009	2010	2011	2012
Crude and process oils					
Refineries *(2)*	4,616	3,848	4,110	3,889	3,829
Terminals *(3)*	1,092	1,136	1,049	694	1,194
Offshore *(4)*	664	682	520	540	473
Total crude and process oils *(5)*	**6,787**	**6,033**	**5,889**	**5,274**	**5,690**
Petroleum products					
Ethane	-	-	-	-	-
Propane	25	30	18	23	28
Butane	38	39	31	38	25
Other petroleum gases	-	-	-	-	-
Naphtha	248	209	229	199	165
Aviation spirit	4	6	4	3	5
Motor spirit	1,085	1,150	1,140	846	727
White spirit & SBP	5	9	9	7	9
Aviation turbine fuel	1,116	1,429	1,188	1,216	1,229
Burning oil	208	204	209	238	198
Gas/Diesel oil *(6)*	4,339	4,623	4,018	3,776	4,230
of which, DERV	790	633	641	545	677
Fuel oils	709	797	687	645	514
Lubricating oils	160	149	180	132	143
Bitumen	123	134	101	95	106
Petroleum wax	11	8	8	6	4
Petroleum coke	227	288	236	252	274
Miscellaneous products	117	96	104	92	88
Total all products	**8,414**	**9,173**	**8,164**	**7,569**	**7,743**
Of which : net bilateral stocks *(7)*	2,104	2,728	2,563	2,100	2,441

(1) Aggregate monthly data on the level of stocks of crude oil and oil products are available - see paragraph 3.34 to 3.39
(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.

3.8 Additional information on inland deliveries for non-energy uses

Thousand tonnes

	2008	2009	2010	2011	2012
Feedstock for petroleum chemical plants:					
Propane	1,224r	1,195r	1,039r	1,102r	776
Butane	935r	728r	628r	593r	527
Other gases	1,459r	1,344r	1,199r	1,003r	899
Total gases	3,619r	3,267r	2,865r	2,699r	2,203
Naphtha (LDF)	856r	1,011r	1,061r	1,046r	1,061
Middle Distillate Feedstock (MDF)	201	143	142	125	130
Other products	-	-	-	-	-
Total feedstock	4,676r	4,421r	4,069r	3,870r	3,394
Lubricating oils and grease:					
Aviation	4r	3	4	4	3
Industrial	284r	296	337	276	205
Marine	15r	17	19	17	15
Other motors, Gear oils & Transmissions	204r	191	216	191	186
Agricultural	3r	3	4	3	3
Fuel oil sold as lubricant	-	-	-	-	-
Total lubricating oils and grease	510r	510	580	491	412
Other non-energy products:					
Industrial spirit/white spirit	145r	174	224	143	219
Bitumen	1,741	1,381	1,370	1,621r	1,355
Petroleum coke	738r	550r	761r	490r	545
Miscellaneous products	590r	573	671	592	541
Total other non-energy products	3,213r	2,679r	3,026r	2,846r	2,659
Total non-energy use	**8,399r**	**7,610r**	**7,675r**	**7,206r**	**6,465**

Chapter 4
Natural gas

Key points

- UK natural gas production has been decreasing since production peaked in 2000 and in 2012 was down 14 per cent on 2011 to 452 TWh. A key driver was the Elgin gas leak in March 2012 which constrained production for the rest of the year. In 2011 the Elgin area produced about 12 per cent of UK production. In 2012 it accounted for only 5 per cent (Chart 4.1, paragraph 4.6).

- Imports and exports of natural gas in 2012 were both lower than in 2011, but net imports remained virtually the same (Table 4.1).

- Imports of Liquefied Natural Gas (LNG) rose from 9 TWh in 2008 to a record 271 TWh in 2011 but in 2012 increased demand for LNG in Asia saw LNG imports fall by almost half to 148 TWh. Pipeline imports from Norway were up substantially following the resolution of some infrastructure issues in 2011 (Chart 4.3, Table 4.5).

- Total gas demand decreased by 6 per cent in 2012 to 857 TWh. Although colder weather meant that domestic demand was higher than in 2011, overall demand decreased due to a 30 per cent drop in demand from electricity generators (Table 4.1).

Introduction

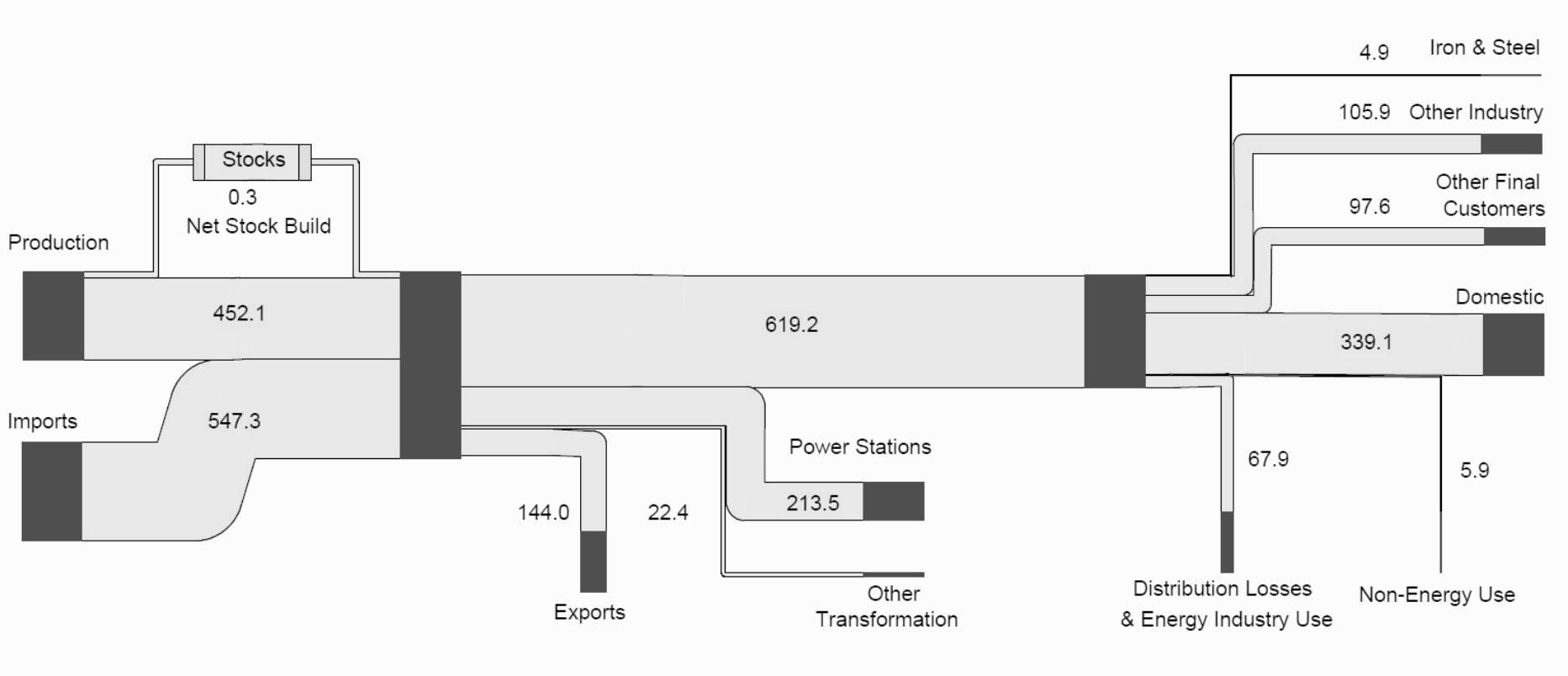
4.1 This chapter presents six data tables on the production, transmission and consumption of natural gas and colliery methane, and two maps showing the gas transmission system in the UK and flows of gas in and around Europe (pages 99 & 100).

4.2 An energy flow chart for 2012, 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 indigenous 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. The natural gas statistics include bio-methane gas which is currently being produced by a small number of companies to feed into the national grid. At this stage volumes are small, but as this increases we will look to present these in a separate column in Table 4.1. 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 and Table 4.6 shows LNG imports by terminal. 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

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 6. Details of net selling values of gas for the domestic, industrial and other sectors are to be found in Chapter 1.

Natural gas flow chart 2012 (TWh)



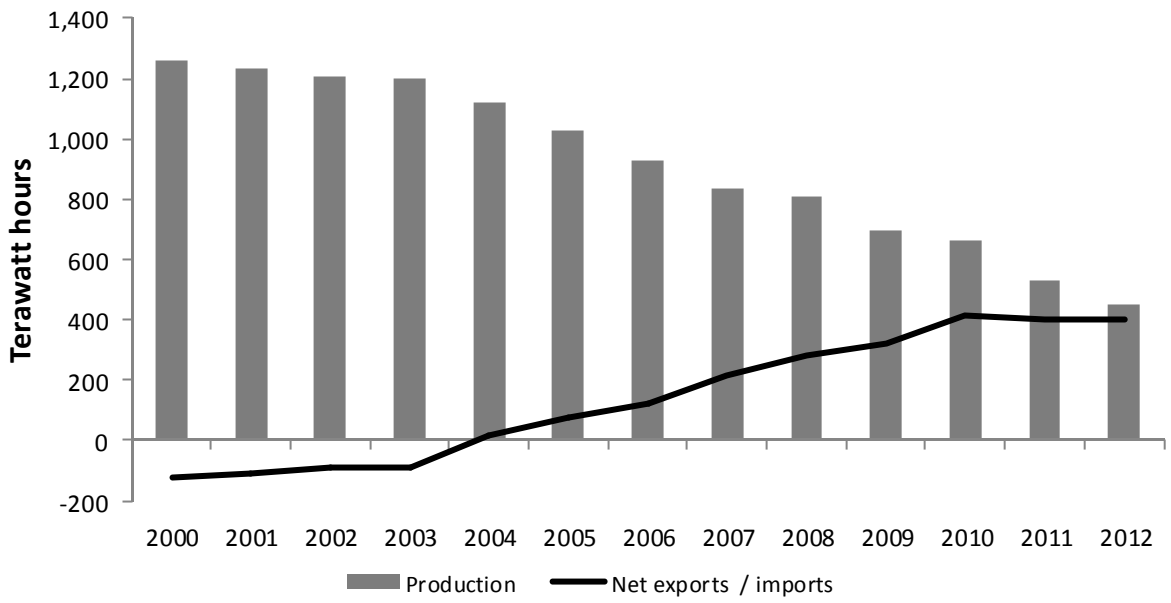
Notes:
This flow chart is based on the data that appear in Table 4.1, excluding colliery methane.

Commodity balances for gas (Tables 4.1 and 4.2)

4.5 UK Continental Shelf (UKCS) production of natural gas has been in decline since the turn of the decade and in 2012 (at 452 TWh) it was 36 per cent of the level produced in 2000 (1,260 TWh). Since 2000, gas production has fallen off at a rate of around 8 per cent per year. However, the rate of decline varies each year, and in 2012 production was 14 per cent lower than in 2011. This was largely driven by the Elgin gas leak in March 2012 which curtailed production for the rest of the year. In 2011 the Elgin area accounted for about 12 per cent of UK gross production, in 2012 this fell to 5 per cent of gross production. The UK, along with the Netherlands, is one of the two major gas producing nations within the EU. The UK's indigenous production would be sufficient to meet around half of the UK's demand.

4.6 The UK imports natural gas by pipelines from Norway, Belgium and the Netherlands and LNG by ship. The UK has been a net importer of gas since 2004 with net imports of gas in 2012 accounting for 47 per cent of supply. The UK imported 547 TWh in 2012. In 2009 two new LNG terminals at Milford Haven (Dragon and South Hook) began commissioning gas and contributed to the 32.8 per increase in natural gas imports between 2010 and 2011. LNG imports were down 45 per cent on 2011 reflecting both increased demand elsewhere (particularly in Asia) and better access to Norwegian supplies following the resolution of operational issues that affected trade for some months in 2011. The overall pattern of production and trade can be seen in Chart 4.1.

Chart 4.1: Natural gas production and net exports/imports 2000 to 2012

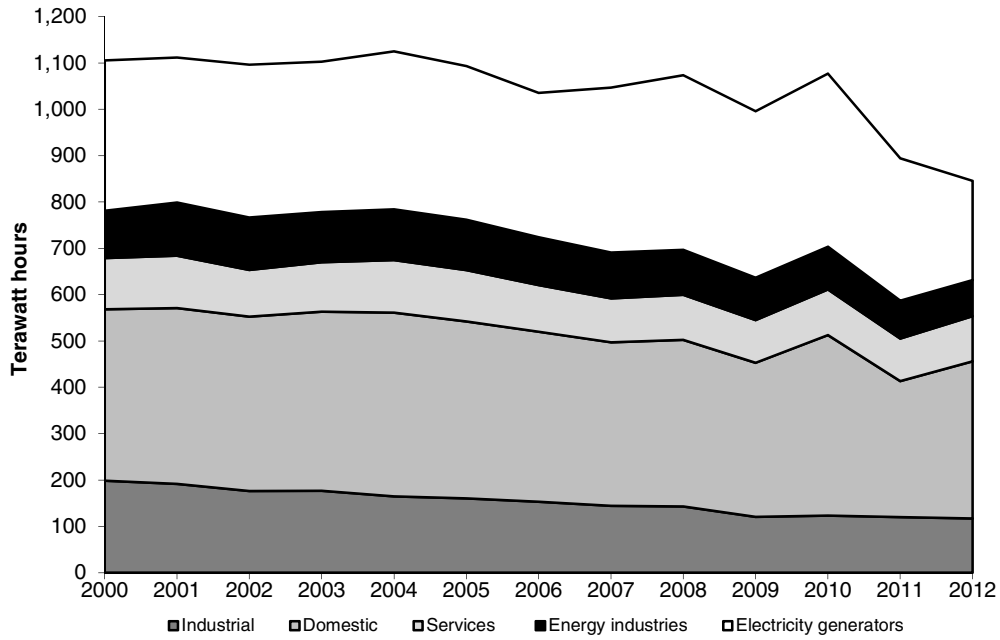


4.7 After a decrease of 17 per cent between 2010 and 2011, total gas demand continued is decline into 2012, from 908 TWh in 2011 to 857 TWh in 2012, a 6 per cent decline.

4.8 Chart 4.2 shows gas use by sector, and illustrates increased gas use in the domestic and services sectors due to the colder weather in 2012 when compared to 2011. However, gas used for electricity generation showed a substantial drop from 307 TWh in 2011 to 214 TWh in 2012, a 30% decrease, resulting in an overall decrease in gas consumption.

4.9 Industrial gas consumption was broadly flat between 2011 and 2012 (see Table 4.1.1). Sectoral breakdowns of gas use have been modified since last year to more accurately represent the data (see paragraph 4.40).

Chart 4.2: Consumption of natural gas 2000 to 2012



UK continental shelf and onshore natural gas (Table 4.3)

4.10 Table 4.3 shows the flows for natural gas from production through transmission to consumption. 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.

4.11 The relationship between total UK gas consumption shown in this table and total demand for natural gas given in the balance Table 4.1 is illustrated for 2012 as follows:

			GWh
Total UK consumption (Table 4.3)			794,779
plus Producers' own use			48,461
plus Operators' own use			1,682
equals			
"Consumption of natural gas"			844,922
plus Other losses and metering differences (upstream)			-
plus Downstream losses	- leakage assessment	4,157)	6,172
	- own use gas	336)	
	- theft	1,679)	
plus Metering differences (transmission)			6,099
equals			
Total demand for natural gas (Table 4.1)			857,192

4.12 The box below shows how, in 2012, the wastage, losses and metering differences figures in Table 4.3 are related to the losses row in the balance Table 4.1.

		GWh
Table 4.3		
	Upstream gas industry:	
	Other losses and metering differences	-
Downstream gas industry:		
	Transmission system metering differences	6,099
	Leakage assessment	4,157
	Own use gas	336
	Theft	1,679
Table 4.1		
	Losses	12,271

4.13 The statistical difference row in Table 4.1 is made up of the following components in 2012:

		GWh
Table 4.3		
	Statistical difference between gas available from upstream and gas input to downstream	-331
plus	Downstream gas industry:	
	Distribution losses and metering differences	-1,814
Table 4.1		
	Statistical difference	-2,145

4.14 For a discussion of the various statistical difference terms, losses and metering differences in this table, see paragraphs 4.43 to 4.47 in the technical notes and definitions section below.

4.15 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 2006 onwards have been sourced from the National Grid and storage capacity data from its 2012 Ten Year Statement.

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

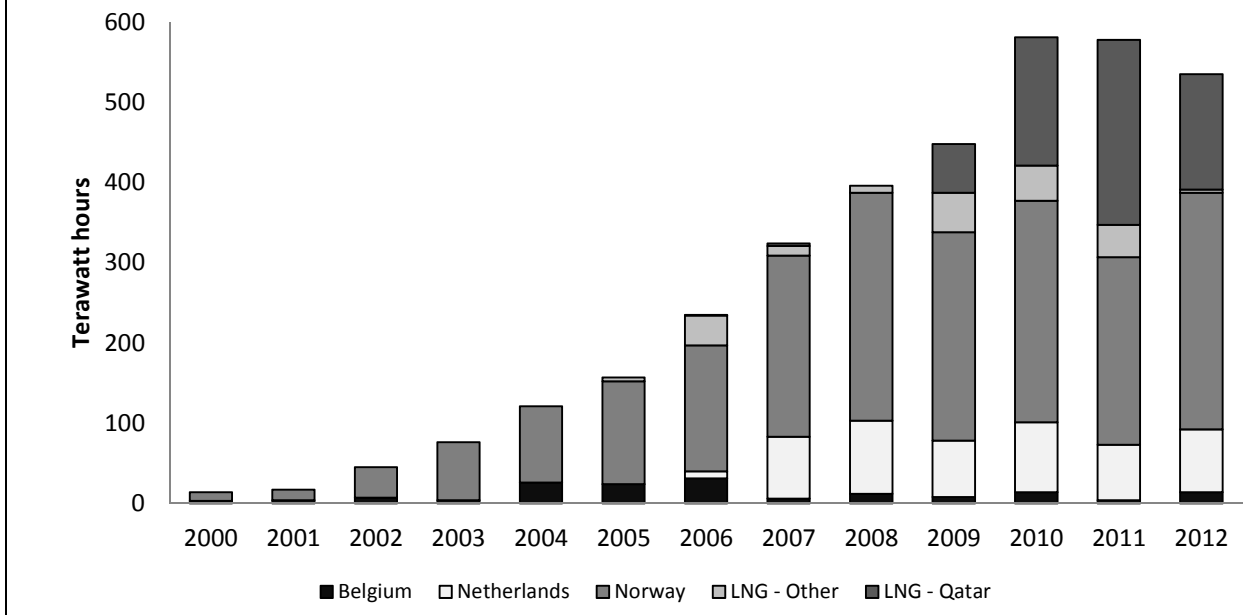
4.16 This table details current gas storage facilities in the UK as at 31 May 2012 and also the two operational pipelines that bring gas to the UK from continental Europe. Significant increases in storage capacity/deliverability are being planned or contemplated at existing or new sites, both onshore and offshore. National Grid's Gas Transportation Ten Year Statement (www.nationalgrid.com/uk/Gas/TYS/) includes public details of such projects in Great Britain.

Natural gas imports and exports (Tables 4.5 and 4.6)

4.17 These tables show how much gas was imported to, and exported from, the UK, via the interconnector pipelines, directly from UKCS gas fields using the Dutch offshore pipeline system and via ships to the UK's LNG terminals. Norwegian gross gas imports were 55 per cent of total gas imports compared to 41 per cent in 2011. Norwegian pipeline imports in 2011 were affected by some operational issues which decreased exports from Norway for a part of the year. In 2012, 56 per cent of gas exports were to continental Europe, with the remaining 44 per cent to the Republic of Ireland.

4.18 Chart 4.3 shows the shares of natural gas imports by interconnector pipelines and LNG, while the flows of gas across Europe for 2011 are illustrated in Map 4.1.

Chart 4.3: Imports of Natural Gas 2000 to 2012



4.19 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), and the second phase of the Isle of Grain expansion was completed at the Isle of Grain terminal. With this expansion, LNG's share of total gas imports rose from 25 per cent in 2009 to 35 per cent in 2010 and to 47 per cent in 2011, but fell to 28 per cent in 2012 because of increased LNG demand in Asia leading to increases in LNG prices in 2012. In 2012, Qatar accounted for 98 per cent of LNG imports.

4.20 The origins of LNG imports can be found in Table 4.5 and the total import volumes by each LNG terminal in Table 4.6. The LNG terminal imports are not shown by country of origin because of the commercial sensitivity of this information.

4.21 Despite the importance of LNG, pipeline imports, particularly from Norway, remain a critical component of the UK's energy mix. 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. Other developments since 2001 include:

- October 2006 – The southern part of the Langeled pipeline from Sleipner to the UK became operational.
- December 2006 – An interconnector from the Netherlands, the Balgzand-Bacton Line (BBL) began importing gas to the UK.
- October 2007 – New pipeline (Tampen Link) from Statfjord B to the UK's FLAGS (Far North Liquids and Associated Gas System) began delivering gas Norwegian gas to St Fergus in Scotland.
- November 2010 – The Norwegian Gjøa oil and gas field and its satellite Vega began delivering gas to St Fergus in Scotland via the FLAGS pipeline.

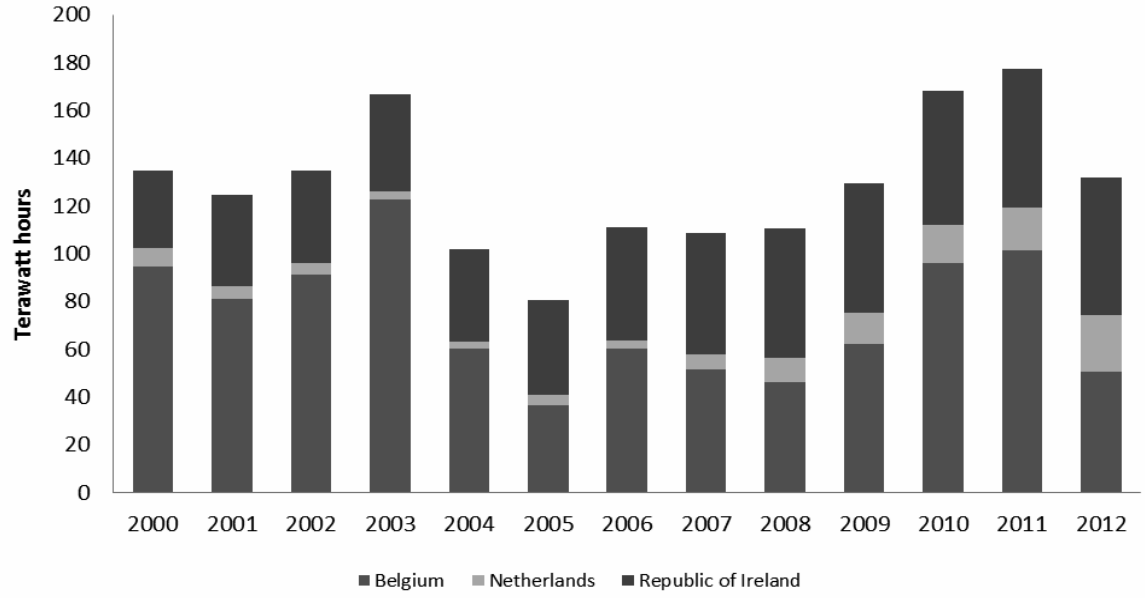
4.22 The interconnector linking the UK's transmission network with Belgium via a Bacton to Zeebrugge pipeline began operating in October 1998, allowing both imports from, and exports to,

mainland Europe. Whilst the net flow was initially to the continent, since 1998 there has been an increase in imports.

4.23 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. Gas from these fields goes straight to Den Helder in the Netherlands. Towards the end of 2011 gas exports from Wingate to Uithuizen in the Netherlands commenced. Exports to the Republic of Ireland started in 1995. (See Map 4.2).

4.24 The increased import infrastructure afforded by the new LNG terminals has ensured that UK exports remain robust, despite the decrease in the UK's production. Chart 4.4 shows significant recent increases in UK exports with record levels of exports in 2011. However, the fall in LNG imports saw exports to Belgium almost halve in 2012 compared with 2011. Exports to the Republic of Ireland were about the same as in 2011. Additionally a small amount of gas is exported to the Norwegian Continental Shelf for injection into the Ula field reservoir, but this accounts for less than 0.1 per cent of total exports.

Chart 4.4: Exports of Natural Gas 2000 to 2012



4.25 The total volume of gas traded in 2012 was down 10 per cent to 691 TWh. The UK exported substantially less gas than 2011, largely due to a decrease in LNG imports shipped into the UK.

Sub-national gas data

4.26 Table 4A gives the number of consumers with a gas demand below 73,200 kWh per year in gas year 2011 (see Technical Terms and Definitions) 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. It should be noted that the data are for gas year 2011, which is approximately one year in arrears of the other data presented in this chapter, and excludes around 33,000 customers (approximately 0.15 per cent) not allocated to a region.

4.27 In December 2012, DECC published in *Energy Trends* and on its sub-national energy statistics website:www.gov.uk/government/organisations/department-of-energy-climate-change/series/sub-national-gas-consumption-data gas consumption data at both regional and local level. The local level data are at "LAU1" level (see article in December 2011 *Energy Trends* for definition) and the regional data at "NUTS1" level. Data for earlier years are presented on the website.

Table 4A: Consumption by gas customers by region in 2011

Region/Country	Consumption by customers below 73,200 kWh (2,500 therms) annual demand		Consumption by all customers (where regional classification is possible)	
	Number of consumers (thousands)	Gas sales 2011 (GWh)	Number of consumers (thousands)	Gas sales 2011 (GWh)
North East	1,083	15,616	1,094	24,383
North West	2,846	40,475	2,879	66,735
Yorkshire and the Humber	2,090	30,883	2,115	52,759
East Midlands	1,726	25,007	1,745	39,313
West Midlands	2,076	29,548	2,101	45,805
East	2,019	28,852	2,042	45,226
London	3,002	42,078	3,045	63,915
South East	3,145	45,345	3,186	65,410
South West	1,792	22,223	1,812	33,094
Wales	1,104	14,997	1,114	24,688
Scotland	1,922	28,959	1,947	51,137
Great Britain	22,806	323,981	23,080	512,467

Source: xoserve and the independent gas transporters

[1] Great Britain includes 33.1 thousand customers (698.5 GWh) that could not be allocated to a region as there was insufficient geographical information to be able to do so.

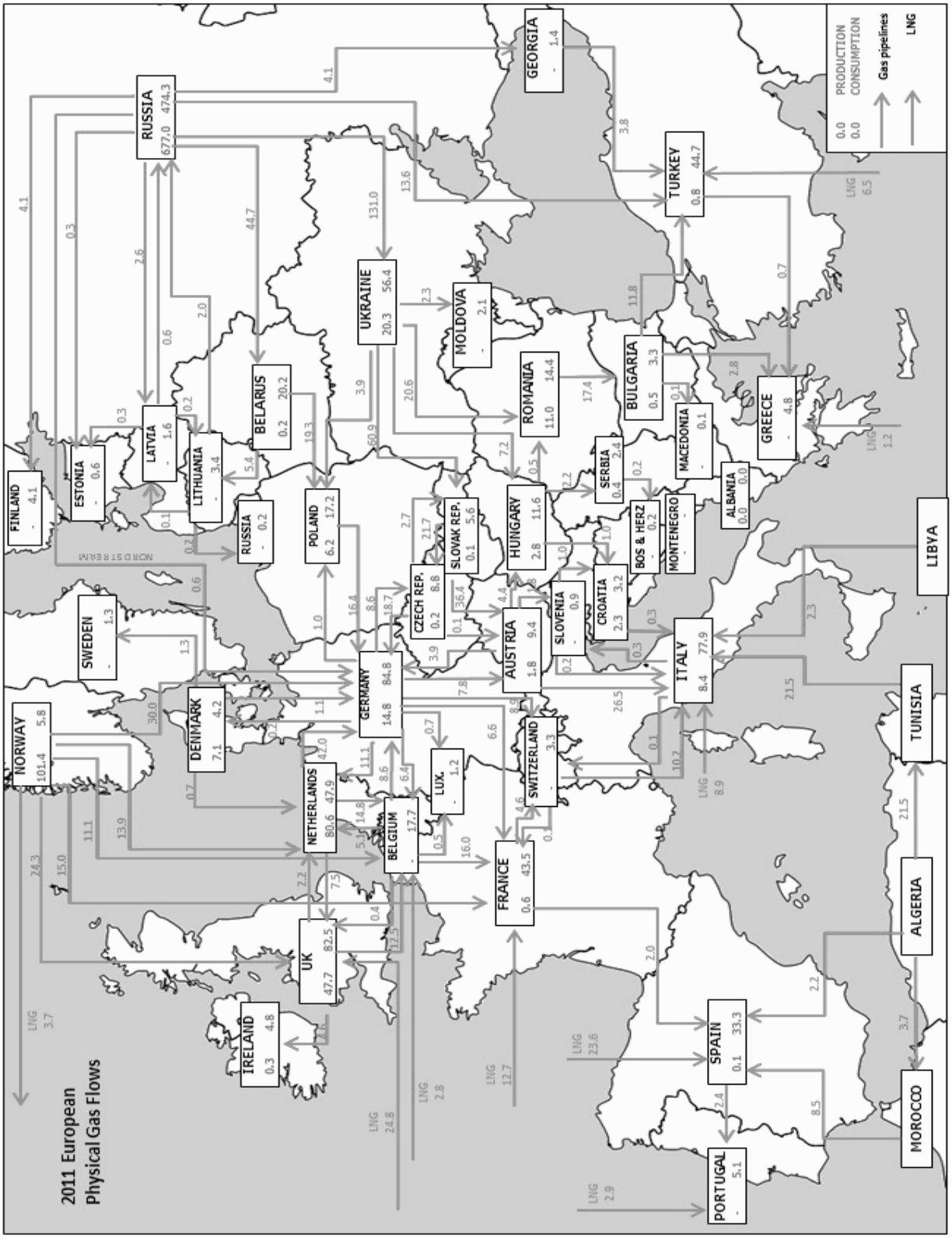
4.28 By the end of December 2012, 12.7 million gas consumers (59 per cent) were no longer supplied by British Gas. Table 4B gives market penetration in more detail, by local distribution zone (LDZ). For all types of domestic customer, it is in the markets in Northern England that new suppliers have had most success. Since the market has opened up, the share of the market not supplied by British Gas currently stands at 43 per cent of the credit market, 68 per cent of the direct debit market, and 57 per cent of the pre-payment market.

4.29 Competition in the domestic market remained broadly unchanged between 2008 and 2012, with the largest three suppliers accounting for just under two thirds of sales in 2012. The industrial sector has remained largely stable, with the proportion of the market supplied by the largest three suppliers at 60 per cent. The commercial sector is more diverse, with the three largest suppliers accounting for 45 per cent of sales in 2011, broadly similar to last year.

Table 4B: Domestic gas market penetration (in terms of percentage of customers supplied) by local distribution zone and payment type, fourth quarter of 2012

Region	British Gas Trading			Non-British Gas		
	Credit	Direct Debit	Prepayment	Credit	Direct Debit	Prepayment
Northern	47	25	32	53	75	68
North Eastern	59	31	44	41	69	56
North Western	59	35	47	41	65	53
East Midlands	54	31	47	46	69	53
West Midlands	61	33	50	39	67	50
Eastern	54	31	42	46	69	58
North Thames	64	40	54	36	60	46
Southern	53	29	39	47	71	61
South Eastern	57	32	46	43	68	54
South Western	59	36	42	41	64	58
Wales	50	30	27	50	70	73
Scotland	57	32	36	43	68	64
Great Britain	57	32	43	43	68	57

Map 4.1: Gas European Transit System



Source: International Energy Agency and DECC

4.30 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 2012

Source: International Energy Agency and DECC

Technical notes and definitions

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 1.28 to 1.62. 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

4.31 **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 on DECC's energy statistics web site under 'Production of gas' - www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes. 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.

4.32 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 UK 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 UK 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.

4.33 **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.

4.34 **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 2.51 in Chapter 2.

4.35 **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 2008 to 2012 are shown in Table 4.2 and estimates for 2010 to 2012 in Table 4.1. The estimates for the years up to 2011 have been obtained from AEA's work for the National Atmospheric Emissions Inventory; 2012 data are DECC extrapolations.

Sectors used for sales/consumption

4.36 For definitions of the various sectors used for sales and consumption analyses see Chapter 1 paragraphs 1.56 to 1.60 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 4.39, below, for information on the source of the sectoral data for consumption of gas.

Data collection

4.37 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.

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

4.39 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. EU-ETS data are estimated to cover around 50 to 60 per cent of industrial energy use.

4.40 Data on sectoral gas use is derived from surveys of gas suppliers and electricity generators, with further information from both EU-ETS and previously unused ONS surveys of business activities for quality assurance. This change in methodology has resulted in shifts in sectoral gas use going back to 2008. In particular, gas use has shifted out of the industrial sector, with a subsequent increase in the services sector. We intend to do further work on this sectoral allocation to improve accuracy, which we aim to complete for next year.

Period covered

4.41 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 5.83 and 5.84.

Monthly and quarterly data

4.42 Monthly data on natural gas production and supply are available from DECC's energy statistics website: www.gov.uk/government/organisations/department-of-energy-climate-change/series/gas-statistics 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.

Statistical and metering differences

4.43 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.

4.44 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 PPRS 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.

4.45 The differences in the natural gas commodity balances 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.

4.46 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.

4.47 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 2012, the allocation of about 5 per cent of demand is estimated.

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4.1 Commodity balances

Natural gas

GWh

	2010			2011			2012		
	Natural gas	**Colliery methane**	**Total Natural gas**	**Natural gas**	**Colliery methane**	**Total Natural gas**	**Natural gas**	**Colliery methane**	**Total Natural gas**
Supply									
Production	664,353	730	665,083	526,030	703r	526,734r	452,094	712	452,806
Other sources	-	-	-	-	-	-	-	-	-
Imports	589,497	-	589,497	584,414	-	584,414	547,300	-	547,300
Exports	-176,399	-	-176,399	-183,689	-	-183,689	-144,023	-	-144,023
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(1)*	+15,271	-	+15,271	-22,623	-	-22,623	-269	-	-269
Transfers *(2)*	-263	-	-263	-60	-	-60	-56	-	-56
Total supply	**1,092,459**	**730**	**1,093,189**	**904,072r**	**703**	**904,776r**	**855,047**	**712**	**855,758**
Statistical difference *(3)*	-2,539r	-	-2,539r	-3,989r	-	-3,989r	-2,145	-	-2,145
Total demand	**1,094,999r**	**730**	**1,095,729r**	**908,061r**	**703**	**908,765r**	**857,192**	**712**	**857,903**
Transformation	**396,675**	**618**	**397,293**	**329,480r**	**595**	**330,076r**	**235,931**	**607**	**236,537**
Electricity generation	372,968	618	373,586	306,544r	595r	307,140r	213,539	607	214,146
Major power producers	342,150	-	342,150	275,591	-	275,591	182,409	-	182,409
Autogenerators	30,818	618	31,436	30,953r	595	31,548r	31,130	607	31,736
Heat generation	23,707	-	23,707	22,936r	-	22,936r	22,392	-	22,392
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**68,961r**	**87**	**69,048r**	**59,200r**	**87**	**59,287r**	**55,622**	**87**	**55,709**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil and gas extraction	61,124	-	61,124	53,163	-	53,163	48,461	-	48,461
Petroleum refineries	3,841r	-	3,841r	3,633r	-	3,633r	3,278	-	3,278
Coal extraction	-	87	87	-	87	87	40	87	127
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	641	-	641	453	-	453	266	-	266
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	3,355	-	3,355	1,951	-	1,951	3,578	-	3,578
Losses *(4)*	**18,737**	-	**18,737**	**14,559r**	-	**14,559r**	**12,271**	-	**12,271**
Final consumption	**610,626r**	**25**	**610,651**	**504,821r**	**21**	**504,842r**	**553,368**	**18**	**553,386**
Industry	**114,379r**	**25**	**114,404r**	**113,543r**	**21**	**113,564r**	**110,705**	**18**	**110,723**
Unclassified	-	25	25	-	21r	21r	-	18	18
Iron and steel	5,827	-	5,827	5,569r	-	5,569r	4,854	-	4,854
Non-ferrous metals	2,643r	-	2,643r	2,428r	-	2,428r	2,805	-	2,805
Mineral products	15,443r	-	15,443r	14,604r	-	14,604r	15,112	-	15,112
Chemicals	21,638r	-	21,638r	23,639r	-	23,639r	22,188	-	22,188
Mechanical Engineering, etc	6,404r	-	6,404r	6,623r	-	6,623r	6,662	-	6,662
Electrical engineering, etc	3,052r	-	3,052r	2,873r	-	2,873r	2,849	-	2,849
Vehicles	8,733r	-	8,733r	9,176r	-	9,176r	9,395	-	9,395
Food, beverages, etc	21,844r	-	21,844r	21,947r	-	21,947r	21,433	-	21,433
Textiles, leather, etc	5,277r	-	5,277r	5,103r	-	5,103r	4,954	-	4,954
Paper, printing, etc	14,694r	-	14,694r	13,179r	-	13,179r	12,371	-	12,371
Other industries	6,958r	-	6,958r	6,653r	-	6,653r	6,447	-	6,447
Construction	1,868r	-	1,868r	1,750r	-	1,750r	1,636	-	1,636
Transport	-	-	-	-	-	-	-	-	-
Air	-	-	-	-	-	-	-	-	-
Rail	-	-	-	-	-	-	-	-	-
Road	-	-	-	-	-	-	-	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**488,158r**	-	**488,158r**	**385,329r**	-	**385,329r**	**436,714**	-	**436,714**
Domestic	389,595r	-	389,595r	293,400r	-	293,400r	339,080	-	339,080
Public administration	49,559r	-	49,559r	45,295r	-	45,295r	48,005	-	48,005
Commercial	36,369r	-	36,369r	34,609r	-	34,609r	37,045	-	37,045
Agriculture	1,969	-	1,969	1,778r	-	1,778r	1,536	-	1,536
Miscellaneous	10,665r	-	10,665r	10,247r	-	10,247r	11,048	-	11,048
Non energy use	**8,089r**	-	**8,089r**	**5,949r**	-	**5,949r**	**5,949**	-	**5,949**

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

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

(3) Total supply minus total demand.

(4) For an explanation of what is included under losses, see paragraphs 4.43 to 4.47.

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

GWh

	2008	2009	2010	2011	2012
Supply					
Production	810,385	694,741	665,083	526,734r	452,806
Imports	407,054	455,789	589,497	584,414	547,300
Exports	-122,670	-137,100	-176,399	-183,689	-144,023
Stock change *(2)*	-3,087	-4,876	+15,271	-22,623	-269
Transfers	-68	-351	-263	-60	-56
Total supply	**1,091,614**	**1,008,202**	**1,093,189**	**904,776r**	**855,758**
Statistical difference *(3)*	+4,456r	-3,994r	-2,539r	-3,989r	-2,145
Total demand	**1,087,158r**	**1,012,196r**	**1,095,729r**	**908,765r**	**857,903**
Transformation	**402,236**	**382,061**	**397,293**	**330,076r**	**236,537**
Electricity generation	376,810	359,303	373,586	307,140r	214,146
Major power producers	344,454	328,249	342,150	275,591	182,409
Autogenerators	32,357	31,054	31,436	31,548r	31,736
Heat generation	25,426	22,758	23,707	22,936r	22,392
Other	-	-	-	-	-
Energy industry use	**72,280**	**69,182r**	**69,048r**	**59,287r**	**55,709**
Electricity generation	-	-	-	-	-
Oil and gas extraction	61,292	61,110	61,124	53,163	48,461
Petroleum refineries	4,971	4,033r	3,841r	3,633r	3,278
Coal extraction	95	89	87	87	127
Coke manufacture	-	-	-	-	-
Blast furnaces	718	450	641	453	266
Other	5,204	3,499	3,355	1,951	3,578
Losses *(4)*	**13,623**	**16,356**	**18,737**	**14,559r**	**12,271**
Final consumption	**599,018r**	**544,598r**	**610,651r**	**504,842r**	**553,386**
Industry	**133,933r**	**113,142r**	**114,404r**	**113,564r**	**110,723**
Unclassified	34	29	25	21r	18
Iron and steel	6,920	5,037	5,827	5,569r	4,854
Non-ferrous metals	2,931r	2,236r	2,643r	2,428r	2,805
Mineral products	18,695r	15,248r	15,443r	14,604r	15,112
Chemicals	28,217r	24,017r	21,638r	23,639r	22,188
Mechanical engineering, etc	7,822r	5,812r	6,404r	6,623r	6,662
Electrical engineering, etc	3,725r	3,017r	3,052r	2,873r	2,849
Vehicles	8,560r	7,107r	8,733r	9,176r	9,395
Food, beverages, etc	23,003r	21,460r	21,844r	21,947r	21,433
Textiles, leather, etc	6,013r	5,167r	5,277r	5,103r	4,954
Paper, printing, etc	16,706r	14,936r	14,694r	13,179r	12,371
Other industries	9,017r	7,228r	6,958r	6,653r	6,447
Construction	2,289r	1,847r	1,868r	1,750r	1,636
Transport	-	-	-	-	-
Road	-	-	-	-	-
Other	**456,880r**	**424,569r**	**488,158r**	**385,329r**	**436,714**
Domestic	359,554	332,499	389,595	293,400r	339,080
Public administration	45,665r	45,233r	49,559r	45,295r	48,005
Commercial	38,448r	34,791r	36,369r	34,609r	37,045
Agriculture	2,161	1,760r	1,969	1,778r	1,536
Miscellaneous	11,052r	10,285r	10,665r	10,247r	11,048
Non energy use	**8,206r**	**6,887r**	**8,089r**	**5,949r**	**5,949**

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

	2008	2009	2011	2012	2013
Total production	**736**	**775**	**730**	**703**	**712**
Electricity generation	607	657	618	595	607
Coal extraction	95	89	87	87	87
Unclassified industries	34	29	25	21	18
Total consumption	**736**	**775**	**730**	**703**	**712**

(2) Stock fall (+), stock rise (-).
(3) Total supply minus total demand.
(4) For an explanation of what is included under losses, see paragraphs 4.43 to 4.47.

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

GWh

	2008	2009	2010	2011	2012
Upstream gas industry:					
Gross production *(2)*	809,649	693,965	664,353	526,030	452,094
Minus Producers' own use *(3)*	61,292	61,110	61,124	53,163	48,461
Exports	122,670	137,100	176,399	183,689	144,023
Plus Imports of gas	407,054	455,789	589,497	584,414	547,300
Gas available at terminals *(4)*	1,032,742	951,544	1,016,327	873,592	806,911
Minus Statistical difference *(5)*	213	-1,173	68	-662	-331
Downstream gas industry:					
Gas input into the national transmission system *(6)*	1,032,529	952,717	1,016,259	874,255	807,241
Minus Operators' own use (7)	4,265	2,810	3,211	1,791	1,682
Stock change (storage sites) *(8)*	3,087	4,876	-15,271	22,623	269
Metering differences *(5)*	5,759	9,111	10,848	8,037	6,099
Gas output from the national transmission system *(9)*	1,019,418	935,920	1,017,471	841,804	799,191
Minus Leakage assessment *(10)*	5,297	4,879r	5,316r	4,393r	4,157
Own use gas *(11)*	428	394	429	355	336
Theft *(12)*	2,139	1,971	2,147r	1,774r	1,679
Transfers *(13)*	68	351r	263r	60r	56
Statistical difference and metering differences *(5)*	4,243r	-2,820r	-2,611r	-3,327r	-1,814
Total UK consumption *(14)*	**1,007,242r**	**931,145r**	**1,011,927r**	**838,548r**	**794,779**
Stocks of gas (at end year) *(15)*	31,135	36,011	20,740	43,363	43,632
Storage capacity *(16)*	47,530	47,310	47,310	47,310	47,310

(1) For details of where to find monthly updates of natural gas production and supply see paragraph 4.42.
(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.
(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 4.43 to 4.47.
(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 4.10 to 4.15 for an explanation of the relationship between these "Total UK consumption" figures and "Total demand" shown within the balance tables.
(15) Due to storage reconciliations, own use and metering differences, over a long period of years the stock levels based on gas put into storage and gas taken out of storage no longer reconciled with storage levels reported by National Grid. For 2011 action was taken to rectify this.
(16) Data compiled by DECC from individual storage site information. Converted from billion cubic metres to GWh assuming 11.02 kWh per cubic metre.

4.4 Gas storage sites and import/export facilities in the United Kingdom at 31 May 2013

Owner	Site	Location	Capacity (Billion m^3)	Max flow rate (Million m^3/day)	Type	Status *(1)*
Operational storage						
Centrica Storage Ltd	Rough	Southern North Sea	3.30	41	Depleted field	Long
National Grid LNGS	Avonmouth	Bristol	0.08	13	LNG	Short
Scottish and Southern Energy	Hornsea	East Yorkshire	0.30	18	Salt cavern	Medium
EDF Trading	Holehouse Farm	Cheshire	0.05	11	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	0.30	40	Salt cavern	Medium
E.ON	Holford	Cheshire	0.20	22	Salt cavern	Medium

Facilities	Owner	Between / Location	Max flow rate (Million m^3/day)
Imports			
Operational pipelines			
Bacton-Zeebrugge Interconnector	Interconnector (UK) Limited	Zeebrugge and Bacton	74
BBL Pipeline	BBL Company	Balgzand and Bacton	53
Vesterled Pipeline	Gassco	Heimdal Riser Platform and St Fergus	36
Tampen Link	Gassco	Links Statfjord to FLAGS (terminating at St Fergus)	25
Gjøa Pipeline	Gassco	Links Gjøa/Vega to FLAGS (terminating at St Fergus)	17
Langeled Pipeline	Gassco	Nyhamna and Easington	69
Liquefied Natural Gas (LNG) terminals			
Isle of Grain	National Grid Grain LNG	Isle of Grain	56
Teesside GasPort	Excelerate	Teesside	11
South Hook	Qatar Petroleum and ExxonMobil	Milford Haven	58
Dragon	BG Group and Petronas	Milford Haven	21
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

	2008	2009	2010	2011	2012
Imports					
by pipelines from:					
Belgium *(2)*	12,174	7,945	13,568	4,032	14,264
The Netherlands *(3)*	90,563	69,529	87,120	69,001	78,258
Norway *(4)*	283,722	260,438	276,807	234,194	294,586
Liquefied Natural Gas (5)	8,912	110,579	203,789	270,733	147,879
of which:					
Algeria	*3,113*	*19,392*	*11,524*	*2,647*	*1,292*
Australia	-	*812*	-	-	-
Egypt	-	*5,804*	*1,263*	*877*	*143*
Nigeria	-	-	*3,674*	*12,833*	*468*
Norway	-	*1,862*	*8,904*	*9,965*	*1,709*
Qatar	-	*61,159*	*159,984*	*230,618*	*144,267*
Trinidad & Tobago	*5,799*	*21,550*	*16,646*	*5,816*	-
USA	-	-	-	*1,552*	-
Yemen	-	-	*1,794*	*6,425*	-
Total Imports	**395,371**	**448,491**	**581,284**	**577,960**	**534,987**
Exports to:					
Belgium *(2)*	45,949	62,084	95,932	101,526	50,343
The Netherlands *(6)*	10,389	13,094	15,830	17,544	23,729
Norway *(7)*	389	266	158	125	49
Republic of Ireland *(8)*	54,260	54,357	56,266	58,041	57,590
Total Exports	**110,987**	**129,801**	**168,186**	**177,236**	**131,711**
Net Imports *(9)*	**284,384**	**318,690**	**413,098**	**400,724**	**403,276**

(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 commercial flows of gas through the pipeline are used. Commercial 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, the Tampen Link (from Statfjord to FLAGS) and Gjoa/Vega (to FLAGS).

(5) From various sources to the Isle of Grain, Milford Haven and Teesside.

(6) Direct exports from the Grove, Chiswick, Markham, Minke, Stamford, Windermere and Wingate 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.

4.6 Liquefied Natural Gas imports by terminal

GWh

	2008	2009	2010	2011	2012
LNG Imports via:					
Dragon (*Milford Haven) (1)*	-	10,034	19,097	28,365	1,792
Isle of Grain (*Isle of Grain*) *(2)*	8,912	50,483	59,770	85,081	37,632
South Hook (*Milford Haven*) *(3)*	-	49,249	124,922	157,287	108,455
Teesside GasPort (*Teesside*) *(4)*	-	813	-	-	-
	8,912	**110,579**	**203,789**	**270,733**	**147,879**

(1) Dragon began importing LNG to the UK in August 2009.

(2) LNG imports at Canvey Island commenced in 1965 but ceased in the early 1980's when, with increasing supplies from the North Sea, imports were no longer required. UK natural gas production peaked in 2000 and as a result of falling production LNG imports recommenced at the Isle of Grain in 2005.

(3) South Hook began importing LNG to the UK in April 2009.

(4) Teesside GasPort was commissioned in February 2007.

Chapter 5
Electricity

Key points

- Electricity generation (including pumped storage) in the UK fell by 1.0 per cent, from 367 TWh in 2011 to 364 TWh in 2012. Total electricity supply (including net imports) increased by 0.6 per cent. (Tables 5.6 and 5.1)
- Gas's share of generation fell from 40 per cent in 2011 to 28 per cent in 2012, as generation from gas fell from 147 TWh to 100 TWh; coal's share rose from 30 to 39 per cent, as generation rose from 109 TWh to 143 TWh. These were respectively the fuels' lowest and highest levels since 1996, due to higher gas prices relative to coal. (Table 5.6)
- Renewables' share of generation increased from 9.4 per cent in 2011 to a new record 11.3 per cent in 2012, as a result of increased capacity. (Table 6B, in chapter 6)
- Low carbon electricity's share of generation increased from 28.2 per cent to a record 30.7 per cent, due to increased renewables generation and nuclear availability.
- Final consumption of electricity in 2012, at 318 TWh, was broadly unchanged on 2011 and at its lowest level since 1998. However, electricity used by the energy industries (particularly in generation) increased by 5.0 per cent, so overall electricity demand and supply increased. Within final consumption, domestic consumption increased by 2.8 per cent, reflecting the colder final quarter. (Table 5.1).
- Total UK Transmission Entry Capacity at the end of 2012 was unchanged at 89 GW, with the closure of several stations offset by new renewable and CCGT capacity. (Table 5.7)
- The UK remained a net importer of electricity in 2012, with net imports contributing 3.2 per cent of electricity supply, the highest share since 2000. (Table 5.1)

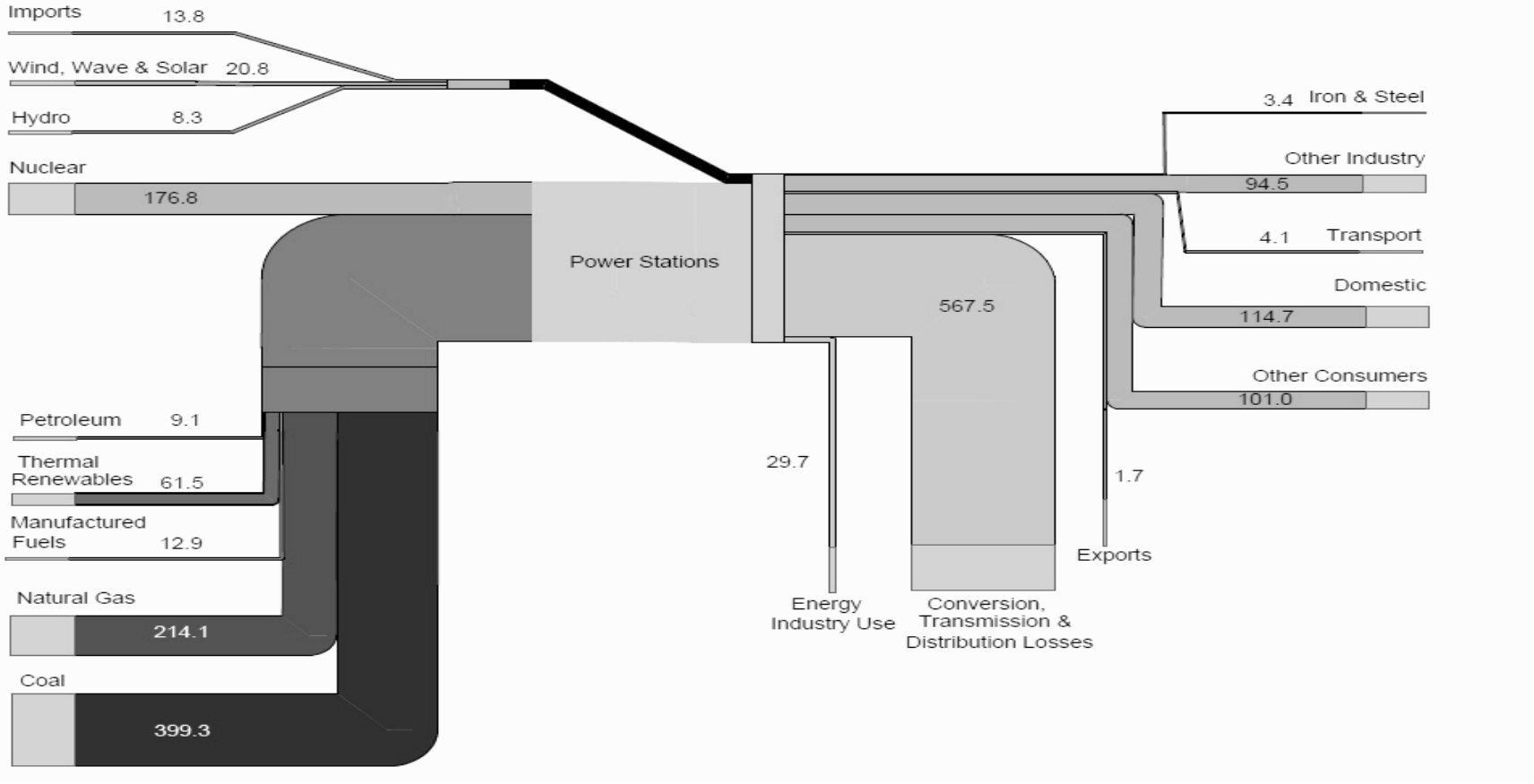
Introduction

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 128).

5.2 An energy flow chart for 2012, 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 of 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. 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 can be found on DECC's energy statistics website,at:www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

Electricity flow chart 2012 (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) Hydro includes generation from pumped storage while electricity used in pumping is included under Energy Industry Use.

Commodity balances for electricity (Tables 5.1 and 5.2)

5.4 In 2012, total electricity supply was 376 TWh, a rise of 0.6 per cent on 2011. Of this, almost 97 per cent of UK electricity supply was home produced and just over three per cent was from imports, net of exports. For electricity, supply is totally driven by demand – the impacts of a colder 2012, particularly in the final quarter, and of improving energy efficiency and lower consumption in the industrial sector, left final consumption unchanged, with the increase in supply due to greater energy industry use (see paragraph 5.13). In 2011, a mild winter had caused demand, and thus supply, to fall to its lowest level since 1997, while in 2010 a very cold final quarter resulted in a 1.3 per cent increase in supply compared to 2009. Prior to this, 2005 to 2009 had all shown falls in supply (compared to the previous year) after continuous growth since 1997. Table 5A below summarises the trend in total generation and supply over the last three years.

Table 5A: Electricity generation and supply

GWh

	2010	2011	2012
Total Generation (excl. pumped storage)	378,608	364,548	360,869
Total Supply	384,422	373,676	375,880

5.5 In 2012, indigenous production fell by 1.0 per cent on 2011, to its lowest level since 1997. Of the 361 TWh produced (excluding pumped storage production), 90 per cent was from major power producers and 10 per cent from other generators, while 27 per cent was from primary sources (including nuclear, wind and hydro) and 73 per cent from secondary sources (including coal, gas and oil).

5.6 Net imports in 2012 were up by 94 per cent on 2011, to 12.0 TWh. This was due to imports rising by 59 per cent, and exports falling by 29 per cent, the highest level of imports since 2000 and lowest level of exports since 2008. This followed a doubling of net imports in 2011, from 2010's seven year low. In 2012, net imports from continental Europe almost doubled, to 12.2 TWh, with the French interconnector providing 6.4 TWh and the Netherlands interconnector (which opened in April 2011) 5.8 TWh. Continental Europe accounted for 99 per cent of imports to the UK. A 4.5 per cent rise in net exports to the Republic of Ireland (via the Northern Ireland interconnector and the new Wales interconnector, which opened in July 2012) was also seen, which accounted for 22 per cent of UK exports in 2012[1]. Net imports contributed 3.2 per cent of electricity supply in 2012, up from 1.7 per cent in 2011.

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 5.25 to 5.32.

5.8 Overall electricity demand rose by 0.5 per cent, from 374 TWh in 2011 to 376 TWh in 2012 [2]. Of total demand, 30 TWh (8 per cent) was used within the energy industry, 29 TWh (8 per cent) was accounted for by losses, and 318 TWh (84 per cent) was final consumption, which fell by 0.1 per cent on 2011, remaining at its lowest level since 1998.

5.9 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. In 2012, temperatures were on average 1.0 degrees cooler than in 2011. Whilst the first quarter was 0.5 degrees warmer, the final quarter was 2.3 degrees cooler than the particularly warm final quarter in 2011, and included the coldest October since 2003. In addition, April 2012 was the coldest April for at least twenty years, meaning the heating season was extended. In 2011, temperatures were on average 1.8 degrees warmer than in 2010 and the warmest since 2006. The first quarter was warmer than the previous two years, while the final quarter was 4.1 degrees higher than a year earlier, and the warmest since prior to 1970.

5.10 With the colder temperatures in 2012, domestic consumption rose by 2.8 per cent on 2011, from 112 TWh to 115 TWh. However, it remained 3.5 per cent lower than 2010's 119 TWh. This was

[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.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-trends

[2] The term statistical difference is used to define the difference between total supply and total demand – see paragraph 5.90

following a decline in 2011 to the lowest level since 2000, on account of a mild winter and continuing energy efficiency improvements. Commercial sector consumption in 2012 also rose on 2011's level, by 0.9 per cent, to 78 TWh. Agriculture consumption fell by 1.9 per cent, while public administration consumption rose by 2.7 per cent on 2011.

5.11 With the manufacturing sector continuing to slow in 2012, industrial consumption of electricity decreased again, by 4.4 per cent on 2011, from 102 TWh to 98 TWh, its lowest level in the last sixteen years. Consumption fell steeply in the non-ferrous metal (due to the closure of the Alcan Lynemouth aluminium smelter during the year), and the iron and steel sectors in 2012, with much smaller falls seen in other sectors.

5.12 Consumption in the transport sector was up slightly in 2012, at 4.1 TWh, with a small increase in numbers of electric road vehicles. Despite this, 99 per cent of transport electricity consumption remained by Rail.

5.13 Industrial consumption was 26 per cent of total demand for electricity, less than the share of consumption by households (30 per cent), with transport and the services sector accounting for 28 per cent. Within the industrial sector, the three largest consuming industries are chemicals, paper and food, which together account for 40 per cent of industrial consumption. Taken together, the engineering industries accounted for a further 19 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 can be found in paragraph 5.86. Chart 5.1 shows the total demand for electricity in 2012, by final consumer.

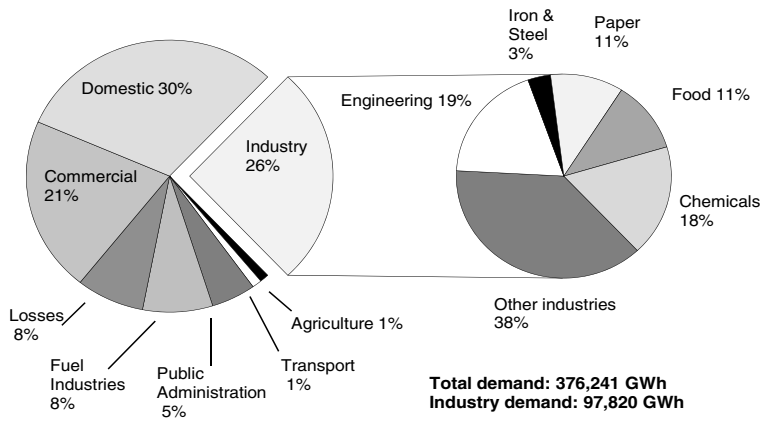
5.14 Consumption by the energy industries rose by 5.0 per cent, to its highest level since 2008, having fallen to its lowest level in the last sixteen years in 2011 (in part due to low levels of generation). This increase was largely driven by an increase in the amount of electricity used in generation, which accounts for 61 per cent of the energy industries' total use of electricity. This increase was due to the rise in generation from coal power stations (which use more electricity in production than gas stations). Additionally, 13 per cent of energy industry use is accounted for by pumping at pumped storage stations (see 'pumped storage' line in tables 5.1 and 5.2), while petroleum refineries are the next most significant consumer with 15 per cent of energy industry use. Energy industry use as a proportion of total demand was 7.9 per cent in 2012, up 0.3 percentage points on 2011.

5.15 Losses as a proportion of electricity demand in 2012, at 7.7 per cent, were up by 0.2 percentage points on 2011 (7.5 per cent). The losses item has three components[3]:

- transmission losses (6.8 TWh) from the high voltage transmission system, which represented about 23 per cent of the figure in 2011;
- distribution losses (21.1 TWh), which occur between the gateways to the public supply system's network and the customers' meters, and accounted for about 73 per cent of losses; and
- theft or meter fraud (1.0 TWh, around 4 per cent).

[3] See paragraph 5.78 for further information on the calculation of losses.

Chart 5.1: Electricity demand by sector 2012



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

5.16 Table 5.3 expands on the commodity balance format to show consumption divided between electricity distributed over the public distribution system (PDS) and electricity provided by other generators (largely autogeneration and generation from renewable sources). Major power producers (MPPs) provide the majority of power to the PDS, with the remainder made up of transfers from other generators and net imports. Further information on the definitions of other generators and MPPs can be found in paragraph 5.66. Table 5.3 also expands 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).

5.17 The proportion of electricity supplied by generators other than MPPs was largely unchanged at 9.5 per cent in 2012 (compared to 9.4 per cent in 2011). Of electricity supplied by other generators, 47 per cent (16.7 TWh) was transferred to the public distribution system in 2012, an increase of around three percentage points on 2011.

5.18 In 2012, 4.2 per cent of final consumption of electricity was by other generators and did not pass over the public distribution system. This was similar to the 4.1 per cent in 2011. A substantial proportion of electricity used in the energy industries is self-generated (around 20 per cent in all three years shown in the table). At petroleum refineries the proportion is even higher; in 2012, 69 per cent of electricity consumed was self-generated.

5.19 In 2012, 8.7 per cent of the industrial demand for electricity was met by autogeneration, a fall of 1.6 percentage points on the 10.3 per cent 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.

5.20 Of the electricity consumed by the domestic sector in 2012, 21 per cent was reported as being purchased under some form of off-peak pricing structure (e.g. Economy 7), unchanged from 2011, but very slightly lower than in 2010. Sixteen per cent of consumption was through prepayment systems, broadly unchanged from the level in 2011.

5.21 Domestic consumption of electricity produced by other generators is also included in the table from 2010. This relates to electricity produced, and consumed, by households with micro-generation units (such as solar photovoltaic panels) installed. The number of these installations has increased sharply since the Great Britain Feed in Tariff (FiT) scheme was launched in April 2010 (see paragraph 6.13 for further information on FiTs uptake). In 2012, consumption of self produced electricity by the domestic sector had more than quadrupled that of 2011, to stand at 543 GWh, a twenty-fold increase on the 26 GWh of 2010.

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

5.22 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[4] as well as showing generation from conventional steam stations and from combined cycle gas turbine stations over the most recent five years.

5.23 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.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

5.24 Fuel used in 2012 rose 1.9 per cent, from 76.9 million tonnes of oil equivalent (mtoe) to 78.4 mtoe. The increase in fuel use, but decrease in generation (see paragraph 5.25), is due to the increase in generation from coal stations (at the expense of gas), which have a lower thermal efficiency than gas, and thus require more fuel for each unit of generation. Of the increase in fuel use, coal use rose by 32 per cent, while gas use fell by 30 per cent. See paragraph 5.46 for further information on thermal efficiencies.

5.25 Total electricity generated (including pumped storage) in the United Kingdom in 2012 was 364 TWh, a decrease of 1.0 per cent on the 367 TWh in 2011. Major power producers (MPPs, as defined in paragraph 5.67) accounted for 90 per cent of electricity generation in 2012. Generation by MPPs was down 1.3 per cent on 2011, at 328 TWh, while generation by other generators was 1.7 per cent up on a year earlier, at 36 TWh.

5.26 Generation from gas fell by 32 per cent, from 147 TWh in 2011 to 100 TWh in 2012, the lowest level since 1996. This was mainly due to high gas prices, particularly relative to coal, making it comparatively more expensive to generate, as well as greater generation from renewables. As a result, several stations have been running at low levels or were closed or mothballed during 2012 (see table 5B). In 2012, generation from coal, with lower prices, increased 32 per cent, from 109 TWh in 2011 to 143 TWh, the highest level since 1996. This increase was all due to Major Power Producers as generation from coal by autogeneration plants fell by 20 per cent between 2012 and 2011 (from 4 TWh to 3 TWh). This was largely due to the closure of Alcan Lynemouth aluminium smelter which used electricity generated by the coal fired power station at Lynemouth.

5.27 In 2012, despite the closure of the second half of Oldbury station, and one half of Wyfla (the remaining magnox station), increased availability at other stations resulted in a 2.1 per cent increase in generation from nuclear, from 69 TWh to 70 TWh. This was following an 11 per cent increase in 2011, after extensive maintenance outages in 2010 (particularly to Sizewell B which was offline for six months).

5.28 In 2012, generation from oil continued to fall, to 3.1 TWh, a 1.6 per cent reduction on 2011, and its lowest level in the last sixteen years, and a fall of 3.6 TWh on 2008's ten year high.

5.29 Generation by all renewable sources[5] rose 19 per cent, to 41 TWh, between 2011 and 2012. Much increased capacity in 2012 resulted in overall wind and solar generation [6] increasing by 32 per cent to 21 TWh. With rainfall levels (in the main hydro areas) in 2012 around one quarter of that of 2011, hydro generation fell by 7.1 per cent, from 5.7 TWh to 5.3 TWh. Over the same period, generation from bio-energy (including biodegradable wastes) rose 15 per cent to 15 TWh, with the

[4] Conversion factors for switching between mtoe, GWh and other units of energy can be found on page 225 and inside back cover flap.

[5] Renewables includes wind, natural flow hydro, solar, wave, tidal and bioenergy (including co-firing).

[6] Including generation from wave and tidal.

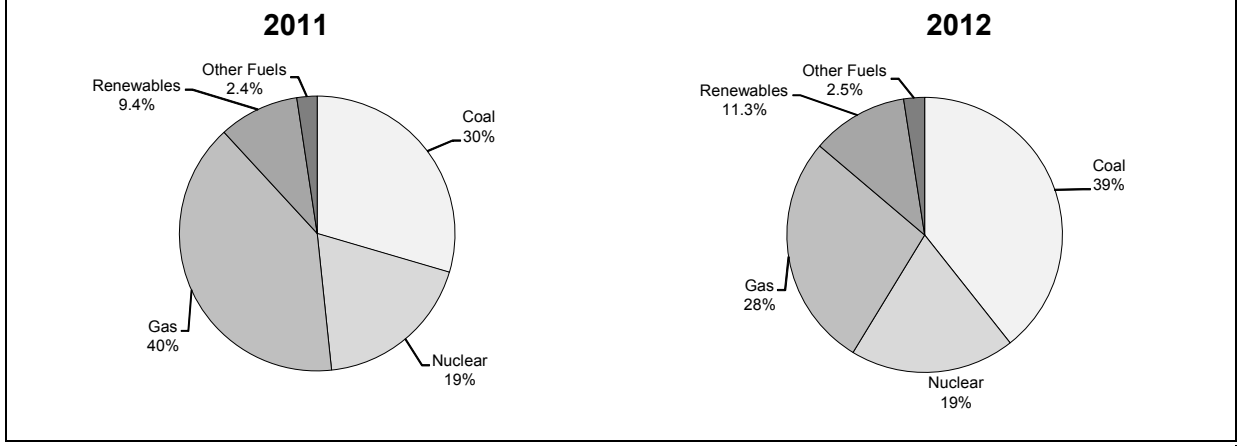
conversion of Tilbury coal power station to biomass.[7] More information on renewable electricity can be found in Chapter 6.

5.30 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 in 2012 was 1.5 per cent less than in 2011, at 346 TWh. For gas-fired stations it was 32 per cent less, for coal it was 32 per cent more, while for nuclear stations it was 2.1 per cent more.

5.31 Chart 5.2 shows the shares of 2012 generation by fuel, on an output basis (i.e. the percentage of electricity generated by the fuel), compared with 2011. Further information on this, and the alternative, input basis, of comparing fuel use, can be found in paragraphs 5.74 to 5.75

5.32 Gas's share of generation in 2012, at 28 per cent, was 12 percentage points lower than in 2011. Coal's share, at 39 per cent, was nine percentage points more than in 2011. Nuclear's 19 per cent share was unchanged from 2011. Renewables' share increased from 9.4 per cent in 2011 to a new record 11.3 per cent in 2012. Other fuels, including oil and pumped storage, increased from 2.4 per cent in 2011 to 2.5 per cent in 2012.

Chart 5.2: Shares of electricity generation, by fuel



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

5.33 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 Annex A, paragraphs A.7 to A.42.

Plant capacity (Tables 5.7, 5.8 and 5.9)

5.34 Table 5.7 shows capacity, i.e. the maximum power available at any one time, for major power producers and other generators by type of plant. From 2006 onwards, major power producers (MPPs) capacities are measured in Transmission Entry Capacity (TEC) terms, rather than Declared Net Capacity (DNC) [8].

5.35 In 2012, total capacity of all generators was 89,241 MW, largely unchanged from the 89,050 MW installed at the end of 2011. For MPPs, there was a decrease of 41 MW, from 81,783 MW to 81,742 MW, with additions in capacity being out-weighed by reductions. With the opening of two new stations, Pembroke and West Burton, CCGT capacity increased by 2,930 MW in 2012 (net of closures of several stations). This was following a fall of 1,541 MW in 2011 (mainly due to the mothballing of Teesside power stations and the closure of Fife power station). However, the closure of Kingsnorth A (having used up its allocated running hours under the Large Combustion Plant Directive) and Grain A

[7] For consistency with the Renewables chapter (Chapter 6), non-biodegradable wastes (previously included in thermal renewables / bio-energy) have been moved to the 'other fuels' category for 2007 onwards. Prior to this, they remain in thermal renewables.

[8] The effect of this change has been to increase the capacity of MPPs by about 2,000 MW in total. A full definition of TEC and DNC is given in paragraph 5.79. Wind, small scale hydro, and solar photovoltaics DNC is de-rated to take into account intermittency. Renewables installed capacity figures are given in table 6.4.

power stations in late 2012 reduced mixed-fired and oil-fired capacity by a combined 3,240 MW. Following the closure of one half of Oldbury nuclear power station in 2011, the remaining half closed in 2012, along with one half of Wylfa, thus reducing nuclear capacity by 717 MW. After an increase of 380 MW in 2011, wind capacity (de-rated, see paragraph 5.79) increased by a further 1,037 MW, with many new sites opening, including the completion of four, as well as the partial opening of two, new large offshore wind farms. Additionally, around 117 MW of wind capacity was reclassified from other generators to MPPs. As noted above, the past three years have seen the closure, capacity reduction, full or partial mothballing, or conversion to biomass, of several large power stations. These are summarised in table 5B below.

Table 5B: Major Power Producers capacity closed, converted or reduced (as at end of May 2013), since end-2010

Site	Fuel	Status	Previous Capacity (MW)	New Capacity (MW)	Year of closure, capacity reduction or conversion
Fife	CCGT	Closed	123	0	2011
Tilbury B	Coal (1)	Converted	1,063	750	2011
Teesside	CCGT (2)	Mothballed	1,875	45	2011
Oldbury	Nuclear (3)	Closed	434	0	2012
Wylfa (Reactor 1)	Nuclear (4)	Partially Closed	980	490	2012
Shotton	CCGT-CHP	Closed	45	0	2012
Kingsnorth A	Coal/Oil	Closed	1,940	0	2012
Derwent	CCGT-CHP	Closed	228	0	2012
Grain A	Oil	Closed	1,300	0	2012
Kings Lynn	CCGT	Mothballed	340	0	2013
Cockenzie	Coal	Closed	1,152	0	2013
Didcot A	Coal/Gas	Closed	1,958	0	2013
Fawley	Oil	Closed	1,036	0	2013
Ironbridge	Coal (1)	Converted	940	900	2013
Drax	Coal (5)	Partially Converted	3,870	3,870	2013
Roosecote	CCGT	Mothballed	229	0	2013
Keadby	CCGT	Mothballed	749	0	2013
Uskmouth	Coal (6)	Partially Closed	363	240	2013

(1) Converted from coal to dedicated biomass

(2) Reduced capacity from 1,875 MW (CCGT 1,830 MW / OCGT 45 MW) to 45 MW (OCGT)

(3) Reactor 2 with capacity of 217 MW closed on 30 June 2011, reactor 1 with capacity of 217 MW closed on 29 February 2012

(4) Reactor 2 with a capacity of 490 MW closed on 30 April 2012

(5) Partly converted to biomass. Overall capacity remains at 3,870 MW (coal 3,225 MW, biomass 645 MW)

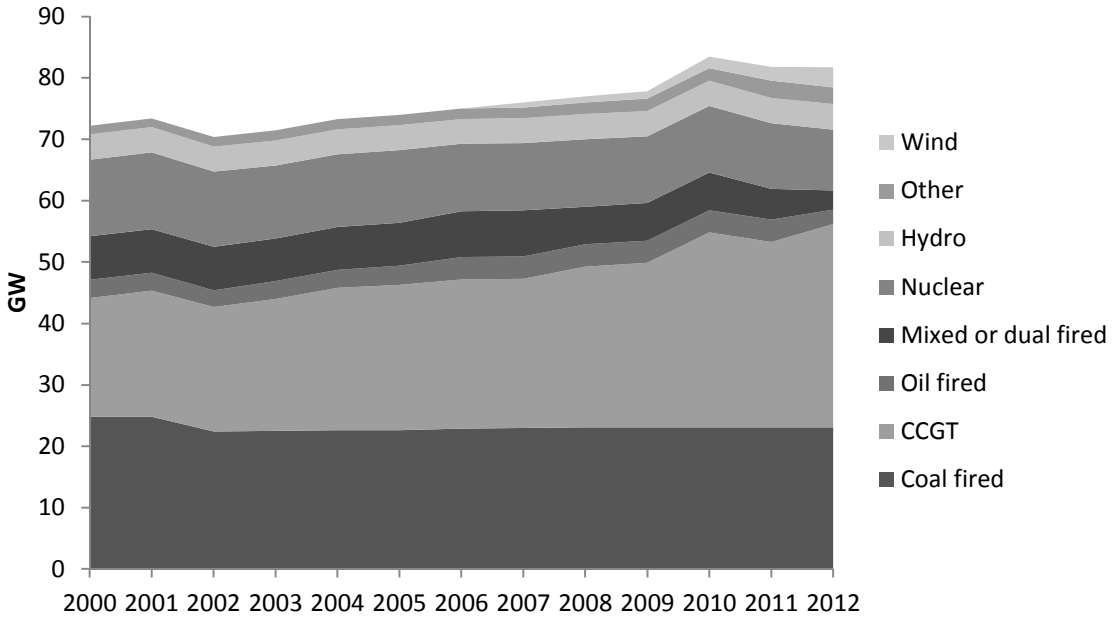
(6) One unit closed in April 2013

5.36 At the end of 2012, MPPs accounted for 92 per cent of the total generating capacity, unchanged from the previous four years. The capacity of other generators increased by 231 MW (3.2 per cent), with a 240 MW increase in capacity from renewables other than hydro and wind [9] offset by a net 53 MW decrease in wind, mainly due to the reclassification of capacity to MPPs. A breakdown of the capacity of the MPPs' plants at the end of December each year from 2000 to 2012 is shown in Chart 5.3.

5.37 Table 5.8 separates the capacities of MPPs geographically to show England and Wales, Scotland and Northern Ireland. In 2012, 84 per cent of the generating capacity in the UK owned by MPPs was in England and Wales, 13 per cent was in Scotland and 3 per cent in Northern Ireland. Out of the net decrease in UK capacity of 41 MW between 2011 and 2012, 476 MW was in England and Wales, with Scotland showing a net increase of 436 MW. Northern Ireland's capacity was unchanged at 2,436 MW.

[9] Approximately 104 MW of this increase is due to solar photovoltaic capacity installed under the Feed in Tariff (FiT) scheme. For further information on FiTs, see paragraph 6.11.

Chart 5.3: Generating capacity of major power producers 2000-2012



(1) 'Other' includes: Gas turbines, oil engines and renewables other than hydro.
(2) 'Hydro' includes Natural flow and pumped storage.
(3) 'Mixed or dual fired' includes non-CCGT stations that can be fuelled by a combination of gas, coal and oil
(4) Wind included from 2007

5.38 In Table 5.9, data for the generating capacity for generators other than MPPs are shown according to the industrial classification of the generator. For CHP, 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 2012, the chemicals sector and the oil and gas terminals and oil refineries sector each had 14 per cent of capacity, while engineering and other metal trades had a nine per cent share and paper, printing and publishing and food, drink and tobacco had a six per cent share each. In 2012, 47 per cent of capacity was in the commercial and domestic sectors, a two percentage point increase on a year earlier.[10]

5.39 In addition to tables 5.7-5.9, a new table, 5.13, showing installed capacity, disaggregated by connection type (high voltage or low voltage) and technology, can be found on DECC's energy statistics website, at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

Plant loads, demand and efficiency (Table 5.10)

5.40 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 5.53), England, Wales and Scotland are covered by a single network and a single maximum load is shown for Great Britain for 2006 to 2012.

5.41 Maximum load (demand) in the UK during the winter of 2012/2013 occurred on 12 December 2012. At 57,490 MW, this was 0.7 per cent lower than the previous winter's maximum on 8 February 2012. In 2012/13, the maximum load in Great Britain occurred on 12 December 2012 at the half hour period ending 17:30 (55,765 MW). However, in Northern Ireland the maximum load occurred on 11 December 2012 at the period ending 17:30 (1,726 MW), which was 0.8 per cent below that of the previous winter. In Great Britain the highest ever load met was 60,118 MW on 10 December 2002.

[10] The total capacity of 'Other Generators' fell in 2007 as, from this point, the capacity of major wind farm operators are included under MPPs (see paragraph 5.68). 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.

5.42 Maximum demand in 2012/2013 was 70 per cent of the UK capacity of major power producers (MPPs) (as shown in Table 5.7) as measured at the end of December 2012, unchanged on 2011/2012.

5.43 In Great Britain, maximum demand in December 2012 was 70 per cent of the England, Wales and Scotland capacity of MPPs (Table 5.8) unchanged on that for winter 2011/12. For Northern Ireland, the proportion was 71 per cent (71 per cent in 2010/11). These percentages do not include the capacities available via the interconnectors with neighbouring grid systems nor demand for electricity via these interconnectors.

5.44 Plant load factors measure how intensively each type of plant has been used. The load factor of nuclear stations in 2012 at 70.8 per cent was 4.4 percentage points higher than in 2011, due to increased availability of stations. However, it was 9.3 percentage points below the peak load factor of 80.1 per cent in 1998. With generation from gas at its lowest level since 1996, the CCGT load factor fell by 17 percentage points to a record low of 30.4 per cent. This was following reductions in each year since 2009, from 2008's eight-year high of 71.0 per cent. Between 2011 and 2012, the load factor for coal fired power stations increased by 16 percentage points, to 57.1 per cent, as generation reached a sixteen year high.[11] With the implementation of the Large Combustion Plant Directive, as well as higher prices relative to gas, restricting their use, coal fired stations' load factor fell continuously between 2005 (63.0 per cent) and 2009.

5.45 Load factors for natural flow hydro and wind (as well as other renewables) can be found in table 6.5.[12] Slightly lower wind speeds in 2012 resulted in a fall in the overall wind load factor (on an unchanged configuration basis) of 1.3 percentage points, from 29.3 per cent in 2011 to 28.1 per cent in 2012. Onshore wind fell from 27.2 per cent to 25.6 per cent, while offshore wind fell from 35.0 per cent to 33.7 per cent, but still higher than the load factor for CCGT stations in 2012. Following the high levels of 2011, rainfall (in the main hydro areas) fell by one quarter in 2012, leading to a fall in the hydro load factor (on an unchanged configuration basis) of 6.2 percentage points, from 41.7 per cent to 35.4 per cent in 2012.[13] Pumped storage use is less affected by the dry weather and the load factor fell successively from 2009 to 2011, from 2008's peak, as lower peak time demand for electricity and lower prices deterred its use. In 2012, the load factor increased by 0.3 percentage points, to 12.3 per cent, with the increasing amount of generation from wind at off-peak times a possible factor behind this.

5.46 Thermal efficiency measures the efficiency with which the heat energy in fuel is converted into electrical energy. An increase in new, more efficient, CCGT capacity in 2010 resulted in an increase to the overall thermal efficiency of these stations of one percentage point in each of 2010 and 2011, to a record high of 48.5 per cent. However, this dropped to 47.7 per cent in 2012 as stations were used more intermittently and were thus not able to achieve such high efficiencies. Prior to this, with little new capacity coming online, it had remained between 45.5 and 47.2 per cent. Since the closure of older, less efficient stations in 2006, the efficiency of nuclear stations increased to a peak in 2009 of 39.0 per cent. However, in 2010, as was the case in 2008, maintenance outages counteracted these efficiency gains, with the efficiency falling to 38.4 per cent. After falling further in 2011, the efficiency increased to a record 39.8 per cent in 2012. The efficiencies presented here are calculated using **gross** calorific values to obtain the energy content of the fuel inputs. [14]

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[11] The load factors for coal and nuclear may have been biased upwards by capacity closing towards the end of the year.

[12] The load factors presented in table 5.10 use transmission entry capacity (as presented in table 5.7). For hydro and wind, this has been de-rated for intermittency, so is not suitable for calculating load factors. The installed capacity measure used in Chapter 6 has not been de-rated.

[13] For renewables load factors, including the unchanged configuration and standard (average beginning and end of year) measures, see table 6.5

[14] For more information on gross and net calorific values, see paragraph 5.81

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

5.47 Table 5.11 lists the operational power stations owned by Major Power Producers in the United Kingdom as at the end of May 2013, along with their installed capacity and the year they began to generate electricity. Where a company operates several stations they are grouped together.

5.48 Table 5.12 shows CHP schemes of 1 MW and over for which the information is publicly available. However, 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 7), since CHPQA information for individual sites is not publicly available.

5.49 In Table 5.11, generating stations using renewable sources are also listed in aggregate form in the "Other power stations" section apart from hydro, wind and biomass/waste stations operated by the major power producers, which appear in the main table. For completeness, CHP stations not appearing in the main table are included in aggregate in this section. Details of the interconnectors between England and France, England and the Netherlands, Scotland and Northern Ireland, Northern Ireland and the Irish Republic, and Wales 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 82,909 MW. [15]

Carbon dioxide emissions from power stations

5.50 It is estimated that carbon dioxide emissions from power stations accounted for 33 per cent of the UK's total carbon dioxide emissions in 2012. Emissions vary by type of fuel used to generate the electricity and emission estimates for all electricity generation for 2010 to 2012 are shown in Table 5C below.

Table 5C: Estimated carbon dioxide emissions from electricity generation 2010 to 2012 *(1)(2)*

Fuel	Emissions (tonnes of carbon dioxide per GWh electricity supplied)		
	2010	2011	2012 *(3)*
Coal	906	906	895
Gas	396	391	415
All fossil fuels	594	614	700
All fuels (including nuclear and renewables)	457	440	483

(1) The carbon intensity figures presented in Table 5A are different to those produced for the Greenhouse Gas Inventory(GHGI). The differences arise due to slightly differing methodologies, including geographical coverage and treatment of autogenerators but principally because the GHGI presents figures based on a 5-year rolling average whereas those in Table 5A are presented as single year figures.

(2) The numerator includes emissions from power stations, with an estimate added for auto-generation. The denominator (electricity supplied by all generators) used in these calculations can be found in table 5.6, with the figure for All fuels in 2012 being 341,856 GWh.

(3) The 2012 emissions figures are provisional.

Sub-national electricity data

5.51 The collection of data relating to regional and local consumption of electricity began in 2004. For details of the availability of local level electricity (and gas) data see Chapter 4, paragraph 4.26 and the sub-national electricity statistics pages of the DECC energy statistics website: www.gov.uk/government/organisations/department-of-energy-climate-change/series/sub-national-electricity-consumption-data. A summary of electricity consumption at regional level is given in Table 5D and relates to 2011. The regional data will not sum exactly to the figures given in table 5.5 as the regional data are not based exactly on a calendar year and are obtained via different data sources.

[15] The total installed capacity for stations listed in table 5.11 differs from the total in table 5.7, as the latter is on a Transmission Entry Capacity basis, and taken as at the end of 2012. See paragraph 5.78 for more information on the measures of capacity.

Table 5D: Electricity sales 2011

	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	13,374	3,396	26,572	399	39,946
South East	16,361	3,712	22,660	330	39,021
North West	12,406	3,139	18,610	233	31,015
Scotland	11,150	2,747	15,508	212	26,658
East of England	11,193	2,547	14,954	214	26,147
West Midlands	9,747	2,371	14,862	193	24,609
South West	10,489	2,429	13,826	246	24,315
Yorkshire and the Humber	8,884	2,338	15,239	178	24,123
East Midlands	7,985	1,985	12,598	155	20,582
Wales	5,287	1,375	9,939	124	15,226
North East	4,209	1,195	7,472	80	11,681
Unallocated Consumption	236	66	2,801	23	3,037
Sales direct from high voltage lines *(2)*					4,237
Great Britain	111,321	27,301	175,040	2,386	286,361
Northern Ireland *(3)*					7,939
Total					298,537

(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

5.52 Since May 1999, all of the domestic electricity market in Great Britain has been open to competition. By December 2012, 16.2 million electricity consumers (62 per cent) were no longer with their home supplier. Table 5E gives market penetration in the fourth quarter of 2012, showing that by the end of 2012, the home suppliers (i.e. the former regional electricity companies) had lost 55 per cent of the credit, 67 per cent of the direct debit, and 61 per cent of the prepayment market. However, as Table 5E shows there is considerable regional variation with much higher retention in Northern Scotland and South Wales.

Table 5E: Domestic electricity market penetration (in terms of percentage of customers supplied) by Public Electricity Supply area and payment type, fourth quarter of 2012

	Home Supplier			Non-Home Supplier		
Region	Credit	Direct Debit	Prepayment	Credit	Direct Debit	Prepayment
North West	40	24	32	60	76	68
East Midlands	44	30	36	56	72	64
West Midlands	36	27	26	64	73	74
Merseyside and North Wales	39	32	42	61	68	58
Eastern	46	27	30	54	73	70
Yorkshire	36	27	25	64	73	75
North East	36	29	22	64	71	78
South East	42	31	37	58	69	63
London	44	37	44	56	63	56
Southern Scotland	44	40	54	56	60	46
South West	46	33	43	54	67	57
Southern	59	44	51	41	56	49
South Wales	64	52	69	36	48	31
Northern Scotland	79	61	65	21	39	35
Great Britain	45	33	39	55	67	61

Structure of the industry

5.53 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.

5.54 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 flotations. At the end of 2012, there were 34 major power producers operating in Great Britain [16]. 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 5.52 and Table 5E give more details of the opening up of the domestic gas and electricity markets to competition.

5.55 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 customers. This transmission system is linked to that of continental Europe via an interconnector to France under the English Channel and, since 1 April 2011, to the Netherlands under the North Sea (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 also took on responsibility for operating the system in Scotland, to form a single Great Britain transmission network.

5.56 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.

5.57 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. In July 2012, an interconnector between the Irish Republic and Wales began operations.

5.58 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,

[16] Some of these producers are joint ventures and so the number of generating companies involved is less than 34.

as system operator, to balance the system, and a settlement process. In April 2005 this system was extended to Scotland under BETTA.

Comparisons of electricity in the European Union in 2011[17]

5.59 The European Union (EU) as a whole generated 3,258 TWh of electricity in 2011. Of this, 11 per cent was generated in the UK. Germany generated the largest share of electricity in the EU, with 18 per cent. Industry had 37 per cent of EU final electricity consumption, households 29 per cent, services 29 per cent and transport two per cent.

5.60 In 2011, the largest source of the EU's generation was Nuclear, with 28 per cent of total generation. Coal had a 26 per cent share, and gas 21 per cent. France sources the largest share of its generation from nuclear, with 79 per cent, while 40 per cent of Sweden's electricity is from nuclear. The largest shares of coal in the generation mix are in Germany (with over half coming from lignite/brown coal), with 43 per cent, and Denmark, with 40 per cent. Italy and the UK source most of their electricity from gas, with 48 per cent and 40 per cent of generation respectively in 2011.

5.61 Renewables represented 21 per cent of the EU's generation. Sweden sources 56 per cent of its electricity from renewables (mainly hydro, but also 8 per cent from biomass). Denmark's 40 per cent renewables share comes from wind (28 per cent) and biomass (12 per cent), the highest share of generation from wind in the EU. Spain's 30 per cent renewables share comes mainly from wind (15 per cent) and hydro (11 per cent). Italy had 27 per cent of its generation from renewables, with Germany and France 21 per cent and 11 per cent respectively.

5.62 France's exports, net of imports, were ten per cent of its generation in 2011, making it the highest net exporter of electricity. For Italy, however, net imports represented 15 per cent of its electricity requirements, making it the highest net importer.

[17] At the time of writing, the latest available data were for 2011. Data from Eurostat, at: http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/introduction

The Electricity Supply System in Great Britain in 2012

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 161 of Chapter 6).

Technical notes and definitions

5.63 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 1.28 to 1.62. 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.

Electricity generation from renewable sources

5.64 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 6.

Combined heat and power

5.65 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 7.

Generating companies

5.66 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. Additionally (and particularly since 2010), this category includes generation from the domestic sector.

5.67 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.

5.68 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.

5.69 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.

5.70 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.

5.71 **Major power producers at the end of 2012 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., DONG Energy Burbo UK Ltd., Drax Power Ltd., EDF Energy plc., Eggborough Power Ltd., E.On UK plc., Energy Power Resources, Falck Renewables Ltd., GDF Suez Teesside Power Ltd., Immingham CHP, Infinis plc., International Power Mitsui, LondonWaste Ltd., Magnox North Ltd., Peel Energy Ltd., Premier Power

Ltd., RGS Energy Ltd, Riverside Resource Recovery 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., Statkraft Energy Ltd.

5.72 **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

5.73 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

5.74 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

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

5.75 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 four percentage points in 2012) compared with the fuel input basis. This is because of the higher conversion efficiency of gas.

Public distribution system

5.76 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

5.77 The various sectors used for sales and consumption analyses are standardised across all chapters of the 2013 Digest. For definitions of the sectors see Chapter 1 paragraphs 1.56 to 1.60 and Annex A paragraphs A.31 to A.42.

Losses

5.78 The losses component of electricity demand are calculated as follows:
Transmission losses: electricity lost as a percentage of electricity entering the GB transmission system (as reported by National Grid); this is applied to the electricity available figure in DUKES 5.5 (353,900 GWh in 2012).
Distribution losses: electricity lost in distribution as a percentage of electricity entering the distribution system (as reported by the distribution network operators); this is applied to electricity available less transmission losses.
Theft: a fixed percentage of 0.3 per cent is assumed to be stolen from the distribution network. This is applied to electricity available less transmission losses.

Transmission Entry Capacity, Declared Net Capacity and Installed Capacity

5.79 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.

5.80 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, 0.365 for small scale hydro and 0.17 for solar photovoltaics). Further information on this can be found in paragraph 6.96, and at: www.legislation.gov.uk/uksi/1990/264/made?view=plain

Load factors

5.81 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 transmission network at any one time, net of demand met by generation connected to the distribution network. From 2005 (following the introduction of BETTA – see paragraph 5.53) 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

5.82 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 7, paragraph 7.24 and 7.25 and Table 7D. 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

5.83 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 – 2012:	12 months ended 31 December

5.84 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
	52 weeks ended
2010	1 January 2011
2011	31 December 2011
2012	29 December 2012

Monthly and quarterly data

5.85 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.gov.uk/government/organisations/department-of-energy-climate-change/series/electricity-statistics. 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, electricity generated, 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

5.86 For MPPs, as defined in paragraphs 5.66 to 5.68, 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 and sales of electricity (where a generator also supplies electricity).

5.87 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. A monthly inquiry is sent to electricity distributors, as well as the National Grid, to establish electricity distribution and transmission losses. Copies of the survey questionnaires are available in *electricity statistics: data sources and methodologies*, at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/electricity-statistics.

5.88 A sample of companies that generate electricity mainly for their own use (known as autogenerators or autoproducers – see paragraph 5.66, 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 7 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.

5.89 In addition to the above sources, some administrative data is used for renewable generation and capacity in the hands of non major power producers- this includes data from the Renewables Obligation and Feed in Tariff schemes.

Statistical differences

5.90 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 5.82 and 5.83, above. Sales data based on calendar years will always have included more electricity consumption than the slightly shorter statistical year of exactly 52 weeks.

5.91 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 2012, for about six 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

	2010	2011	2012
Total electricity			
Supply			
Production	378,608r	364,548r	360,869
Other sources *(1)*	3,150	2,906	2,966
Imports	7,144	8,689	13,791
Exports	-4,481	-2,467	-1,746
Marine bunkers	-	-	-
Stock change	-	-	-
Transfers	-	-	-
Total supply	**384,422r**	**373,676r**	**375,880**
Statistical difference *(2)*	-432r	-658r	-361
Total demand	**384,854r**	**374,333r**	**376,241**
Transformation	-	-	-
Electricity generation	-	-	-
Major power producers	-	-	-
Other generators	-	-	-
Heat generation	-	-	-
Petroleum refineries	-	-	-
Coke manufacture	-	-	-
Blast furnaces	-	-	-
Patent fuel manufacture	-	-	-
Other	-	-	-
Energy industry use	**28,994r**	**28,317r**	**29,720**
Electricity generation	16,108r	16,427r	18,002
Oil and gas extraction	563	576	565
Petroleum refineries	5,034	4,684r	4,323
Coal extraction and coke manufacture	1,040	929	902
Blast furnaces	297	253	369
Patent fuel manufacture	-	-	-
Pumped storage	4,212	3,843	3,978
Other	1,740	1,603r	1,582
Losses	**27,036r**	**28,143r**	**28,946**
Final consumption	**328,824r**	**317,873r**	**317,575**
Industry	**104,522r**	**102,348r**	**97,820**
Unclassified	-	-	-
Iron and steel	3,842	3,842r	3,366
Non-ferrous metals	6,726	6,971r	5,034
Mineral products	7,266	7,010r	6,749
Chemicals	18,454	17,637r	17,242
Mechanical engineering, etc	7,653	7,261r	7,069
Electrical engineering, etc	6,657	6,383r	6,189
Vehicles	5,284	5,188r	5,074
Food, beverages, etc	11,520	11,319r	11,104
Textiles, leather, etc	3,050	2,992r	2,910
Paper, printing, etc	10,954	10,904r	10,763
Other industries	21,496r	21,301r	20,825
Construction	1,621	1,539	1,494
Transport *(3)*	**4,076**	**4,083r**	**4,089**
Air	-	-	-
Rail *(4)*	4,058	4,062r	4,062
Road *(5)*	18	21	26
National navigation	-	-	-
Pipelines	-	-	-
Other	**220,226r**	**211,442r**	**215,666**
Domestic	118,836r	111,603r	114,698
Public administration	19,101	18,396r	18,891
Commercial	78,261r	77,495r	78,206
Agriculture	4,029	3,948	3,871
Miscellaneous	-	-	-
Non energy use			

5.1 Commodity balances (continued)

Electricity

GWh

	2010	2011	2012
Electricity production			
Total production *(6)*	**378,608r**	**364,548r**	**360,869**
Primary electricity			
Major power producers	**72,984r**	**86,250**	**91,459**
Nuclear	62,140	68,980	70,405
Large scale hydro *(6)*	2,505r	4,291	3,898
Small scale hydro	198r	303	272
Wind *(7)*	8,141r	12,675	16,884
Other generators	**2,957r**	**4,176r**	**5,006**
Nuclear	-	-	-
Large scale hydro	587	698	733
Small scale hydro	285r	398r	382
Wind, wave and solar photovoltaics *(7)*	2,085r	3,079r	3,891
Secondary electricity			
Major power producers	**271,651**	**243,157**	**233,681**
Coal	103,941	104,797	140,164
Oil	2,271r	1,074r	1,130
Gas	161,748r	132,753r	86,229
Renewables	3,691r	4,533r	6,157
Other	-	-	-
Other generators	31,017r	30,966r	30,724
Coal	3,753	3,774r	3,017
Oil	2,532	2,043r	1,935
Gas	13,908	13,767r	13,844
Renewables	8,346r	8,667r	9,041
Other	2,478r	2,715r	2,887

Primary and secondary production *(8)*			
Nuclear	62,140	68,980	70,405
Hydro	3,575r	5,690r	5,284
Wind, wave and solar photovoltaics	10,226r	15,755r	20,775
Coal	107,694	108,571r	143,181
Oil	4,803r	3,117r	3,065
Gas	175,656r	146,520r	100,073
Other renewables	12,037r	13,200r	15,198
Other	2,478r	2,715r	2,887
Total production	**378,608r**	**364,548r**	**360,869**

(1) Pumped storage production.
(2) Total supply minus total demand.
(3) From 2004, non-traction Transport sector consumption is included under 'Transport Services'.
(4) From 2004, this includes light rail and metro systems (eg. London Underground).
(5) Included from 2004.
(6) Excludes pumped storage production.
(7) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.68.
(8) 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 5.31).

5.2 Electricity supply and consumption

GWh

	2008	2009	2010	2011	2012
Supply					
Production	384,783r	373,068r	378,608r	364,548r	360,869
Other sources *(1)*	4,089	3,685	3,150	2,906	2,966
Imports	12,294	6,609	7,144	8,689	13,791
Exports	-1,272	-3,748	-4,481	-2,467	-1,746
Total supply	**399,894r**	**379,614r**	**384,422r**	**373,676r**	**375,880**
Statistical difference *(2)*	235r	138r	-432r	-658r	-361
Total demand	**399,659r**	**379,476r**	**384,854r**	**374,333r**	**376,241**
Transformation	**-**	**-**	**-**	**-**	**-**
Energy industry use	**29,988r**	**29,685r**	**28,994r**	**28,317r**	**29,720**
Electricity generation	16,340r	16,571r	16,108r	16,427r	18,002
Oil and gas extraction	598	594	563	576	565
Petroleum refineries	4,351	4,519	5,034	4,684r	4,323
Coal and coke	1,058	1,018	1,040	929	902
Blast furnaces	452	464	297	253	369
Pumped storage	5,371	4,843	4,212	3,843	3,978
Other	1,818	1,676	1,740	1,603r	1,582
Losses	**27,849r**	**28,043r**	**27,036r**	**28,143r**	**28,946**
Final consumption	**341,822**	**321,748**	**328,824r**	**317,873r**	**317,575**
Industry	**114,151**	**99,738**	**104,522r**	**102,348r**	**97,820**
Unclassified	-	-	-	-	-
Iron and steel	4,657	3,615	3,842	3,842	3,366
Non-ferrous metals	7,391	6,075	6,726	6,971r	5,034
Mineral products	7,931	7,010	7,266	7,010r	6,749
Chemicals	20,287	17,702	18,454	17,637r	17,242
Mechanical engineering. etc	8,614	7,688	7,653	7,261r	7,069
Electrical engineering, etc	7,397	6,455	6,657	6,383r	6,189
Vehicles	5,812	5,012	5,284	5,188r	5,074
Food, beverages, etc	12,257	10,741	11,520	11,319r	11,104
Textiles, leather, etc	3,395	3,013	3,050	2,992r	2,910
Paper, printing, etc	12,865	11,069	10,954	10,904r	10,763
Other industries	21,729	19,771	21,496r	21,301r	20,825
Construction	1,817	1,586	1,621	1,539	1,494
Transport ***(3)***	**3,943**	**4,040**	**4,076**	**4,083r**	**4,089**
Other	**223,728**	**217,970**	**220,226r**	**211,442r**	**215,666**
Domestic	119,800	118,541	118,836r	111,603r	114,698
Public administration	20,355	19,442	19,101	18,396r	18,891
Commercial	79,506	76,187	78,261r	77,495r	78,206
Agriculture	4,067	3,801	4,029	3,948	3,871
Miscellaneous	-	-	-	-	-
Non energy use	**-**	**-**	**-**	**-**	**-**

(1) Pumped storage production.
(2) Total supply minus total demand.
(3) From 2004, non-traction Transport sector consumption is included under 'Commercial'.

5.3 Commodity balances

Public distribution system and other generators

GWh

	2010			2011			2012		
	Public distribution system	**Other generators**	**Total**	**Public distribution system**	**Other generators**	**Total**	**Public distribution system**	**Other generators**	**Total**
Supply									
Major power producers	344,635r	-	344,635r	329,406	-	329,406	325,139	-	325,139
Other generators	-	33,974r	33,974r	-	35,142r	35,142r	-	35,730	35,730
Other sources *(1)*	3,150	-	3,150	2,906	-	2,906	2,966	-	2,966
Imports	7,144	-	7,144	8,689	-	8,689	13,791	-	13,791
Exports	-4,481	-	-4,481	-2,467	-	-2,467	-1,746	-	-1,746
Transfers	14,660r	-14,660r	-	15,226r	-15,226r	-	16,669	-16,669	-
Total supply	**365,108r**	**19,314r**	**384,422r**	**353,759r**	**19,916r**	**373,676r**	**356,819**	**19,061**	**375,880**
Statistical difference *(2)*	-447r	15r	-432r	-720r	63r	-658r	-369	8	-361
Total demand	**365,555r**	**19,299r**	**384,854r**	**354,480r**	**19,853r**	**374,333r**	**357,188**	**19,053**	**376,241**
Transformation	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy industry use	**23,143**	**5,851r**	**28,994r**	**22,592**	**5,725r**	**28,317r**	**24,046**	**5,674**	**29,720**
Electricity generation	14,403	1,705r	16,108r	14,480	1,947r	16,427r	15,881	2,121	18,002
Oil and gas extraction	563	-	563	576	-	576	565	-	565
Petroleum refineries	1,407	3,627	5,034	1,357	3,328r	4,684r	1,338	2,985	4,323
Coal extraction and coke manufacture	950	90	1,040	847	82	929	825	77	902
Blast furnaces	-	297	297	-	253	253	-	369	369
Pumped storage	4,212	-	4,212	3,843	-	3,843	3,978	-	3,978
Other fuel industries	1,608	132	1,740	1,489	115r	1,603r	1,460	122	1,582
Losses	**27,021r**	**15**	**27,036r**	**28,123r**	**20**	**28,143r**	**28,921**	**25**	**28,946**
Transmission losses	5,975		5,975	6,470		6,470	6,763		6,763
Distribution losses	19,971	15	19,986	20,612	20	20,632	21,116	25	21,141
Theft	1,074		1,074	1,041		1,041	1,041		1,041
Final consumption	**315,392**	**13,432r**	**328,824r**	**303,765**	**14,109r**	**317,873r**	**304,221**	**13,354**	**317,575**
Industry	**94,438**	**10,084r**	**104,522r**	**91,796**	**10,552r**	**102,348r**	**89,313**	**8,507**	**97,820**
Iron and steel	3,094	748	3,842	3,167	675	3,842	2,807	559	3,366
Non-ferrous metals	3,981	2,745	6,726	3,936	3,035	6,971r	3,888	1,146	5,034
Mineral products	7,185	82	7,266	6,916	94r	7,010r	6,641	109	6,749
Chemicals	15,844	2,610	18,454	14,854	2,783r	17,637r	14,639	2,604	17,242
Mechanical engineering etc	7,451	376	7,827	7,163	241r	7,404r	6,970	236	7,206
Electrical engineering etc	6,637	-	6,637	6,377	-	6,377	6,184	-	6,184
Vehicles	5,129	-	5,129	5,053	-	5,053	4,942	-	4,942
Food, beverages etc	10,256	1,264	11,520	10,042	1,277r	11,319r	9,798	1,306	11,104
Textiles, leather, etc	3,045	-	3,045	2,986	-	2,986	2,905	-	2,905
Paper, printing etc	9,662	1,292	10,954	9,436	1,468r	10,904r	9,224	1,539	10,763
Other industries	20,548	953r	21,501r	20,342	966r	21,308r	19,837	993	20,831
Construction	1,606	15	1,621	1,524	15	1,539	1,479	15	1,494
Transport *(3)*	**4,076**	**-**	**4,076**	**4,083r**	**-**	**4,083r**	**4,089**	**-**	**4,089**
Rail *(4)*	4,058	-	4,058	4,062r	-	4,062r	4,062	-	4,062
Road *(5)*	18	-	18	21	-	21	26	-	26
Other	**216,878**	**3,348r**	**220,226r**	**207,886r**	**3,556r**	**211,442r**	**210,819**	**4,847**	**215,666**
Domestic *(6)*	118,810	26r	118,836r	111,482	122r	111,603r	114,155	543	114,698
Standard	79,764	-	79,764	74,506	-	74,506	76,315	-	76,315
Economy 7 and other off-peak *(7)*	21,084	-	21,084	18,744	-	18,744	19,239	-	19,239
Prepayment (standard)	13,446	-	13,446	13,863	-	13,863	14,219	-	14,219
Prepayment (off-peak) *(7)*	4,516	-	4,516	4,369	-	4,369	4,382	-	4,382
Sales under any other arrangement	0	-	0	-	-	-	0	-	0
Public administration	17,125	1,976	19,101	16,510	1,885r	18,396r	16,617	2,274	18,891
Public lighting *(8)*	1,962	-	1,962	1,906	-	1,906	1,908	-	1,908
Other public sector	15,162	1,976	17,138	14,604	1,885r	16,490r	14,710	2,274	16,983
Commercial	76,914	1,346r	78,261r	75,946r	1,549r	77,495r	76,175	2,031	78,206
Shops	28,246	-	28,246	27,766	-	27,766	27,808	-	27,808
Offices	24,868	-	24,868	24,731	-	24,731	24,779	-	24,779
Hotels	8,684	-	8,684	8,641	-	8,641	8,723	-	8,723
Combined domestic/ commercial premises	2,657	-	2,657	2,595	-	2,595	2,604	-	2,604
Post and telecommunications	6,149	-	6,149	5,970	-	5,970	5,986	-	5,986
Unclassified	2,369	-	2,369	2,354	-	2,354	2,374	-	2,374
Transport services	3,941	-	3,941	3,889r	-	3,889r	3,901	-	3,901
Agriculture	4,029	-	4,029	3,948	-	3,948	3,871	-	3,871

(1) Pumped storage production.
(2) Total supply minus total demand.
(3) From 2004, non-traction Transport sector consumption is included under 'Transport Services'.
(4) From 2004, this includes light rail and metro systems (eg. London Underground).
(5) Included from 2004.
(6) From 2010, this includes consumption by domestic generators. See paragraph 5.21.
(7) Electricity consumed under an off-peak tariff.
(8) 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	2008	2009	2010	2011	2012
						Original units of measurement
Major power producers (2)						
Coal	M tonnes	46.25	38.26	40.23	40.57	53.84
Oil (3)	"	0.84	0.63	0.46	0.29	0.30
Gas (5)	GWh	344,454	328,249	342,150	275,591	182,409
Other generators (2)						
Transport undertakings:						
Gas	GWh	21	16	18	14	13
Undertakings in industrial and commercial sectors:						
Coal (4)	M tonnes	1.56	1.42	1.27	1.28r	1.07
Oil (5)	"	0.42	0.43	0.48	0.38r	0.33
Gas (6)	GWh	32,336	31,038	31,418	31,534r	31,723
						Mtoe
Major power producers (2)						
Coal		28.990	23.791	24.780	25.232	33.666
Oil (3)		1.105	1.025	0.634	0.346	0.407
Gas		29.618	28.224	29.420	23.697	15.684
Nuclear		11.910	15.230	13.926	15.626	15.206
Hydro (natural flow) (7)		0.363	0.369	0.232	0.395	0.359
Wind		0.461	0.594	0.700r	1.090	1.452
Other renewables (7)		0.803r	0.744	1.013	1.263	1.746
Net imports		0.948	0.246	0.229	0.535	1.036
Total major power producers (2)		**74.197r**	**70.223**	**70.934r**	**68.183**	**69.555**
Of which: conventional thermal and other stations (10)		31.833r	26.455	27.572r	28.232	37.516
combined cycle gas turbine stations		29.144	27.923	28.975	23.394	15.438
Other generators (2)						
Transport undertakings:						
Gas (6)		0.002	0.001	0.002	0.001	0.001
Undertakings in industrial and commercial sectors:						
Coal (4)		0.971	0.871	0.782	0.794	0.664
Oil (5)		0.477	0.488	0.544	0.437r	0.373
Gas		2.780	2.669	2.701	2.711r	2.728
Hydro (natural flow) (7)		0.080	0.081	0.075	0.094	0.096
Wind, wave and solar photovoltaics		0.151	0.208	0.179r	0.265	0.335
Other renewables (7)		2.716r	3.207r	3.378r	3.401r	3.540
Other fuels (9)		1.124	0.993	0.802	1.024r	1.111
Total other generators *(2)*		**8.301r**	**8.519r**	**8.463r**	**8.727r**	**8.848**
All generating companies						
Coal (4)		29.961	24.662	25.562	26.026	34.330
Oil (3)(5)		1.582	1.513	1.178	0.783r	0.780
Gas (6)		32.400	30.895	32.123	26.409r	18.413
Nuclear		11.910	15.230	13.926	15.626	15.206
Hydro (natural flow) (7)		0.443	0.451	0.307r	0.489	0.454
Wind, wave and solar photovoltaics		0.611	0.802	0.879	1.355	1.786
Other renewables (7)		3.520r	3.951r	4.390r	4.663r	5.286
Other fuels (9)		1.124	0.993	0.802	1.024r	1.111
Net imports		0.948	0.246	0.229	0.535	1.036
Total all generating companies		**82.499r**	**78.742r**	**79.397r**	**76.910r**	**78.403**

(1) A monthly update of fuel used in electricity generation by major power producers is given in Table 5.1 of Energy Trends, and a quarterly update of fuel used in electricity generation by all generating companies is given in Table 5.4 of Energy Trends.
(2) See paragraphs 5.66 to 5.72 for information on companies covered.
(3) Includes orimulsion, oil used in gas turbine and diesel plant, and oil used for lighting up coal fired boilers.
(4) Includes coke oven coke.
(5) Includes refinery gas.
(6) Includes colliery methane.
(7) Renewable sources which are included under hydro and other renewables in this table are shown separately in Table 6.6 of Chapter 6.
(8) Includes electricity supplied by gas turbines and oil engines. From 1988 also includes electricity produced by plants using renewable sources.
(9) Main fuels included are coke oven gas, blast furnace gas, and waste products from chemical processes.
(10) Includes gas turbines and oil engines and plants producing electricity from renewable sources other than hydro.

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

GWh

	2008	2009	2010	2011	2012
Total supply					
(as given in Tables 5.1 and 5.2)	399,894r	379,614r	384,422r	373,676r	375,880
less imports of electricity	-12,294	-6,609	-7,144	-8,689	-13,791
plus exports of electricity	+1,272	+3,748	+4,481	+2,467	+1,746
less electricity used in pumped storage	-5,371	-4,843	-4,212	-3,843	-3,978
less electricity used on works	-16,340r	-16,571r	-16,108r	-16,427r	-18,002
equals					
Electricity supplied (net)	367,161r	355,339r	361,439r	347,184r	341,855
(as given in Tables 5.6, 5.1.2 and 5.1.3)					
Total supply					
(as given in Tables 5.1 and 5.2)	399,894r	379,614r	384,422r	373,676r	375,880
less electricity used in pumped storage	-5,371	-4,843	-4,212	-3,843	-3,978
less electricity used on works	-16,340r	-16,571r	-16,108r	-16,427r	-18,002
equals					
Electricity available	378,183r	358,200r	364,102r	353,406r	353,900
(as given in Table 5.1.2)					
Final consumption					
(as given in Tables 5.2 and 5.3)	341,822	321,748	328,824r	317,873r	317,575
plus Iron and steel consumption counted as energy industry use	+568	+603	+421	+370	+495
equals					
Final users	342,390	322,351	329,245r	318,243r	318,070
(as given in Table 5.1.2)					
Final consumption					
Public distribution system					
(as given in Table 5.3)	327,124	309,244	315,392	303,765	304,221
plus Oil and gas extraction use	+598	+594	+563	+576	+565
plus Petroleum refineries use	+1,482	+1,464	+1,407	+1,357	+1,338
plus Coal and coke use	+979	+928	+950	+847	+825
plus Other fuel industries use	+1,687	+1,554	+1,608	+1,489	+1,460
equals					
UK Electricity sales *(1)*	331,870	313,784	319,920	308,034	308,409

(1) A calendar year estimate of the Renewables Obligation percentage can be calculated using the "total generation from sources eligible for the Renewable Obligation" figure from Table 6.4 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.gov.uk/government/publications/electricity-section-5-energy-trends

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	Wind and solar (4)	Total All sources
2008											
Major power producers *(2) (5)*											
Fuel used	337,155	12,849	344,454	138,508	9,344r	-	842,310r	4,224	4,089	5,357	855,980
Generation	120,305	4,557r	161,583	52,486	2,608r	-	341,539	4,224	4,089	5,357	355,209
Used on works	6,112	669r	2,778	4,813	262r	-	14,633	15	14	-	14,662
Supplied (gross)	114,192	3,888r	158,805	47,673	2,346r	-	326,906	4,209	4,075	5,357	340,547
Used in pumping											5,371
Supplied (net)											335,175
Other generators *(2) (5)*											
Fuel used	11,296	5,544	32,357	-	31,590r	13,074	93,860r	931	-	1,753	96,544r
Generation	4,077	2,152	14,636	-	6,927r	3,188	30,979r	931	-	1,753	33,663r
Used on works	216	155	453	-	679r	158	1,661r	16	-	-	1,678
Supplied	3,861	1,997	14,183	-	6,247r	3,031	29,318r	915	-	1,753	31,985r
All generating companies											
Fuel used	348,450	18,393	376,810	138,508	40,934r	13,074	936,170r	5,155	4,089	7,110	952,524r
Generation	124,381	6,709r	176,219	52,486	9,535r	3,188	372,518r	5,155	4,089	7,110	388,872r
Used on works	6,328	824	3,231	4,813	941r	158	16,294r	31	14	-	16,340
Supplied (gross)	118,053	5,885r	172,988	47,673	8,594r	3,031	356,224r	5,124	4,075	7,110	372,532r
Used in pumping											5,371
Supplied (net)											367,161
2009											
Major power producers *(2) (5)*											
Fuel used	276,689	11,926	328,249	177,124	8,648	-	802,635	4,294	3,685	6,904	817,518
Generation	99,287	3,839	152,598	69,098	2,670	-	327,491	4,294	3,685	6,904	342,374
Used on works	5,030	476	2,613	6,336	268	-	14,723	15	13	-	14,750
Supplied (gross)	94,257	3,363	149,985	62,762	2,402	-	312,769	4,279	3,672	6,904	327,624
Used in pumping											4,843
Supplied (net)											322,781
Other generators *(2) (5)*											
Fuel used	10,132	5,671	31,054	-	37,302r	11,551	95,709r	947	-	2,424	99,080r
Generation	3,751	2,155	13,901	-	8,004r	3,196r	31,008r	947	-	2,424	34,378r
Used on works	210	154	431	-	844r	165	1,804r	17	-	-	1,821
Supplied	3,541	2,002	13,471	-	7,160r	3,031r	29,204r	930	-	2,424	32,558r
All generating companies											
Fuel used	286,820	17,597	359,303	177,124	45,949r	11,551	898,345r	5,241	3,685	9,328	916,599r
Generation	103,038	5,995	166,499	69,098	10,674r	3,196r	358,499r	5,241	3,685	9,328	376,753r
Used on works	5,240	629	3,044	6,336	1,113r	165	16,526r	32	13	-	16,571
Supplied (gross)	97,798	5,365	163,455	62,762	9,561r	3,031r	341,972r	5,209	3,672	9,328	360,182r
Used in pumping											4,843
Supplied (net)											355,339
2010											
Major power producers *(2) (5)*											
Fuel used	288,195	7,376	342,150	161,959	11,778r	-	811,459r	2,703r	3,150	8,141	825,453r
Generation	103,941	2,271r	161,748r	62,140	3,691r	-	333,791	2,703r	3,150	8,141	347,785r
Used on works	5,233	311	2,770	5,698	371	-	14,383	9r	11	-	14,403
Supplied (gross)	98,708	1,960r	158,977r	56,442	3,321r	-	319,408	2,694r	3,139	8,141	333,382r
Used in pumping											4,212
Supplied (net)											329,170
Other generators *(2) (5)*											
Fuel used	9,095	6,328	31,436	-	39,282r	9,322	95,463r	872r	-	2,085	98,420r
Generation	3,753	2,532	13,908	-	8,346r	2,478r	31,017r	872r	-	2,085	33,974r
Used on works	195	186	431	-	742r	135	1,690r	15r	-	-	1,705
Supplied	3,558	2,346	13,478	-	7,603r	2,342r	29,327r	857r	-	2,085	32,269r
All generating companies											
Fuel used	297,290	13,705	373,586	161,959	51,061r	9,322	906,922r	3,575r	3,150	10,226	923,873r
Generation	107,694	4,803	175,656	62,140	12,037r	2,478r	364,808r	3,575r	3,150	10,226	381,759r
Used on works	5,428	497	3,201	5,698	1,113r	135	16,072r	25r	11	-	16,108
Supplied (gross)	102,266	4,306	172,455	56,442	10,924r	2,342r	348,735r	3,550r	3,139	10,226	365,651
Used in pumping											4,212
Supplied (net)											361,439

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	Wind and solar (4)	Total All sources
2011											
Major power producers *(2) (5)*											
Fuel used	293,444	4,022	275,591	181,732	14,685r	-	769,474r	4,594	2,906	12,675	789,649
Generation	104,797	1,074r	132,753	68,980	4,533r	-	312,137	4,594	2,906	12,675	332,312
Used on works	5,245	161	2,268	6,325	455r	-	14,454	16	10	-	14,480
Supplied (gross)	99,552	913r	130,485	62,655	4,078r	-	297,683	4,578	2,895	12,675	317,832
Used in pumping											3,843
Supplied (net)											313,988
Other generators *(2) (5)*											
Fuel used	9,234r	5,081r	31,548r	-	39,548r	11,910r	97,322r	1,096r	-	3,079	101,497r
Generation	3,774r	2,043r	13,767r	-	8,667r	2,715r	30,966r	1,096r	-	3,079	35,142r
Used on works	204r	151r	426r	-	993r	153r	1,926r	21	-	-	1,947
Supplied	3,570r	1,892r	13,341r	-	7,675r	2,562r	29,040r	1,075r	-	3,079	33,195r
All generating companies											
Fuel used	302,677r	9,104r	307,140r	181,732	54,233r	11,910r	866,796r	5,690r	2,906	15,755	891,146r
Generation	108,571r	3,117r	146,520r	68,980	13,200r	2,715r	343,103r	5,690r	2,906	15,755	367,454r
Used on works	5,449r	311r	2,694r	6,325	1,448r	153r	16,380r	37	10	-	16,427
Supplied (gross)	103,122r	2,805r	143,826r	62,655	11,753r	2,562r	326,723r	5,653r	2,895	15,755	351,026r
Used in pumping											3,843
Supplied (net)											347,183
2012											
Major power producers *(2) (5)*											
Fuel used	391,530	4,736	182,409	176,846	20,301	-	775,823	4,169	2,966	16,884	799,843
Generation	140,164	1,130	86,229	70,405	6,157	-	304,086	4,169	2,966	16,884	328,106
Used on works	7,121	187	1,474	6,456	618	-	15,856	15	10	-	15,881
Supplied (gross)	133,043	943	84,755	63,949	5,539	-	288,229	4,155	2,956	16,884	312,224
Used in pumping											3,978
Supplied (net)											308,247
Other generators *(2) (5)*											
Fuel used	7,723	4,340	31,736	-	41,170	12,926	97,896	1,115	-	3,891	102,902
Generation	3,017	1,935	13,844	-	9,041	2,887	30,724	1,115	-	3,891	35,730
Used on works	172	143	429	-	1,180	177	2,100	20	-	-	2,121
Supplied	2,846	1,792	13,415	-	7,861	2,710	28,623	1,095	-	3,891	33,609
All generating companies											
Fuel used	399,253	9,076	214,146	176,846	61,471	12,926	873,718	5,284	2,966	20,775	902,745
Generation	143,181	3,065	100,073	70,405	15,198	2,887	334,809	5,284	2,966	20,775	363,836
Used on works	7,293	330	1,903	6,456	1,799	177	17,957	35	10	-	18,002
Supplied (gross)	135,888	2,735	98,171	63,949	13,400	2,710	316,853	5,250	2,956	20,775	345,834
Used in pumping											3,978
Supplied (net)											341,856

	2008		2009		2010		2011		2012	
	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	128,944	160,109	106,939	151,454	111,133r	160,518r	111,270	131,886	148,034	85,647
Supplied (gross)	121,816	157,417	101,100	148,907	105,148r	157,818r	105,359	129,669	140,073	84,207
Other generators										
Generated	19,457r	11,522	20,218r	10,790	20,408r	10,609r	20,406	10,560r	20,332	10,392
Supplied (gross)	18,371r	10,947	18,952r	10,251	19,248r	10,079r	19,007	10,033r	18,750	9,873
All generating companies										
Generated	148,401r	171,631	127,157r	162,244	131,542r	171,126r	131,676	142,447r	168,366	96,039
Supplied (gross)	140,186r	168,364	120,052r	159,159	124,396r	167,898r	124,366	139,702r	158,824	94,080

(1) Thermal renewable sources are those included under bioenergy in Chapter 6. Prior to 2007, non-biodegradable wastes are also included.

(2) See paragraphs 5.66 to 5.72 on companies covered.

(3) Other thermal sources include coke oven gas, blast furnace gas and waste products from chemical processes. From 2007, non-biodegradable wastes are also included.

(4) For Major Power Producers, this is wind only; for other generators, this includes solar photovoltaics as well as wave and tidal.

(5) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.68.

(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				
	2008	2009	2010	2011	2012
Major power producers *(1)*					
Total transmission entry capacity *(2)*	**76,993**	**77,810r**	**83,426r**	**81,783r**	**81,742**
Of which:					
Conventional steam stations:	32,823r	32,831r	32,839r	31,763r	28,523
Coal fired	23,069	23,077	23,085	23,072	23,072
Oil fired	3,638r	3,638r	3,638r	3,638r	2,338
Mixed or dual fired *(3)*	6,116	6,116	6,116	5,053	3,113
Combined cycle gas turbine stations	26,203	26,785	31,724	30,183	33,113
Nuclear stations	10,979	10,858	10,865	10,663	9,946
Gas turbines and oil engines	1,641r	1,779r	1,779r	1,706r	1,651
Hydro-electric stations:					
Natural flow *(4)*	1,392	1,395	1,391	1,391	1,392
Pumped storage	2,744	2,744	2,744	2,744	2,744
Wind *(4) (5)*	997	1,205	1,860r	2,240	3,277
Renewables other than hydro and wind *(6)*	213	213	223	1,092	1,096
Other generators *(1)*					
Total capacity of own generating plant ***(7)***	**6,686r**	**7,021r**	**7,045r**	**7,267r**	**7,498**
Of which:					
Conventional steam stations *(8)*	2,749r	2,828r	3,196r	2,407r	2,446
Combined cycle gas turbine stations	1,988r	1,846r	1,581r	2,206r	2,207
Hydro-electric stations (natural flow) *(4)*	126r	128r	130r	154r	157
Wind *(4) (9)*	469r	699r	456r	544r	492
Renewables other than hydro and wind *(4) (6)*	1,353r	1,519r	1,682r	1,955r	2,196
All generating companies					
Total capacity	**83,678r**	**84,831r**	**90,471r**	**89,050r**	**89,241**
Of which:					
Conventional steam stations *(8)*	35,572r	35,660r	36,036r	34,170r	30,970
Combined cycle gas turbine stations	28,191r	28,631r	33,305r	32,389r	35,320
Nuclear stations	10,979	10,858	10,865	10,663	9,946
Gas turbines and oil engines	1,641r	1,779r	1,779r	1,706r	1,651
Hydro-electric stations:					
Natural flow *(4)*	1,518r	1,524r	1,521r	1,545r	1,549
Pumped storage	2,744	2,744	2,744	2,744	2,744
Wind *(4)*	1,467r	1,904r	2,316r	2,785r	3,769
Renewables other than hydro and wind *(4)*	1,566r	1,732r	1,905r	3,048r	3,292

(1) See paragraphs 5.66 to 5.72 for information on companies covered.
(2) See paragraph 5.79 for definition. Data before 2006 are based on declared net capacity.
(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) Small-scale hydro, wind and solar photovoltaics capacity are shown on declared net capability basis, and are de-rated to account for intermittency, by factors of 0.365, 0.43 and 0.17 respectively. See paragraph 5.80.
(5) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.68
(6) For Major Power Producers, this includes bioenergy; for other generators, this includes bioenergy, solar photovoltaics, wave and tidal.
(7) "Other generators" capacities are given in declared net capacity terms, see paragraph 5.80.
(8) 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.
(9) Falls in capacity in 2007, 2010 and 2012 due to re-classification of capacity to Major Power Producers.

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

MW

	2008	2009	2010	2011	2012
					end December
Major power producers in England and Wales *(1)*					
Total transmission entry capacity *(2)*	**64,344**	**65,039r**	**70,705r**	**69,047r**	**68,570**
Of which:					
Conventional steam stations:	28,307r	28,315r	28,323r	27,247r	24,007
Coal fired	19,613	19,621	19,629	19,616	19,616
Oil fired	3,638r	3,638r	3,638r	3,638r	2,338
Mixed or dual fired *(3)*	5,056	5,056	5,056	3,993	2,053
Combined cycle gas turbine stations	23,516	24,120	29,404	27,985	30,915
Nuclear stations	8,569	8,569	8,576	8,374	7,657
Gas turbines and oil engines	1,203r	1,256r	1,256r	1,187r	1,132
Hydro-electric stations:					
Natural flow	129	130	131r	131	131
Pumped storage	2,004	2,004	2,004	2,004	2,004
Wind *(4)*	447	476r	843r	1,080	1,682
Renewables other than hydro and wind *(5)*	169	169	169	1,039	1,042
Major power producers in Scotland *(1)*					
Total transmission entry capacity ***(2)***	**10,346**	**10,343r**	**10,288r**	**10,301**	**10,736**
Of which:					
Conventional steam and combined cycle gas turbine stations	5,119	5,097	4,752	4,638	4,638
Nuclear stations	2,410	2,289	2,289	2,289	2,289
Gas turbines and oil engines	264	265	265	260	260
Hydro-electric stations:					
Natural flow	1,263	1,265	1,260r	1,261	1,262
Pumped storage	740	740	740	740	740
Wind *(4)*	507	643r	929r	1,059	1,494
Renewables other than hydro and wind *(5)*	44	44	54	54	54
Major power producers in Northern Ireland *(1)*					
Total transmission entry capacity *(2)*	**2,303**	2,429r	2,432r	**2,436**	**2,436**

(1) See paragraphs 5.66 to 5.72 for information on companies covered.
(2) See paragraph 5.79 for definition. Data before 2006 are based on declared net capacity.
(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 5.68.
(5) Bioenergy only.

5.9 Capacity of other generators

MW

	2008	2009	2010	2011	2012
					end December
Capacity of own generating plant *(1) (2)*					
Undertakings in industrial and commercial sector:					
Oil and gas terminals and oil refineries	1,014r	1,012r	1,045	1,001r	1,052
Iron and steel	316	316	316	128r	315
Chemicals	1,051	1,039	1,104	1,021r	1,018
Engineering and other metal trades	632	626	626	660r	644
Food, drink and tobacco	406	408	411	660r	437
Paper, printing and publishing	569	522	491	401r	426
Other *(3)*	2,593r	2,994r	2,948r	3,293r	3,502
Total industrial, commercial and domestic sector	6,583r	6,918r	6,942r	7,164r	7,395
Undertakings in transport sector	103	103	103	103	103
Total other generators	**6,686r**	**7,021r**	**7,045r**	**7,267r**	**7,498**

(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 7. 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 5.68.
(3) Includes companies in the commercial sector, and domestic installations.

5.10 Plant loads, demand and efficiency

Major power producers [1]

	2008	2009	2010	2011	2012
Simultaneous maximum load met *(2) (3)*	60,289	60,231	60,893	57,086	57,490
of which England and Wales	..	..	..	..	..
Scotland	..	..	..	..	..
Great Britain	58,590	58,510	59,130	55,505	55,765
Northern Ireland	1,699	1,721	1,763	1,581	1,725
Maximum demand as a percentage of UK Major Power Producers' capacity	78.3	77.4	73.0r	69.8	70.3
Plant load factor *(2) (4)*					
Combined cycle gas turbine stations	71.0	64.2	61.6	47.8	30.4
Nuclear stations	49.4	65.6	59.3	66.4	70.8
Pumped storage hydro	16.9	15.3	13.1	12.0	12.3
Conventional thermal and other stations *(5)*	39.3	33.2	34.5	34.7	48.6
of which coal-fired stations *(6)*	45.0	38.5	40.2	40.8	57.1
All plant *(7)*	**49.9**	**47.4**	**46.0r**	**42.5r**	**44.0**
System load factor *(8)*	**67.7r**	**64.5**	**64.6r**	**66.6r**	**66.3**
Thermal efficiency *(9)*					
(gross calorific value basis)					
Combined cycle gas turbine stations	47.2	46.6	47.6	48.5	47.7
Coal fired stations	35.7	35.9	36.1	35.7	36.0
Nuclear stations	37.9	39.0	38.4	38.0	39.8

(1) See paragraphs 5.66 to 5.72 for information on companies covered.
(2) Load met by transmission network, net of demand met by embedded generation. See paragraph 5.81 for definitions.
(3) Data cover the 12 months ending March of the following year, e.g. 2012 data are for the year ending March 2013.
In 2012/13, the highest load met simultaneously in GB and NI was on 12 December 2012.
The figures here relate to that date.
(4) Load factors for renewable sources, including wind and hydro, can be found in Table 6.5.
(5) Conventional steam plants, gas turbines and oil engines and plants producing electricity from thermal renewable sources.
(6) Includes both coal-fired stations, and dual/mixed fired stations that mainly use coal.
(7) Includes wind (from 2008) and natural flow hydro, using capacity that has not been de-rated for intermittency.
(8) Average electricity available as percentage of maximum demand. See paragraph 5.81.
(9) See paragraph 5.82 for definition of thermal efficiency.

5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)[1]

Company Name	Station Name	Fuel	Installed Capacity (MW)	Year of commission or year generation began	Location Scotland, Wales Northern Ireland, or English region
A7 Energy (2)	Greendykeside	wind	4	2007	Scotland
	Lochhead	wind	6	2009	Scotland
AES	Kilroot	coal/oil	520	1981	Northern Ireland
	Kilroot OCGT	gas oil	142	1981	Northern Ireland
	Ballylumford B	gas	540	1968	Northern Ireland
	Ballylumford B OCGT	gas oil	116	1968	Northern Ireland
	Ballylumford C	CCGT	616	2003	Northern Ireland
Baglan Generation Ltd	Baglan Bay	CCGT	510	2002	Wales
Barking Power (3)	Barking	CCGT	1000	1994	London
Beaufort Wind Ltd (4)	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
BNP Paribas Clean Energy Partners GP Limited	Gruig	wind	25	2009	Northern Ireland
Braes of Doune Windfarm (6)	Braes of Doune	wind	72	2007	Scotland
British Energy (7)	Dungeness B	nuclear	1040	1983	South East
	Hartlepool	nuclear	1180	1984	North East
	Heysham1	nuclear	1155	1984	North West
	Heysham 2	nuclear	1220	1988	North West
	Hinkley Point B	nuclear	880	1976	South West
	Sizewell B	nuclear	1198	1995	East
	Hunterston B	nuclear	890	1976	Scotland
	Torness	nuclear	1185	1988	Scotland
Cemmaes Windfarm Ltd (8)	Cemmaes	wind	15	2002 (9)	Wales
Centrica	Barry *(10)*	CCGT	140	1998	Wales
	Glanford Brigg *(10)*	CCGT	140	1993	Yorkshire and the Humber
	Killingholme	CCGT	665	1994	Yorkshire and the Humber
	Peterborough *(10)*	CCGT	240	1993	East
	South Humber Bank	CCGT	1285	1996	Yorkshire and the Humber
	Langage	CCGT	905	2010	South West
	Glens of Foudland	wind	26	2005	Scotland
	Lynn	wind (offshore)	97	2009	East Midlands
	Inner Dowsing	wind (offshore)	97	2009	East Midlands
Cold Northcott Windfarm Ltd (8)	Cold Northcott	wind	7	1993	South West

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5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)[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
Coolkeeragh ESB Ltd	Coolkeeragh	CCGT	408	2005	Northern Ireland
	Coolkeeragh OCGT	gas oil	72	2005	Northern Ireland
Corby Power Ltd	Corby	CCGT	401	1993	East Midlands
Dong Energy	Burbo Bank	wind (offshore)	90	2009	North West
	Gunfleet Sands 1	wind (offshore)	108	2010	South East
	Gunfleet Sands 2	wind (offshore)	65	2010	South East
	Walney 1 (3)	wind (offshore)	184	2011	North West
	Walney 2 (3)	wind (offshore)	184	2011	North West
	Barrow (11)	wind (offshore)	90	2006	North West
	Severn	CCGT	848	2010	Wales
	Lincs (11)	wind (offshore)	270	2012	East
Drax Power Ltd	Drax	coal/biomass	3870	1974	Yorkshire and the Humber
	Drax GT	gas oil	75	1971	Yorkshire and the Humber
EDF Energy	Cottam	coal	2008	1969	East Midlands
	West Burton	coal	2012	1967	East Midlands
	West Burton GT	gas oil	40	1967	East Midlands
	Thames Valley Power	Gas/Gas oil CHP	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
	West Burton CCGT	CCGT	1410	2012	East Midlands
EDF Energy Renewables	Bicker Fen	wind	26	2008	East Midlands
	Walkway	wind	14	2008	North East
	Longpark	wind	38	2009	Scotland
	Burnfoot Hill	wind	26	2010	Scotland
	Rusholme	wind	24	2010	Yorkshire and the Humber
	Fairfield	wind	7	2011	North West
	Green Rigg	wind	36	2012	North East
	Fallago	wind	144	2013	Scotland
	Glass Moor II	wind	12	2013	East Midlands
	Boundary Lane	wind	6	2013	North East
Eggborough Power Ltd	Eggborough	coal	1960	1967	Yorkshire and the Humber
EPR Ely Limited	Elean	straw/gas	38	2001	East
EPR Eye Ltd	Eye, Suffolk	AWDF (10)	13	1992	East
EPR Glanford Ltd	Glanford	meat & bone meal	13	1993	East
EPR Thetford Ltd	Thetford	poultry litter	39	1998	East
EPR Scotland Ltd	Westfield	poultry litter	12	2000	Scotland
E.On UK	Ironbridge	biomass	900	1970	West Midlands
	Ratcliffe	coal	2000	1968	East Midlands
	Grain GT	gas oil	55	1978	South East
	Ratcliffe GT	gas oil	34	1966	East Midlands
	Taylor's Lane GT	gas oil	132	1979	London
	Connahs Quay	CCGT	1380	1996	Wales
	Cottam Development Centre	CCGT	390	1999	East Midlands
	Enfield	CCGT	408	1999	London
	Killingholme	CCGT	900	1993	Yorkshire and the Humber
	Sandbach	CCGT	50	1999	North West

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5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)[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
	Castleford	CCGT	56	2002	Yorkshire and the Humber
	Thornhill	CCGT	50	1998	Yorkshire and the Humber
	Grain	CCGT	1365	2010	South East
	Steven's Croft	biomass	50	2007	Scotland
	Askam	wind	5	1999	North West
	Bowbeat	wind	31	2002	Scotland
	Deucheran Hill	wind	16	2001	Scotland
	Hare Hill	wind	6	2004	North East
	High Volts	wind	8	2004	North East
	Holmside	wind	6	2004	North East
	Lowca	wind	5	2000	North West
	Oldside	wind	5	1996	North West
	Out Newton	wind	9	2002	Yorkshire and the Humber
	Scroby Sands	wind (offshore)	60	2004	East
	Siddick	wind	4	1996	North West
	Stags Holt	wind	20	2007	East
	Rhyd-y-Groes	wind	7	1992	Wales
	Blyth	wind (offshore)	4	2000	North East
	Robin Rigg	wind (offshore)	180	2010	Scotland
	Great Eppleton	wind	8	2010	North East
	Butterwick Moor	wind	21	2011	North East
	Haswell Moor	wind	10	2010	North East
	Rosehall	wind	25	2012	Scotland
	Tween Bridge	wind	44	2012	North East
	Camster	wind	10	2012	Scotland
Falck Renewables Wind Ltd	Ben Aketil	wind	28	2007	Scotland
	Boyndie	wind	16	2006	Scotland
	Cefn Croes	wind	59	2006	Wales
	Earlsburn	wind	38	2007	Scotland
	Kilbraur	wind	68	2008	Scotland
	Millennium	wind	65	2008	Scotland
Fenland Windfarms Ltd (8)	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
	Rothes II	wind	41	2013	Scotland
GDF Suez	Teesside (13)	OCGT	45	1992	North East
	Scotia	wind	20	2010	Scotland
Great Orton Windfarm Ltd (8)	Great Orton	wind	4	1999 (7)	North West
HG Capital	Tyr Mostyn & Foel Goch	wind	21	2005	Wales
	Bagmoor	wind	16	2009	East Midlands
	Solutia	wind	5	2009	Wales
	Workington (Eastman)	wind	4	2005	North West
	Dewley Cheese	wind	2	2010	North West
High Hedley Hope Wind Ltd (8)	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
Immingham CHP LLP	Immingham CHP	gas CHP	1240	2004	Yorkshire and the Humber

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5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)[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
Infinis	Ardrossan	wind	24	2004	Scotland
	Ardrossan Extension	wind	6	2008	Scotland
	Dalswinton	wind	30	2008	Scotland
	Minsca	wind	37	2008	Scotland
	Slieve Divena	wind	30	2009	N Ireland
	Rheidol	wind	2	1997	Wales
	Lissett	wind	30	2007	Yorkshire and the Humber
	Mynydd Clogau	wind	14	2004	Wales
	Hill of Fiddes	wind	7	2010	Scotland
	Low Spinney	wind	8	2011	East Midlands
	Blackstone Edge	wind	6	2013	Yorkshire and the Humber
	Gordonstown	wind	6	2013	Scotland
	Seamer	wind	10	2012	North East
	Westfield	wind	10	2013	Scotland
	Wingates	wind	15	2013	North East
	Glenkerie	wind	20	2012	Scotland
Intergen	Coryton	CCGT	800	2001	East
	Rocksavage	CCGT	810	1998	North West
	Spalding	CCGT	880	2004	East Midlands
International Power Ltd	Indian Queens	gas oil/kerosene	140	1996	South West
	Dinorwig	pumped storage	1728	1983	Wales
	Ffestiniog	pumped storage	360	1961	Wales
	Rugeley	coal	1006	1972	West Midlands
	Rugeley GT	gas oil	50	1972	West Midlands
	Deeside	CCGT	515	1994	Wales
	Saltend	CCGT	1200	2000	Yorkshire and the Humber
Kirkheaton Wind Ltd (8)	Kirkheaton	wind	2	2000	North East
K/S Winscales (8)	Winscales 1	wind	2	1999	North West
	Winscales 2	wind	7	2005	North West
Llangwyryfon Windfarm Ltd (8)	Llangwyryfon	wind	9	2003	Wales
London Array Ltd (14)	London Array	wind (offshore)	630	2012	South East
Londonwaste Limited	Belvedere	waste	60	2012	South East
Lynemouth Power Ltd (15)	Lynemouth	coal	420	1972	North East
Magnox Ltd (16)	Wylfa	nuclear	490	1971	Wales
	Maentwrog	hydro	28	1928	Wales
Marchwood Power Limited (17)	Marchwood	CCGT	842	2009	South West
MEAG	Scout Moor *(3)*	wind	65	2009	North West
Peel Energy Ltd	Seaforth	wind	4	1999	North West
	Port of Liverpool	wind	10	2008	North West
Px Limited (18)	Fellside CHP	gas CHP	180	1995	North West
RES-Gen Ltd	Dyffryn Brodyn	wind	5	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
	Kelburn	wind	28	2011	Scotland
	Hill of Towie	wind	48	2012	Scotland
	Meikle Carewe	wind	10	2013	Scotland
	Tallentire	wind	12	2013	England
	Grange	wind	14	2013	England
	Roos	wind	17	2012	England
	Wadlow	wind	26	2012	England

For footnotes see page 151

5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)[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
RGS Energy Ltd	Knapton	gas	40	1994	Yorkshire and the Humber
Riverside Resource Recovery Limited	Edmonton	waste	72	2011	South East
RWE Npower Plc	Aberthaw B	coal	1586	1971	Wales
	Tilbury B	biomass	750	1968	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	rapeseed oil	68	1968	East
	Little Barford GT	gas oil	17	2006	East
	Littlebrook D	oil	1370	1982	South East
	Didcot B	CCGT	1430	1998	South East
	Great Yarmouth	CCGT	420	2001	East
	Little Barford	CCGT	720	1995	East
	Staythorpe C	CCGT	1724	2010	East Midlands
	Pembroke	CCGT	2180	2012	Wales
RWE Npower Renewables Ltd (Part of RWE Npower)	Black Rock	hydro	2	2012	Scotland
	Braevallich	hydro	2	2005	Scotland
	Cwm Dyli	hydro	10	2002 (9)	Wales
	Dolgarrog High Head	hydro	17	2002 (9)	Wales
	Dolgarrog Low Head	hydro	15	1926/2002	Wales
	Garrogie	hydro	2	2005	Scotland
	Inverbain	hydro	1	2006	Scotland
	Kielder	hydro	6	2006 (9)	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
	Hameldon Hill	wind	5	2007	North West
	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
	Lindhurst	wind	9	2010	East Midlands
	Novar 2	wind	37	2012	Scotland
	Hellrigg	wind	9	2012	North West
	Bradwell	wind	21	2013	North East
	Kiln Pit Hill	wind	14	2012	North East
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
	Cuileg	hydro	3	2002	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

For footnotes see page 151

5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)[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
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
	Glenmoriston	hydro	37	1957	Scotland
	Glendoe	hydro	100	2008	Scotland
	Quoich	hydro	18	1955	Scotland
	Invergarry	hydro	20	1956	Scotland
	Kingairloch	hydro	4	2005	Scotland
Shin	Cassley	hydro	10	1959	Scotland
	Lairg	hydro	4	1959	Scotland
	Shin	hydro	18	1958	Scotland
Sloy/Awe	Sloy	hydro	153	1950	Scotland
	Sron Mor	hydro	4	1957	Scotland
	Clachan	hydro	40	1955	Scotland
	Allt-na-Lairige	hydro	7	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	2	1952	Scotland
	Striven	hydro	8	1951	Scotland
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
	Balmurrie Fell	wind	9	2012	Scotland
	Bu	wind	3	2002	Scotland
	Hadyard Hill	wind	120	2005	Scotland
	Spurness Extension (19)	wind	10	2012	Scotland
	Tangy	wind	19	2002	Scotland
	Drumderg	wind	37	2008	Scotland
	Bessy Bell 1	wind	5	1995	Northern Ireland
	Bessy Bell 2	wind	9	2008	Northern Ireland
	Bin Mountain (20)	wind	9	2007	Northern Ireland
	Tappaghan (20)	wind	29	2005	Northern Ireland
	Slieve Kirk	wind	28	2011	Northern Ireland
	Carcant (20)	wind	7	2010	Scotland
	Toddleburn	wind	28	2010	Scotland
	Griffin	wind	156	2011	Scotland
	Greater Gabbard (21)	wind (offshore)	504	2011	East
	Achany	wind	38	2010	Scotland
	Fairburn	wind	40	2009	Scotland
	Clyde South	wind	129	2011	Scotland
	Clyde Central	wind	113	2011	Scotland
	Clyde North	wind	108	2012	Scotland
	Gordonbush	wind	70	2011	Scotland
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 (22)	CCGT	1180	1980	Scotland

For footnotes see page 151

5.11 Power Stations in the United Kingdom

(operational at the end of May 2013)[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
Thermal (continued)	Keadby	CCGT	710	1994	Yorkshire and the Humber
	Keadby GT	gas oil	25	1994	Yorkshire and the Humber
	Medway	CCGT	700	1995	South East
	Ferrybridge C	coal/biomass	1960	1966	Yorkshire and the Humber
	Fiddler's Ferry	coal/biomass	1961	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
	Slough	coal/biomass/ gas/waste derived fuel	61	1918	South East
	Chickerell	gas/oil	45	1998	South West
	Burghfield	gas/oil	45	1998	South East
	Thatcham	light oil	9	1994	South East
	Five Oaks	light oil	9	1995	South East
	Chippenham	gas	10	2002	South West
	Wheldale	mines gas	8	2002	Yorkshire and the Humber
Island Generation	Arnish	diesel	10	2001	Scotland
	Barra	diesel	3	1990	Scotland
	Bowmore	diesel	6	1946	Scotland
	Kirkwall	diesel	16	1953	Scotland
	Lerwick	diesel	67	1953	Scotland
	Loch Carnan, South Uist	diesel	10	1971	Scotland
	Stornoway	diesel	19	1950	Scotland
	Tiree	diesel	3	1945	Scotland
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:	Longannet	coal	2304	1970	Scotland
	Damhead Creek	CCGT	800	2000	South East
	Pilkington - Greengate	gas CHP	10	1998	North West
	Rye House	CCGT	715	1993	East
	Shoreham	CCGT	400	2000	South East
Wind:	Arecleoch	wind	120	2010	Scotland
	Beinn an Tuirc I	wind	30	2001	Scotland
	Beinn an Tuirc II	wind	7	2012	Scotland
	Beinn Tharsuinn	wind	30	2007	Scotland
	Black Law	wind	124	2005	Scotland
	Callagheen	wind	17	2006	Northern Ireland
	Carland Cross RP	wind	10	2013	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 I	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 I	wind	16	1995	Scotland
	Hagshaw Hill II	wind	26	2009	Scotland
	Hare Hill	wind	13	2000	Scotland
	Lynemouth	wind	26	2012	Scotland
	Mark Hill	wind	56	2011	Scotland

For footnotes see page 151

5.11 Power Stations in the United Kingdom

(operational at the end of May 2013)[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
	Middleton	wind	12	2013	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
	Whitelee II	wind	217	2012	Scotland
	Wolf Bog	wind	10	2008	Northern Ireland
Seabank Power Limited (24)	Seabank 1	CCGT	812	1998	South West
	Seabank 2	CCGT	410	2000	South West
Sembcorp Utilities (UK) Ltd	Wilton Power Station	gas/coal/oil	238	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
Statkraft Energy Ltd	Rheidol	hydro	49	1961	Wales
Statkraft Wind UK Ltd	Alltwalis	wind	23	2009	Wales
	Scira (Sheringham Shoal)	wind (offshore)	316	2012	East
	Baillie	wind	53	2013	Scotland
Sutton Bridge Power Generation	Sutton Bridge	CCGT	819	1999	East
Talisman Energy	Beatrice *(3)*	wind (offshore)	10	2007	Scotland
Triodos	FMC *(2)*	wind	2	2011	Scotland
Vattenfall Wind Power	Kentish Flats	wind (offshore)	90	2005	South East
	Thanet	wind (offshore)	300	2010	South East
	Edinbane	wind	41	2010	Scotland
	Ormonde	wind (offshore)	150	2011	North West
	Swinford	wind	22	2012	Midlands
Windcluster	Haverigg III *(2)*	wind	3	2005	North West
Yorkshire Windpower Ltd *(25)*	Ovenden Moor	wind	9	1993	Yorkshire and the Humber
	Royd Moor	wind	7	1993	Yorkshire and the Humber
Total			**82,928**		

Other power stations[26]

Renewable sources and combustible wastes	wind	1,144	
	landfill gas	1,036	
	sewage gas	199	
	hydro	240	
	biomass and waste	921	
	solar photovoltaics and wave/tidal	1,712	
CHP schemes listed in Table 5.12	various fuels	2,122	
CHP schemes other than major power producers and renewables and those listed in Table 5.12	mainly gas	1,944	
Other autogenerators	various fuels	491	

For footnotes see page 151

5.11 Power Stations in the United Kingdom
(operational at the end of May 2013)(1) (continued)

Interconnectors

	Capacity (MW)
England - France	2,000
England - Netherlands	1,000
Scotland - Northern Ireland	500
Wales - Irish Republic	500
Northern Ireland - Irish Republic	600

Footnotes

(1) This list covers stations owned or operated by Major Power Producers; other power stations (including many renewable sites and auto-generators) are included in the sub table on page 152.

(2) Operated by HG Capital

(3) Joint venture with Scottish and Southern Energy

(4) Managed by RWE

(5) Operated by RES

(6) Joint venture between Green Coat Capital and Hermes, but operated by SSE.

(7) Now owned by EDF

(8) Managed by EDF Energy Renewables Ltd

(9) Recommissioning dates.

(10) Capacity reduced in 2013, with these stations typically now operating as Open Cycle Gas Turbines

(11) Co-owned with Centrica

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

(13) Teesside station partially mothballed, reducing capacity from 1875 MW (1830 MW CCGT) to 45 MW (OCGT)

(14) Co-owned by Dong and EON

(15) Owned by RWE

(16) Owned by NDA but operated by Magnox Ltd

(17) Joint venture between SSE and ESB

(18) Owned by NDA but operated by Px Limited

(19) Spurness re-powered in December 2012 with a capacity of 10MW

(20) Owned by Green Coat Capital, but continues to be operated by SSE

(21) Joint venture with Green Coat Capital, but operated by SSE

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

(23) Carland Cross re-powered in 2013 (originally commissioned in 1992)

(24) Joint venture with Scottish and Southern Energy and Electricity First Limited

(25) Owned by E.On and EPR

(26) As at end December 2012.

5.12 Large scale CHP schemes in the United Kingdom (operational at the end of December 2012)[1]

Company Name	Scheme Location	Installed Capacity (MWe) (2)
Adm Erith Ltd	Erith Oil Works	14
Alta Estate Services Limited	Chp Station, Alta Estate Services Ltd, University Of	6
Anglian Water Services Limited	Tilbury Sewage Treatment Works	2
Astrazeneca Limited	Astrazeneca - Avlon	3
Balcas Limited	Balcas Limited	3
Balcas Timber Ltd	Balcas Invergordon	9
Barkantine Heat & Power Company	Barkantine, Barkantine Heat & Power Company	1
Basf Performance Products	Water Treatments, Basf Performance Products	17
Bayer Cropscience Limited	Bayer Cropscience Limited, Norwich	4
Bd Diagnostics	Bd Diagnostics, Beckton Dickinson	3
Bhp Billiton Uk Production Unit	Point Of Ayr Terminal, Bhp Billiton Uk Production Unit	9
British Sugar Plc	Bury St Edmunds Sugar Factory	90
British Sugar Plc	Wissington Sugar Factory, British Sugar Plc (Chp 2)	93
Cambridge University Hospitals Foundation	Addenbrookes Hospital	4
Cantelo Nurseries	Bradon Farm	10
Carillion Services Ltd Ta Carillion Health	Queen Alexandra Hospital	3
Celts Ltd	Levenmouth Waste Water Treatment Works	2
Citywesthomes	Pump House	3
Cofely District Energy Ltd	The Heat Station (Chp 2)	7
Cofely District Energy Ltd	Mod Main Building, Cofely Limited	5
Cofely District Energy Ltd	Soas Chp, The Boiler House	2
Cofely District Energy Ltd	Icc Energy Centre	2
Cofely District Energy Ltd	Aston University Energy Centre, Aston University	3
Cofely District Energy Ltd	Birmingham Childrens Hospital	2
Cofely Ltd	Trafford Park, Kellogg Company Of Great Britain	5
Cofely Ltd	Hillhouse International	5
Crisp Maltings Group Ltd	Crisp Maltings Ryburgh	1
Cyclerval Uk Ltd	Newlincs Efw, Newlincs Development Ltd	4
Dalkia	Freeman Hospital	4
Dalkia	Royal Victoria Infirmary	4
Dalkia Cleanpower 2 Ltd	Fribo Foods	1
Dalkia Plc	Lincoln County Hospital	1
Dalkia Utilities Services	North Tyneside General Hospital	1
Dalkia Utilities Services	Eli Lilly & Co Ltd	10
Dalkia Utilities Services Plc	Astrazeneca	23
De La Rue International	Overton Mill, De La Rue International Ltd	7
Dsm Nutritional Products (Uk) Ltd	Dsm Dalry	46
E.On Uk Chp Limited	Brunner Mond (Uk) Limited	146
E.On Uk Chp Limited	Port Of Liverpool Chp	31
E.On Uk Cogeneration Ltd	Leeds Teaching Hospital Nhs Trust	5
E.On Uk Cogeneration Ltd	Stoke Chp, Michelin Tyre Plc	61
E.On Uk Plc	Workington Chp	48
East Sussex Healthcare Trust	Eastbourne District General Hospital	1
ED&F Man Ltd (Man Group Plc)	ED&F Man Ltd (Man Group Plc)	1
Ener-G	Loughborough University (Unit 1285)	1
Ener-G	Granada Studios (Unit 730)	1
Enviroenergy	London Road Heat Station	14
Eon	Ah Marks And Company Ltd	5
Eon	Queens Medical Centre Nhs Trust	5
Eon Uk	Citigen Chp, Citigen (London) Limited	16
Esso Petroleum Company Limited	Fawley Cogen	316
Fine Organics Limited	Fine Organics Limited	4
Fortum O&M (Uk) Ltd	Sullom Voe Power Station	89
Genzyme Ltd	Genzyme Ltd	1
Glaxosmithkline	Glaxosmithkline Montrose	1
Glaxosmithkline	Glaxosmithkline Irvine	4
Glaxosmithkline	Glaxosmithkline Coleford	5
Glaxosmithkline	Barnard Castle	2
Glaxosmithkline	Glaxosmithkline, Ware	2

For footnotes see page 154

5.12 Large scale CHP schemes in the United Kingdom
(operational at the end of December 2012)[1] *(continued)*

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
Heathcoat Fabrics Ltd	Heathcoat Fabrics Limited	1
Helix Agencies Limited	Natural History Museum	2
Helix Agencies Limited	Blackpool Victoria Hospital	1
Humber Energy Ltd	Humber Energy Ltd, Grimsby Site	48
Imperial College London	South Kensington Campus Chp Plant	9
Inbev Uk Ltd	Samlesbury Brewery, Inbev Uk Ltd	7
Inbev Uk Ltd	Magor Brewery, Inbev Uk Ltd	7
Ineos Chlorvinyls Limited	Runcorn, Ineos Chlorvinyls Limited	38
Ineos Newton Aycliffe Ltd	Ineos Newton Aycliffe Ltd	12
Integrated Energy Utilities Ltd	Callendar Park Energy Centre, Falkirk Council	1
James Cropper Plc	James Cropper Plc	7
John Thompson And Son Ltd	John Thompson & Sons Limited	4
Johnson Matthey	Johnson Matthey Enfield	3
Johnson Matthey Plc	Johnson Matthey - Royston	6
Kingspan Insulation Limited	Kingspan Insulation Limited	1
Kodak Limited	Harrow Site, Kodak Limited	12
Medway Nhs Foundation Trust	Medway Hospital, Medway Maritime Hospital	1
Milford Haven Refinery	Milford Haven Refinery	29
Mill Nurseries Ltd	Millchp, Mill Nurseries	14
Millenium Inorganic Chemicals Ltd	Stallingborough Chp C/O Millenium Inorganic Chemicals	16
Norbord Ltd	Cowie, Norbord Ltd	16
North Tees & Hartlepool Nhs Foundation	University Hospital Of North Tees	2
Northumbrian Water Ltd	Bran Sands (Biogas)	5
Powell Energy	St. Georges Hospital	4
Preston Board And Packaging Ltd	Romiley Board	1
Rotherham General Hospital Nhs Trust	Rotherham District General Hospital	1
Royal Mail Group Property	Royal Mail (Hwdc) Chp 1, Consignia Plc	3
Rwe Npower	Basf Chp	98
Rwe Npower	Aylesford Chp	100
Rwe Npower	Hythe Chp, Npower Cogen (Hythe) Ltd	53
Rwe Npower	Ppco Generating Plant	97
RWE Npower Cogen Ltd	Dow Corning CHP	27
Ryobi Aluminium Casting (Uk) Ltd	Ryobi	1
Sca Hygiene Products Tissue Ltd	Sca Chp	9
Scottish And Southern Energy	Slough Nurseries, G & C Properties	2
Scottish And Southern Energy Plc	Ninewells Hospital, Tayside University Hospitals Nhs Trust	3
Scottish And Southern Energy Plc	Port Clarence Works, Koppers	2
Scottish And Southern Energy Plc	Western General Hospital, Lothian Universities Nhs Trust	1
Scottish And Southern Energy Plc	Red Roofs - North Moor & Dunswell Road	3
Shell Uk Oil Products Ltd	Stanlow Manufacturing Complex	109
Smithkline Beecham Plc/Glaxo Smith Kline	Glaxo Smith Kline Worthing	2
Smurfitt Kappa Ssk	Smurfit Kappa Ssk Limited	9
Springfields Fuels Ltd	Springfields	12
Syngenta Limited	Huddersfield Works, Syngenta Ltd	16
Tangmere Airfield Nurseries Limited	Tangmere Nursery	9
Tate & Lyle Sugars Ltd	Thames Refinery, Tate And Lyle New Scheme	32
Thames Water Utilities Ltd	Maple Lodge Stw	4
Thames Water Utilities Ltd	Long Reach Stw	4
Thames Water Utilities Ltd	Beckton Stw Bio Diesel Chp	4
Thames Water Utilities Ltd	Mogden Stw	8
Thames Water Utilities Ltd	Beddington Stw	4
Thames Water Utilities Ltd	Deephams Stw	3
Thames Water Utilities Ltd	Ryemeads Stw	2
Thames Water Utilities Ltd	Oxford Stw	2
Thames Water Utilities Ltd	Crawley Stw	1
Thames Water Utilities Ltd	Reading (Island Road) Stw	1

For footnotes see page 154

5.12 Large scale CHP schemes in the United Kingdom (operational at the end of December 2012)[1] *(continued)*

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
Thameswey Central Milton Keynes Ltd	Woking Town Centre Phase I	1
Thameswey Central Milton Keynes Ltd	Tcmk Phase 1 Chp No 2 Gas Engine	6
The Boots Group Plc	Boots Energy Centre	14
Transport For London	Palestra, Transport for London	1
University College London	University College London, Bloomsbury Campus	3
University Of Bristol	University Of Bristol Chp 2	1
University Of Dundee	Dundee University - Main Chp Boilerhouse	3
University Of East Anglia	University Of East Anglia (Plain Campus)	3
University Of Edinburgh Utilities Supply	Kings Buildings	3
University Of Edinburgh Utilities Supply	George Square Energy Centre	2
University Of Southampton	University of Southampton	3
University Of Surrey	University Of Surrey	1
University Of Sussex	University of Sussex	1
University Of Warwick	Chp Boilerhouse (Chp 2), University Of Warwick	4
Upm-Kymmene (Uk)	Upm Shotton	22
Van Heyningen Brothers Ltd	West End Nurseries	2
Van Heyningen Brothers Ltd	Runcton Nursery	4
Weetabix Ltd	Weetabix Limited	6
Wessex Water Services Ltd	Bristol Waste Water Treatment Works Scheme A	5.8
Total *(2)*		2,122
Electrical capacity of good quality CHP for these sites in total		1,989

(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
Renewable sources of energy

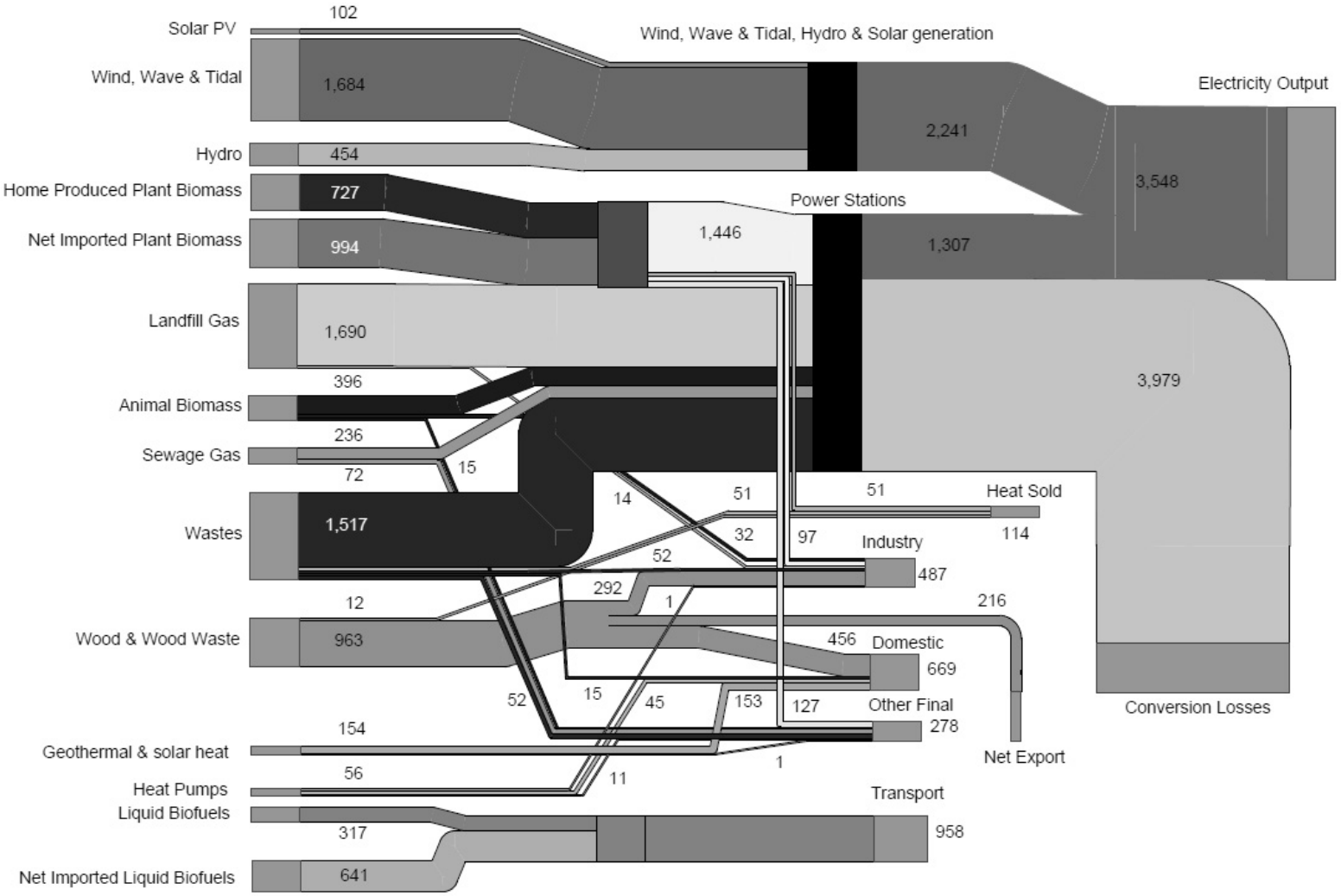
Key points

- Electricity generation from renewable sources increased by around one fifth between 2011 and 2012 to reach 41.3 TWh. Capacity grew by more than one quarter (to 15.5 GW) over the same period (paragraphs 6.9 and 6.12; table 6.4).
- Offshore wind generation was 46 per cent higher than in 2011, with capacity up 63 per cent. Onshore wind generation was 17 per cent higher, with capacity up 27 per cent. Overall wind generation was 26 per cent higher and capacity 37 per cent higher (paragraphs 6.9 and 6.12; table 6.4).
- Generation from bioenergy sources was 15 per cent higher; however generation from hydro sources fell by 7 per cent (paragraph 6.9; table 6.4).
- 707 MW of renewable electricity capacity was added via Feed-in Tariffs during 2012, following the introduction of the FiT scheme in April 2010 (paragraph 6.13).
- Load factors for wind and hydro generation in 2012 were slightly lower than during 2011, but higher than observed in 2010; they are highly dependent on wind speeds and rainfall levels (paragraphs 6.18 and 6.19; table 6.5).
- The contribution of all renewables to UK electricity generation was 11.3 per cent in 2012, 1.9 percentage points higher than in 2011. However using normalised load factors to take account of fluctuations in wind and hydro increased the contribution of renewables to gross electricity consumption rose by 2.0 percentage points to 10.8 per cent (table 6A).
- Heat from renewable sources increased by 7 per cent during 2012 (to 1,409 ktoe); and renewable biofuels for transport fell by 15 per cent (to 958 ktoe) (paragraphs 6.24 and 6.31; table 6.6).
- Progress has been made against the UK's 15 per cent target introduced in the 2009 EU Renewable Directive. Using the methodology set out in the Directive, provisional calculations show that 4.1 per cent of energy consumption in 2012 came from renewable sources; this is up from 3.8 per cent in 2011. There was a significant growth in the contribution of renewable electricity, the renewable heating contribution remained constant, but the renewable transport contribution fell. Across 2011 and 2012, the UK achieved an average of 3.94 per cent, against the 4.04 per cent target set out in the Directive, the shortfall being within the margin of error around the estimate (paragraph 6.35; table 6.7).

Introduction

6.1 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 in combined heat and power (CHP) plants, heat obtained from other renewable sources including deep geothermal, active solar and heatpumps, 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.

Renewables flow chart 2012 (thousand tonnes of oil equivalent)



Note: This flow chart is based on data that appear in Tables 6.1 and 6.4

6.2 The data summarise the results of DECC surveys of electricity generators, information from CHP schemes, and an ongoing study undertaken by Ricardo-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. Further information on RESTATS is available in the technical notes section of this Chapter.

6.3 The renewable energy flow chart summarises the flows of renewables from fuel inputs through to consumption for 2012. This is a way of simplifying the figures that can be found in the commodity balance for renewables energy sources in Table 6.1 and the renewable electricity output that can be derived from Table 6.4. 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.

6.4 Commodity balances for renewable energy sources covering each of the last three years form the first three tables in this chapter (Tables 6.1 to 6.3). Unlike the commodity balance tables in other chapters of the Digest, Tables 6.1 to 6.3 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 6.4). Table 6.5 focuses on load factors for electricity generation. Table 6.6 shows renewable sources used to generate electricity, to generate heat, and for transport purposes in each of the last five years. Finally, table 6.7 shows the UK's progress against the 2009 EU Renewable Energy Directive target.

6.5 In addition to the tables and commentary contained within this Digest, a long-term trends commentary and table (Table 6.1.1) covering the use of renewables to generate electricity, to generate heat, and as a transport fuel is available on the DECC section of the gov.uk website, accessible from the Digest of UK Energy Statistics home page:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes.
Quarterly table ET 6.1, showing renewable electricity generation and capacity by UK country, can be found at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/renewables-statistics

6.6 Also available on the web site is Table 6.1.2 which summarises all the renewable orders made under the Non Fossil Fuels Obligation (NFFO), Northern Ireland Non Fossil Fuels Obligation, and Scottish Renewables Orders (SRO), together with some descriptive text.

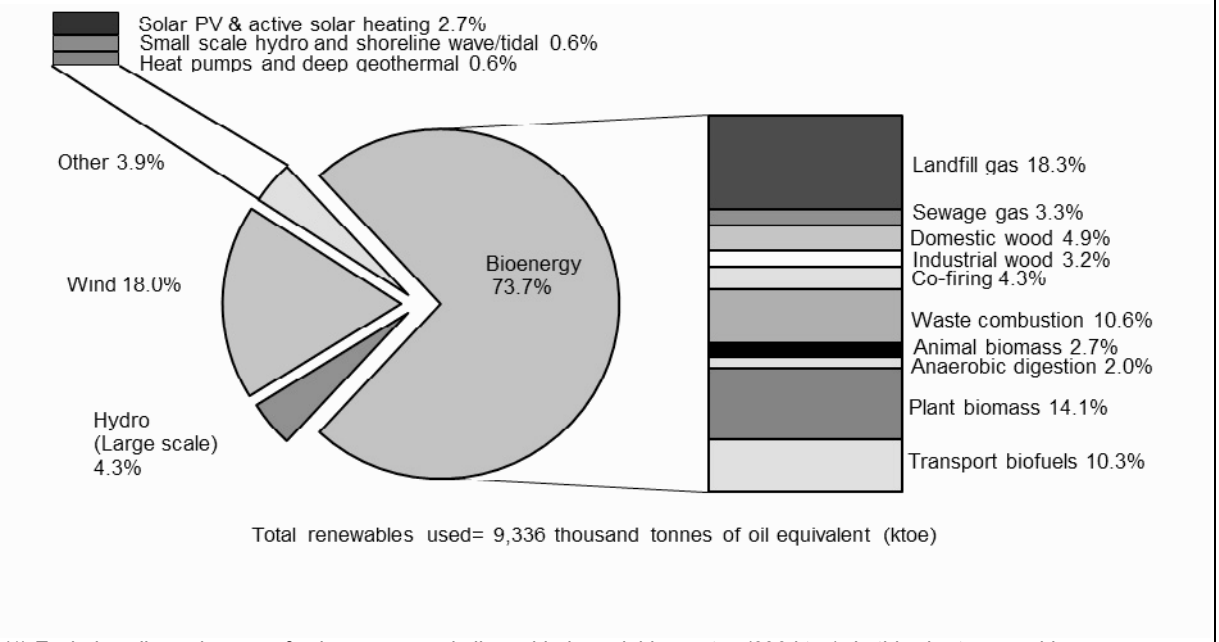
Commodity balances for renewables and waste in 2012 (Table 6.1), 2011 (Table 6.2) and 2010 (Table 6.3)

6.7 Twelve different categories of renewable fuels are identified in the commodity balances. Some of these categories are themselves groups of renewables because a more detailed 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 and waste energy in input terms (around three-quarters) is from bioenergy, with wind generation and large-scale hydro electricity production contributing the majority of the remainder as Chart 6.1 shows. Just 4 per cent of renewable energy comes from renewable sources other than biomass, wind and large-scale hydro. These include solar, small-scale hydro, heat pumps, and deep geothermal.

6.8 Three quarters of the 9,336 ktoe of renewable energy (excluding non-biodegradable wastes) produced in 2012 was transformed into electricity. This proportion reduced year-on-year between 2005 (when electricity accounted for 85 per cent of renewable energy) and 2010 (69 per cent); however, the reduced demand for biofuels in the transport sector in 2011 and 2012 reversed this trend. While bioenergy 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 6.4 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 5.74).

However for landfill gas, sewage sludge, municipal solid waste and other bioenergy sources a substantial proportion of the energy content of the input is lost in the process of conversion to electricity as the flow chart (page 156) illustrates.

Chart 6.1: Renewable energy fuel use 2012 (1)



(1) Excludes all passive use of solar energy and all non-biodegradable wastes (696 ktoe). In this chart renewables are measured in primary input terms.
(2) Biomass co-fired with fossil fuels in power stations.
(3) 'Animal biomass' includes farm waste, poultry litter, and meat and bone combustion.
(4) 'Plant biomass' includes straw and energy crops.

Capacity of, and electricity generated from, renewable sources (Table 6.4)

6.9 Table 6.4 shows the capacity of, and the amounts of electricity generated from, each renewable source. Total electricity generation from renewables in 2012 amounted to 41,258 GWh, an increase of 6,613 GWh (19 per cent higher) on 2011. The largest absolute increase in generation came from plant biomass, rising by 2,348 GWh to 4,098 GWh, due to the conversion of Tilbury B's, previously coal-fired, power station to dedicated biomass in December 2011. Greater capacity also increased generation from offshore wind - raising output by 2,337 GWh to 7,463 GWh (a 46 per cent increase on the previous year). Similar factors helped onshore wind generation contribute the third largest absolute increase, of 1,737 GWh to 12,121 GWh (17 per cent higher). Greater uptake of solar photovoltaics, supported by the Feed-in tariff scheme, led to generation in 2012 which was nearly four times higher (up by 944 GWh) than in 2011, at 1,188 GWh. Generation from biodegradable waste increased by 540 GWh to 2,279 GWh (31 per cent higher). Other sources showing increases during the year included anaerobic digestion (an increase of 245 GWh, 88 per cent higher), landfill gas (62 GWh, 1 per cent higher) and animal biomass (28 GWh, 5 per cent higher). There were reductions in generation from co-firing renewables with fossil fuels (1,181 GWh lower), hydro (406 GWh lower due to reduced rain fall in the main hydro areas) and sewage sludge digestion (44 GWh lower).

6.10 Onshore wind continued to be the leading individual technology for the generation of electricity from renewable sources during 2012 with 29 per cent of renewables generation coming from this source; a further 18 per cent came from offshore wind, and 13 per cent came from hydro. However the combined generation from the variety of different bioenergy sources accounted for 37 per cent of renewable generation, with landfill gas accounting for one-third of the bioenergy generation (and 12 per cent of all renewable electricity generation). Despite the large annual increase, just 3 per cent of renewable generation came from solar photovoltaics. Total generation from bioenergy sources was 15 per cent higher than in 2011, with wind being 26 per cent higher, whilst hydro's contribution was 7 per cent lower, reflecting lower rainfall in the main hydro areas.

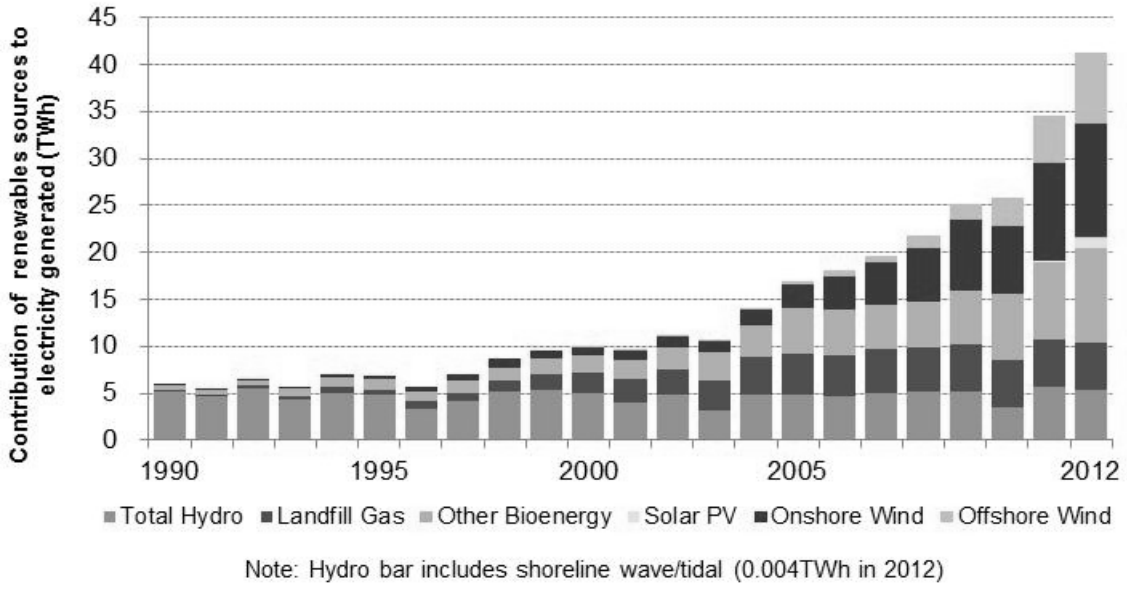
6.11 Renewable sources provided 11.3 per cent of the electricity generated in the United Kingdom in 2012 (measured using the "international basis", i.e. electricity generated from all renewables except non-biodegradable wastes as a percentage of all electricity generated in the UK), 1.9 percentage points higher than the proportion recorded during 2011. Table 6A and Chart 6.2 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 Renewables Obligation (see paragraphs 6.45 to 6.47), and progress towards the 2001 Renewables Directive (using both the original and normalised calculation methods) and the 2009 Renewable Energy Directive (see paragraph 6.43). Future editions of the Digest of this article will not report the 2001 Renewables Directive measure.

Table 6A: Percentages of electricity derived from renewable sources

	2008	2009	2010	2011	2012
Overall renewables percentage (international basis)	5.6	6.7	6.8	9.4	11.3
Percentage on a Renewables Obligation basis	5.4	6.7	6.8	9.4	10.6
Percentage on original 2001 Renewables Directive basis	5.5	6.7	6.7	9.3	11.0
Percentage on normalised 2001 Renewables Directive basis	5.4	6.6	7.3	8.7	10.7
Percentage on a 2009 Renewable Energy Directive basis (normalised)	5.4	6.6	7.4	8.8	10.8

6.12 Installed generation capacity reached 15,538 MW at the end of 2012, an increase of 3,274 MW (27 per cent) during the year; this excludes the capacity within conventional generation stations that was used for co-firing (a further 204 MW). The largest contributor towards the increase was 1,256 MW from onshore wind, with a further 1,157 MW from offshore wind; capacity from solar photovoltaics increased by 713 MW; and capacity from the variety of bioenergy technologies increased by a combined 134 MW. In capacity terms, onshore wind was the leading technology at the end of 2012, accounting for 38 per cent of capacity, followed by offshore wind (19 per cent), solar photovoltaics and hydro (11 per cent each). Bioenergy represented 21 per cent of capacity, with the main components being plant biomass (8 per cent) and landfill gas (7 per cent).

Chart 6.2: Electricity generation by main renewable sources since 1990

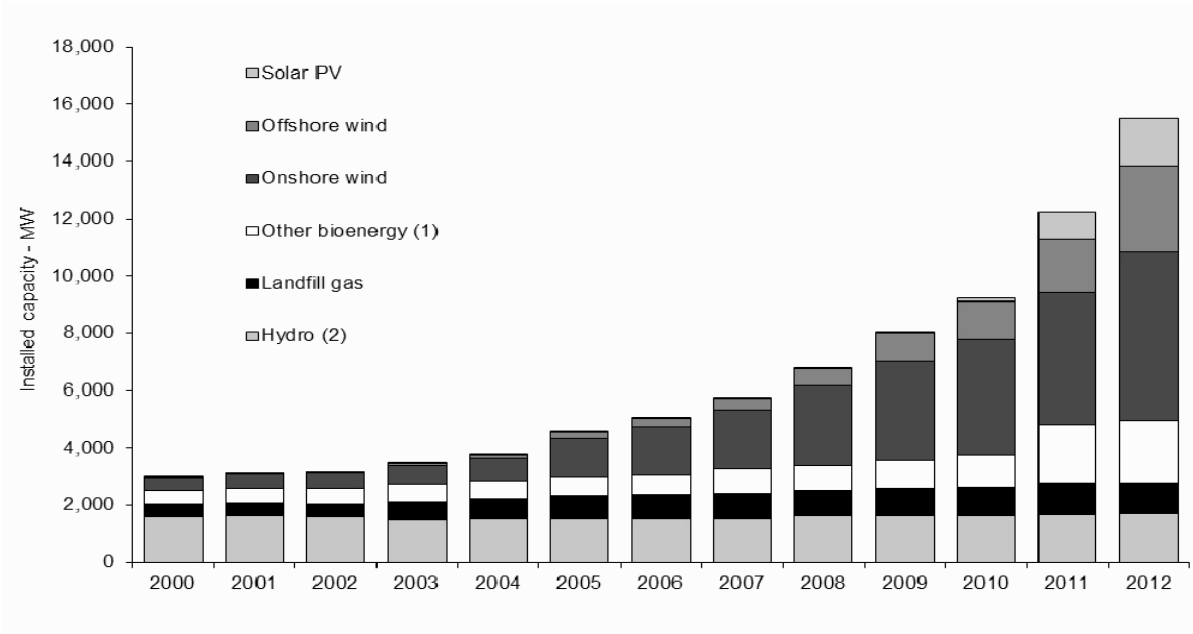


6.13 During the first nine months (April and December 2010) of the FiT scheme, a total of 69 MW of renewable capacity was installed and subsequently confirmed on the FiT scheme. During 2011, a further 947 MW of FiT supported renewable capacity was installed. For 2012, 707 MW of capacity was added, with 87 per cent of this new capacity coming from photovoltaics. A further 149 MW of PV capacity was installed in 2012 and awaiting accreditation on FiTs. Despite the majority of the increase in FiTs capacity in 2012 coming from PV, this (615 MW) was lower than 2011 (871 MW). The greatest increase in capacity in percentage terms in 2012 was from onshore wind, which more than doubled

during the year, from 66 MW at the end of 2011 to 132 MW at the end of 2012, while hydro capacity increased from 26 MW to 35 MW and anaerobic digestion from 21 MW to 38 MW. At the end of 2012, PV represented 88 per cent of commissioned FiTs capacity (down from 89 per cent at the end of 2011), with onshore wind 7.5 per cent (down from 6.3 per cent), hydro 2.0 per cent (down from 2.4 per cent) and anaerobic digestion 2.2 per cent (up from 2.0 per cent). It should be noted that, due to administrative lags of around three months, much capacity installed towards the end of 2012 was not confirmed until the first quarter of 2013 (so the amount of capacity installed under FiTs at the end of 2012 will not equal the amount actually confirmed on the Central FiTs Register).[1]

6.14 Chart 6.3 illustrates the continuing increase in the electricity generation capacity from all significant renewable sources since 2000. This upward trend in the capacity of renewable sources should continue as recently consented onshore and offshore windfarms and other projects come on stream. The map, shown on page 161, shows the location of wind farms in operation at the end of December 2012, together with an indication of the capacity.

Chart 6.3: Electrical generating capacity of renewable energy plant since 2000



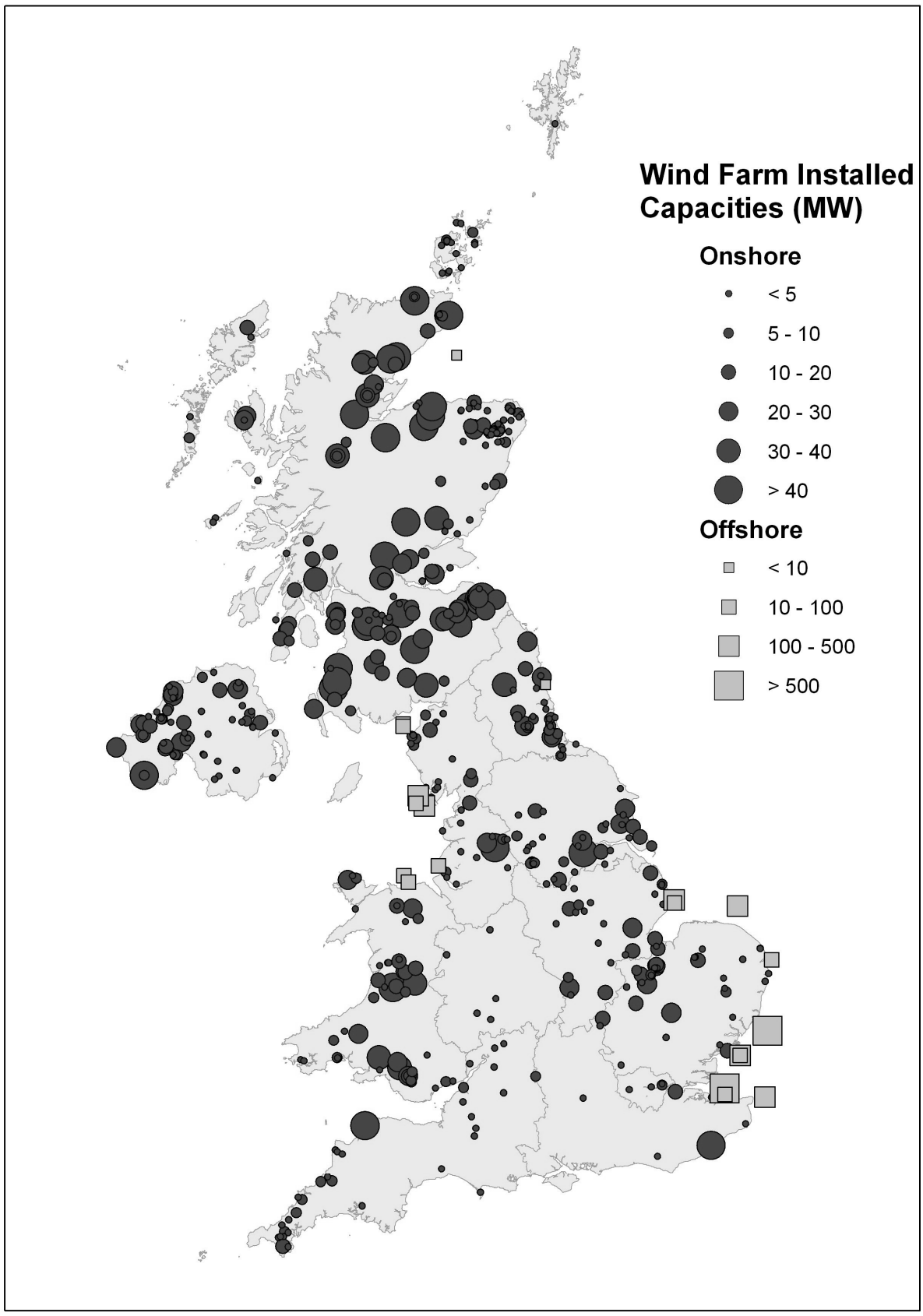
(1) All waste combustion plant is included because both biodegradable and non-biodegradable wastes are burned together in the same plant.

(2) Hydro includes both large scale and small scale, and shoreline wave (6.7 MW in 2012).

6.15 Electricity generated in the UK from renewable sources eligible for, and claiming Renewable Obligation Certificates (ROCs) in 2012 was 13 per cent greater than in 2011; this compares with 32 per cent growth in 2011, the higher growth rate in 2011 being largely due to the much higher rainfall and, especially, wind speeds than in 2010, resulting in a large increase in generation from onshore wind and hydro in that year. Chart 6.4 includes a line showing the growth in the proportion of electricity produced from renewable sources claiming ROCs in addition to the International definition and the definition used to monitor the electricity component of the 2009 Renewable Energy Directive. Table 6A shows electricity eligible for and claiming ROCs as a percentage of electricity sales. RO supported generation has increased by 27 TWh since its introduction in 2002, an increase of 469 per cent, although a small amount 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 271 per cent over the same period, but from a higher starting level.

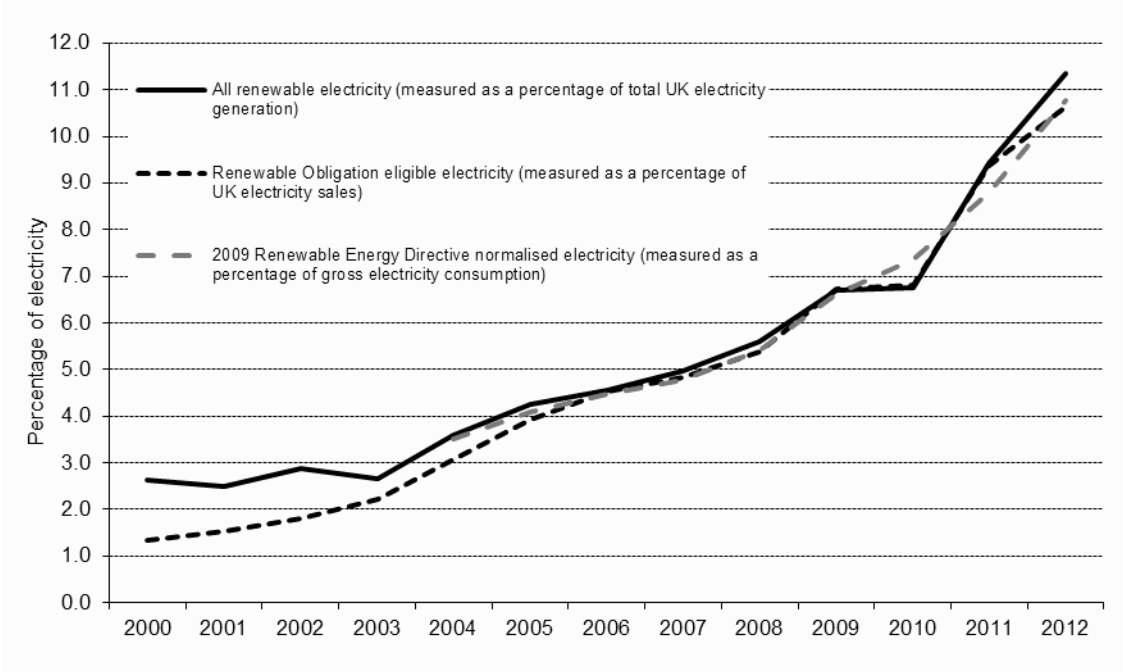
[1] At the end of 2012, 1,760 MW of renewable capacity was commissioned and subsequently confirmed on the Central FiTs Register. This includes 37 MW commissioned prior to the start of FiTs on 1 April 2010.

The Location of Wind Farms in the United Kingdom as at 31 December 2012



6.16 As shown in Table 6A, during 2012 renewable generation measured using the RO basis (i.e. as a proportion of electricity sales by licensed suppliers) increased to 10.6 per cent. Since the introduction of the RO in 2002 generation from wind has increased on average by nearly one-third each year, with year-on-year increases ranging from 2 per cent to 52 per cent.

Chart 6.4: Growth in electricity generation from renewable sources since 2000



Load factors for electricity generated from renewable sources (Table 6.5)

6.17 Plant load factors in Table 6.5 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. The number of technologies for which load factors are shown have been expanded in this edition of the Digest, but the method for calculating them has remained the same. The method can be expressed as:

$$\frac{\text{Electricity generated during the year (kWh)}}{\text{(Installed capacity at the beginning of the year + Installed capacity at the end of the year (kW))} \times 0.5 \times \text{hours in year}}$$

6.18 A number of factors can have major impacts on load factors. For instance, rain levels during 2010 were 30 per cent lower than in 2009, and it was the driest year since 2003; this impacted on hydro load factors which fell from 36.7 per cent in 2009 to 24.9 per cent in 2010. Rain levels in 2011 were 85 per cent higher than in 2010; this resulted in a record high hydro load factor of 39.2 per cent. In 2012 rain levels were 24 per cent lower than in 2011, returning to a similar level to the average between 2002 and 2011; consequently the load factor fell to 35.8 per cent.

6.19 The lowest average wind speeds this century (7.8 knots) were observed in 2010, reducing onshore load factors by one-fifth to 21.7 per cent compared with 2009. Wind speeds in 2011 were around 1.3 knots higher than in 2010, returning load factors to a similar level obtained in 2007 to 2009. During 2012 average wind speed was 0.8 knots lower than in 2011, and around 0.6 knots lower than the 10 year average; this reduced onshore wind load factors by one percentage point. Other factors, such as improved design can also impact on load factors. Load factors for all non-renewable generating plant in the UK are shown in Chapter 5, Table 5.10.

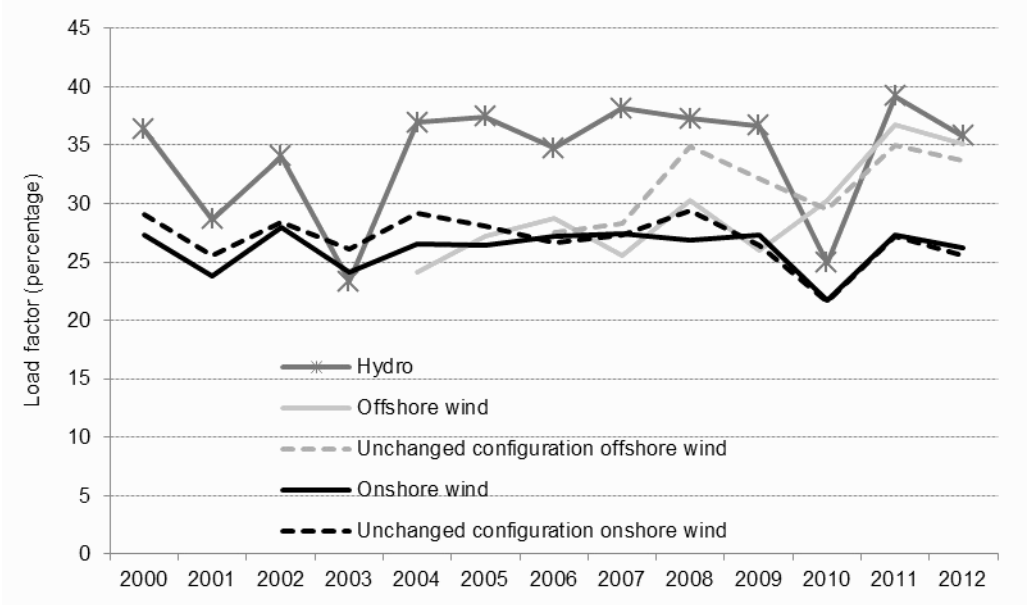
6.20 Change in capacity during the year can also affect load factors calculated using this methodology. Over recent years this has particularly impacted on wind technologies. As an indication of the impact that new capacity can have on load factors, the off-shore capacity at Rhyl Flats (90 MW) which came on line on 28 December 2009, had the impact of reducing the all-offshore factor by 1½ percentage points in 2009, since it was only generating for 4 days but its capacity has an impact on the denominator of the calculation for the whole year. During 2011, the conversion of Tilbury B's previously coal-fired power station to dedicated biomass in December 2011 reduced the plant biomass load factor by around one-half as the 750 MW capacity only contributed to renewable generation for less than one month. Similarly the large increase in solar PV capacity towards the end of 2010 and 2011 affected the load factors for this technology.

6.21 To compensate for these calculation issues, a second "unchanged configuration" set of statistics have been calculated for many technologies and included in Table 6.5. These statistics use the same methodology as the other load factor statistics, but are restricted to those schemes that have operated continuously throughout the year without a change in capacity. One of the inputs to the unchanged configuration calculation is data on claims for Renewable Obligation Certificates, and a site is included in the calculation only if it has claimed ROCs for each month during the calendar year. In this edition of the Digest, the unchanged configuration basis has been expanded to include non-wind technologies. The formula for calculating the unchanged configuration load factors is:

$$\frac{\text{Electricity generated during the year (kWh)}}{\text{(Installed capacity operating throughout the year with unchanged configuration (kW)) x hours in year}}$$

6.22 Chart 6.5 shows load factors for wind and hydro. The impacts of new capacity and changes in weather conditions – referred to in the preceding paragraphs - can be identified.

Chart 6.5: Load factors for renewable electricity generation



Renewable sources used to generate electricity, heat, and for transport fuels (Table 6.6)

6.23 Between 2011 and 2012 there was an increase of 14 per cent in the **input** of renewable sources into electricity generation, to 6,969 ktoe. The combined contribution of on-shore and off-shore wind increased by 26 per cent, bioenergy sources increased by 11 per cent, whilst hydro fell by 7 per cent.

Renewable heat

6.24 Table 6.6 also shows the contribution from renewables to heat generation. Around 15 per cent of renewable sources were used to generate heat in 2012. This sector has seen some growth in recent years, following a decline that started more than 10 years ago as a result of tighter emission controls which discouraged on-site burning of bioenergy, especially wood waste. Since their 'low point' in 2005 bioenergy use has more than doubled to 1,199 ktoe; the increase between 2011 and 2012 was 4 per cent. Around one per cent of renewable heat was supported by the RHI during 2012 (13 ktoe, or 152 GWh). Further information on the RHI and RHPP schemes can be found in paragraphs 6.51 to 6.53. Energy from all renewable heat sources increased by 7 per cent during 2012 to 1,409 ktoe.

6.25 Domestic use of wood is the main contributor to renewables used for heat – comprising around 32 per cent of the renewable heat total. Non-domestic use of wood and wood waste, and plant biomass formed the next largest components, at around 22 per cent and 20 per cent respectively. Non-bioenergy renewable heat sources include solar thermal, deep geothermal and heat pumps, and combined these accounted for 15 per cent of renewable heat in 2012.

6.26 The contribution of energy from heat pumps is included in the Digest for 2008 onwards. Only the net gain in energy (i.e. total heat energy minus the electricity used to power the pump) is counted as renewable energy. The calculations have used information from BSRIA, a research organisation, that heat pumps installed in 2008 and onwards have a seasonal performance factor (SPF) that meets the minimum requirements set out in the Renewable Energy Directive (RED); it is assumed that there was no significant contribution from heat pumps installed before 2008.

6.27 Guidance on measuring the contribution of heat pumps for the RED was produced by the European Commission in March 2013, and data in this edition of the Digest has been revised to use this methodology. In summary, default values for SPF and hours of operation have been applied to information on the installed heat pump capacity. The UK is split into two climate zones which use different default values. The "warm" climate zone covers the South West, South East, London, Wales and the West Midlands regions, with the "average" climate zone covering the remaining regions. Data from the RHPP scheme were used as a basis for allocating heat pumps to the climate zones. The total installed capacity of ground source heat pumps, ambient air to water heat pumps, and exhaust air heat pumps meeting the minimum SPF was estimated to be 864 MW at the end of 2012. The capacity installed during 2012 was assumed to be installed at a steady rate throughout the year. Heat pumps were estimated to deliver 652 GWh of renewable heat in 2012, with 53 per cent of this heat coming from air source heat pumps. The guidance referred to above can be found at:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:062:0027:0035:EN:PDF

Liquid Biofuels for transport

6.28 Biodiesel consumption figures have been obtained from data 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. 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. On 1 April 2010, the duty rates for biodiesel and bioethanol were increased to the same rate as the main road fuel rate. However, biodiesel made from waste cooking oil continued to benefit from a 20 pence per litre duty differential for a period of two years until April 2012, via a relief scheme introduced from 1 April 2010. The HMRC figures show that 634 million litres of biodiesel were consumed in 2012, around 31 percent lower than in 2011. Credits under the Renewable Transport Fuel Obligation were doubled for some types of biodiesel (such as waste cooking oil), meaning that less was needed to be blended with diesel. It is estimated that 280 million litres of biodiesel were produced in the UK in 2012, around three-fifths of the production in 2007 (485 million litres). Therefore around 354 million litres of biodiesel were imported in 2012. The total annual capacity for biodiesel production in the UK in 2012 is estimated to be around 590 million litres.

6.29 HMRC data also show that 775 million litres of bioethanol was consumed in the UK in 2012; this continues a trend of increasing bioethanol use that started with 85 million litres in 2005. Growth between 2011 and 2012 was 19 per cent. The UK capacity for bioethanol production at the end of

2012 was estimated to be around 895 million litres, although actual production – at 154 million litres – was less than one-fifth of capacity.

6.30 During 2012, biodiesel accounted for 2.4 per cent of diesel, and bioethanol 4.1 per cent of motor spirit. The combined contribution of liquid biofuels for transport was 3.1 per cent. The monthly HMRC source data can be obtained from their Hydrocarbon Oils Duties bulletins available at: www.uktradeinfo.com/Statistics/Pages/TaxAndDutybulletins.aspx

6.31 The HMRC data have been converted from litres to tonnes of oil equivalent and the data are shown in both the commodity balances (Tables 6.1 to 6.3) and in Table 6.6. In addition these data are also included in the aggregate energy balances (Tables 1.1 to 1.3). The tables show the contribution that liquid biofuels are making towards total renewable sourced energy. Between 2011 and 2012, the use of biofuels for transport fell by 15 per cent to 958 ktoe. In 2012 10 per cent of the renewable sources used in the UK in primary input terms were liquid biofuels for transport, down from a high of 16 per cent in 2010, but significantly greater than the half of one per cent in 2003.

6.32 The growth can, in part, be attributed to the introduction of the Renewable Transport Fuel Obligation (RTFO) which came into force on 15 April 2008. When measuring the contribution of transport biofuels for the Renewable Energy Directive, only those meeting sustainability criteria count. The HMRC data referred to above do not contain sustainability information, so data from the RTFO are used to identify the quantity of sustainable biofuels – including those which carry a higher weighting in the transport-specific measure. During 2012 around 83 per cent of transport biofuel consumption was sustainable. Further information on the RTFO is given in paragraphs 6.49 and 6.50.

Renewable sources data used to indicate progress under the 2009 EU Renewable Energy Directive (RED) (Table 6.7)

6.33 The 2009 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. The renewable numerator in the calculation uses 'normalised' wind and hydro generated electricity – combined with other actual electricity generated from other sources, energy for heating and cooling by final consumers, as well as 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. The normalisation process is carried out by calculating generation by applying an average load factor to current capacity. For wind, the load factor is calculated as the average of the past five years (including the present one), with current capacity taken as an average of the start and end of year capacity. For hydro, the load factor is the average of the past 15 years, applied to capacity at the end of the current year. The generation figures obtained from this procedure replace the actual generation figures for wind and hydro in the Directive calculation. Additionally, the Directive includes a cap on the proportion that air transport can contribute to the total; this cap is currently 6.18 per cent; 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.

6.34 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 2012 have been calculated on a net calorific value basis and are available in Table I.1 at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/total-energy-statistics

6.35 Table 6.7 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 renewable sources. These provisional figures indicate that during 2012, 4.1 per cent of final energy consumption was from renewable sources. This is an increase from the 2011 figure of 3.8 per cent, and 3.3 per cent in 2010. The methodology for the derivation of interim targets was specified in the Directive, resulting in a 4.04 per cent target for the UK. Whilst the 2012 Directive percentage figure is greater than the first interim target, that target is defined as a 2011-2012 target. Calculating

the average contribution across these two years shows that provisionally the UK achieved 3.94 per cent, thus falling short by 275 ktoe (or 3,200 GWh) of Directive compliant renewable energy. DECC's normal practise in reporting deployment of renewables is to calculate rates to 1 decimal place, which recognises the uncertainty in estimates of both renewables and final energy consumption; methodology notes on the DECC section of the gov.uk website give further details. As such whilst the estimate of 3.94 per cent is our best estimate, users should be aware that the uncertainty attached to this estimate would cover the 275 ktoe shortfall.

6.36 Overall renewable sources, excluding non-biodegradable wastes and passive solar design (see paragraph 6.54), provided 4.4 per cent of the United Kingdom's total primary energy requirements in 2012 (excluding energy products used for non-energy purposes). This is a different measure to that reported in the RED. 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, so 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, then the gross final energy consumption percentage will overtake the primary energy demand percentage. Both of these percentage measures are directly influenced by overall energy use: for instance, whilst the renewable energy component (the numerator in the RED calculation) increased by 12 per cent, the final consumption denominator increased by 3 per cent. Table 6B shows both measures.

Table 6B: Percentages of energy derived from renewable sources

	2008	2009	2010	2011	2012
Eligible renewable energy sources as a percentage of capped gross final energy consumption (ie the basis for the Renewable Energy Directive)	2.4	3.0	3.3	3.8	4.1
Renewable energy as a percentage of primary energy demand	2.6	3.1	3.4	4.0	4.4

6.37 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 the calculations are based on "in-country" generation. The majority of imported electricity comes from EU Member States, who include their renewable generation in their own RED progress calculations.

6.38 Eurostat publishes data on how all countries are progressing towards their RED targets. The latest comparative data relates to 2011, and was published in a news release report on 26 April 2013. It shows that, in 2011, the UK had the third lowest RED percentage, with Malta and Luxembourg having lower percentages. The 2011 RED percentage for all EU countries combined was 13.0 per cent, but with wide variation amongst member states, from 0.4 per cent in Malta to 46.8 per cent in Sweden. Since 2004, the share of renewable energy in final energy consumption grew in all Member States. The largest increases during this period were recorded in Sweden (from 38.3 per cent in 2004 to 46.8 per cent in 2011), Denmark (from 14.9 per cent to 23.1 per cent), Austria (from 22.8 per cent to 30.9 per cent), Germany (from 4.8 per cent to 12.3 per cent) and Estonia (from 18.4 per cent to 25.9 per cent). The UK showed a 2.7 percentage point increase over the same time period. France currently has the largest challenge to meet its 2020 target (a further 11.5 percentage point increase is required to achieve its 23 per cent target), followed by the UK (requiring a further 11.2 percentage point increase to achieve the 15 per cent target). In 2011, Estonia had exceeded its 25 per cent 2020 target. Further details of progress for all member states can be found at:
http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/8-26042013-AP/EN/8-26042013-AP-EN.PDF

Technical notes, definitions, and policy context

6.39 The RESTATS study started in 1989 and, where possible, information was collected on the amounts of energy derived from each renewable source. Additional technologies have been included for more recent years, such as the inclusion of energy from heat pumps from 2008 onwards and the recording of technology types such as anaerobic digestion. This technical notes section defines these renewable energy sources. The database now contains 24 years of data from 1989 to 2012. Information within RESTATS was recently combined with supplementary data obtained from monitoring the planning process for new renewable electricity and heat installations to ensure that it is more comprehensive.

6.40 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. Some data are also collected via other methods, such as desk research and data from the administration of renewable energy policies. Further details about the data collection methodologies used in RESTATS are also contained in a guidance note on the DECC section of the gov.uk website at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/renewables-statistics

6.41 Energy derived from renewable sources is included in the aggregate energy tables in Chapter 1 of this Digest. The main commodity balance tables (Tables 6.1 to 6.3) present figures in the common unit of energy, the tonne of oil equivalent, which is defined in Chapter 1 paragraph 1.28. The gross calorific values and conversion factors used to convert the data from original units are given on page 229 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 5.74). 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 6.96, below).

6.42 The various renewable energy Directives, policies and technologies are described in the following paragraphs. This section also provides details of the quality of information provided within each renewables area, and the methods used to collect and 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 section of the gov.uk website.

European and UK Renewable Energy Policy Context

EU Renewables Directives

6.43 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 UKs indicative "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. The UK first achieved this target in the 2012 calendar year. 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. In 2009 a new Renewable Energy Directive (Directive 2009/29/EC) ('RED') was implemented 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. The RED included interim targets, and required each Member State to produce a National

Renewable Energy Action Plan (which contains a progress trajectory and identifies measures which will enable countries to meet their targets). The Directive also requires each Member State to submit a report to the Commission on progress in the promotion and use of energy sources every two years. The UK's action plan, and the first progress report (covering performance during 2009 and 2010 which was submitted in December 2011) are available at:
www.gov.uk/government/uploads/system/uploads/attachment_data/file/47871/25-nat-ren-energy-action-plan.pdf and
http://ec.europa.eu/energy/renewables/reports/2011_en.htm

UK Renewables Policy

6.44 The UK's progress report details the key policies and measures undertaken or in planning, to further increase renewables deployment. These include:

- Putting in place appropriate financial incentives to bring forward and support the take-up of renewable energy, including the "banded" Renewables Obligation, Feed-in Tariffs (FiTs) for small scale (under 5 MW) electricity generation, the Renewable Transport Fuel Obligation, the Renewable Heat Incentive tariff scheme (for industry, commercial premises and the public sector), and the Renewable Heat Premium Payment Scheme (for households);
- Identifying and removing the most significant non-financial barriers to renewables deployment, including measures to improve existing grid connection arrangements; and
- Overcoming supply chain blockages and promoting business opportunities in the renewables sector in the UK.

More details of the main renewable technologies that either have the greatest potential to help the UK meet the 2020 RED target in a cost effective and sustainable way, or offer the greatest potential for the decades that follow, can be found in the UK Renewable Energy Roadmap, which was first published in July 2011, and the 2012 Update available at:

www.gov.uk/government/publications/renewable-energy-roadmap and
www.gov.uk/government/publications/uk-renewable-energy-roadmap-update

A further update to the UK Renewable Energy Roadmap will be published later in 2013.

Renewables Obligation (RO)

6.45 In April 2002 the Renewables Obligation came into effect[2]. It is an obligation on electricity suppliers to source a specific and annually increasing proportion of electricity from eligible renewable sources or pay a penalty. The proportion is measured against total electricity sales (as shown in Table 5.5 contained in the electricity chapter of this Digest). The Obligation is intended to incentivise an increase in the level of renewable generating capacity and so contribute to our climate change targets. Examples of RO eligible sources include wind energy, wave and tidal energy, landfill gas, sewage gas, deep geothermal, hydro, photovoltaics, energy from waste, biomass, energy crops and anaerobic digestion. Ofgem which administers the RO, issues Renewables Obligation Certificates (ROCs) to qualifying renewable generators. These certificates may be sold by generators directly to licensed electricity suppliers or traders. Suppliers present ROCs to Ofgem to demonstrate their compliance with the obligation.

6.46 When the Obligation was first introduced, 1 ROC was awarded for each MWh of renewable electricity generated. In 2009, 'banding' was introduced into the RO, meaning different technologies now receive different numbers of ROCs depending on their costs and potential for large scale deployment; for example offshore wind receives 2 ROCs/MWh while onshore wind receives 0.9 ROCs/MWh. The more established renewable technologies such as sewage gas receive 0.5 ROCs/MWh. A review of the bands across the UK concluded in 2012 and set the level of support under the RO from 1 April 2013 – 31 March 2017 (with the exception of offshore wind for which new

[2] Parliamentary approval of the Renewables Obligation Orders under The Utilities Act 2000 was given in March 2002. 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. 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.

bands will come in on 1 April 2014). Banding reviews ensure that as market conditions and innovation within sectors change and evolve, renewables developers continue to receive the appropriate level of support necessary to maintain investments within available resources. A list of technologies eligible for the RO, details of the RO banding review, and the level of ROCs received, is available at: www.gov.uk/calculating-renewable-obligation-certificates-rocs

6.47 Table 6.4 contains a row showing the total electricity eligible for the RO basis. Prior to 2002 the main instruments for pursuing the development of renewables capacity were the Non Fossil Fuel Obligation (NFFO) Orders for England and Wales and for Northern Ireland, and the Scottish Renewable Orders. Statistics of these Orders can now be found in Table 6.1.2 on the DECC section of the gov.uk website (see paragraphs 6.5 and 6.6).

Feed-in Tariffs (FiTs)

6.48 Feed-in Tariffs are a financial support scheme for eligible low-carbon electricity technologies, aimed at small-scale installations with a capacity of less than 5 Megawatts (MW). FiTs support new anaerobic digestion (AD), solar photovoltaic, small hydro and wind, by requiring electricity suppliers to make payments (generation tariffs) to these generators based on the number of kilowatt hours (kWh) they generate. An additional guaranteed export tariff of 4.64p per kWh is paid for electricity generated that is not used on site and exported to the grid. The scheme also supports micro combined heat and power installations with an electrical capacity of 2 kW or less. A comprehensive review of the FiTs scheme was launched in February 2012 and completed in December 2012. It had two parts, the first considered support for solar PV and the second other technologies and administrative issues. In May 2012 DECC announced new tariffs for solar PV, which came into effect on 1 August 2012, and in July 2012 it announced changes to tariffs for other technologies which came into effect from 1 December 2012. Changes implemented as a result of the review only affect new entrants to the scheme and there is no intention to retrospectively adjust support levels. Policy information and statistical reports relating to FiTs can be found at:
www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/feed-in-tariffs-scheme and
www.gov.uk/government/organisations/department-of-energy-climate-change/series/feed-in-tariff-statistics respectively.

Renewable Transport Fuel Obligation (RTFO)

6.49 The Renewable Transport Fuel Obligation, introduced in April 2008, placed a legal requirement on road transport fuel suppliers (who supply more than 450,000 litres of fossil petrol, diesel or renewable fuel per annum to the UK market) to ensure that 4.75 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, 3.5 per cent (by volume) in 2010/11, 4.0 per cent (by volume) in 2011/12, and 4.5% (by volume) in 2012/13. Under the RTFO all obligated companies are required to submit data to the RTFO administrator on volumes of fossil and renewable fuels they supply. There is a monthly reporting process required of fuel companies under the RTFO, issuing Renewable Transport Fuel certificates in proportion to the quantity of biofuels registered. The RTFO (amendment) Order, made in 2011, introduced mandatory carbon and sustainability criteria for all renewable fuels and double rewards for some fuel types, including those made from waste materials. Once the data on volumes of fuels supplied and sustainability criteria have been checked by the RTFO administrator and independently verified Renewable Transport Fuel Certificates are issued depending on the quantity and type of renewable fuel registered. Further information on the RTFO policy can be found at:
www.gov.uk/government/publications/rtfo-guidance

6.50 The verified RTFO biofuels statistics, including information on origin and sustainability for obligation year 2011/12 were published by DfT on 7 March 2013. These, together with provisional data covering 2012/13 can be found at:
www.gov.uk/government/organisations/department-for-transport/series/biofuels-statistics

Renewable Heat Incentive (RHI)

6.51 The Renewable Heat Incentive opened for applications in November 2011. The scheme provides tariffs for commercial, industrial and community renewable heating installations. The

incentive is expected to promote the delivery of renewable heat (equating to 12 per cent of heat coming from new and diversified renewable sources) and save 44 million tonnes of carbon by 2020. In September 2012, the Government set out proposals for extensions to the non-domestic scheme and the introduction of a scheme for domestic properties. In response to industry and market feedback, DECC has looked at the evidence on cost data and heat usage assumptions used to set the levels of tariffs when the scheme was launched, alongside the level of uptake so far under the scheme and evidence from the renewable heat industry and market. A Non-Domestic Scheme Early Tariff Review consultation ran from 31 May 2013 to 28 June 2013. Policy information on the RHI can be found at:
www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/renewable-heat-incentive-rhi

6.52 DECC publishes monthly statistics on the take-up of the RHI. These can be found at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/renewable-heat-incentive-renewable-heat-premium-payment-statistics

Renewable Heat Premium Payment (RHPP)

6.53 The Renewable Heat Premium Payment (RHPP) scheme was launched in August 2011 to provide one-off grants to support the installation of eligible renewable heat technologies – air-to-water and ground-source heat pumps, solar thermal and biomass boilers – in domestic households across Great Britain. Phase 1 of the scheme ran from August 2011 to March 2012. Phase 2 ran from April 2012 to March 2013 before being extended for a further year in April 2013. Table 6C below shows the breakdown of installations and capacity by technology for the first two phases. Further information on the RHPP scheme can be found at:
www.gov.uk/renewable-heat-premium-payment-scheme

Table 6C: Renewable Heat Premium Payment voucher redemptions, capacity installed and estimated heat generation

Technology	Number of vouchers redeemed-RHPP1	Total capacity (MW) / Solar thermal estimated heat generation (MWh)	Number of vouchers claimed - RHPP2	Total capacity (MW) / Solar thermal estimated heat generation (MWh)
Ground or Water Source Heat Pump	1,000	11.5 MW	738	8.2 MW
Biomass Boiler	733	17.6 MW	665	15.0 MW
Air Source Heat Pump	1,837	21.7 MW	2,122	24.0 MW
Solar Thermal	1,660	3,609 MWh	1,977	3,252MWh
Total	**5,230**		**5,502**	

Sources of Renewable Energy

Use of passive solar energy

6.54 Nearly all buildings make use of some existing (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 technology is defined. The unplanned benefit of solar energy for heating and lighting in UK buildings is estimated to be 145 TWh per 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 per year.

Active solar heating

6.55 Active solar heating employs solar collectors to heat water mainly for domestic hot water systems but also for swimming pools and other applications. DECC intends to examine the case for active solar heating and other renewable heat solutions during the next scheduled review for the non-domestic RHI, due to start in 2014. Updated figures on the contribution of active solar heating have been obtained by Ricardo-AEA (on behalf of DECC) based on the Solar Trade Association sales figures. This year has also seen a change in methodology, as recommended by the IEA Solar heat and cooling program and ESTIF (European Solar Thermal Industry Foundation). For 2012, an estimated 252 GWh for domestic hot water generation replaces gas and electricity heating; for swimming pools, an estimated 1,082 GWh generation replaces gas (45 per cent), oil (45 per cent) or electricity (10 per cent). Details of the new methodology can be found at:
www.estif.org/area_to_energy_conversion_method/

Solar photovoltaics (PV)

6.56 Photovoltaics 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 1,705.5 MW in 2012. Support for small scale (less than 5 MW) PV and other microgeneration technologies is provided through a system of Feed-in Tariffs introduced in April 2010, which provide householders and communities generating their own electricity with regular payments through their energy supplier. Tariffs are linked to the Retail Price Index and support for individual PV schemes lasts for 25 years. The recent comprehensive review of FiTs has altered the lifetime of generation tariff payments to 20 years for installations with an eligibility date after 1 August 2012. Specific tariff levels are dependent on size and type of installation (i.e. less than 4 kW or standalone). Levels of support available under FiTs were adjusted in March 2012 to take account of the falling costs of solar PV. Further reductions took place in August 2012 and an automatic degression system was introduced in April 2013. Solar PV is also supported by the Renewable Obligation. The level of support for solar PV within the Renewable Obligation from April 2013 forms part of the banding review.

Onshore wind power

6.57 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.

6.58 Following the introduction of the Renewables Obligation (RO) in April 2002 the rate of installation of new wind farms has increased year on year. As at end December 2012, the UK had 5.74 GW of installed capacity, from 598 (excluding 0.15 GW of very small-scale and FITs) wind schemes in the UK. Turbine size has steadily increased over the years and the average new turbine size for operational schemes over the last 5 years is around 2.5 MW. For those schemes under construction, however, this is moving towards 3 MW. 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 some of the early projects which were installed around 20 years ago, 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 6.17 to 6.22 regarding load factors) and the wind farm installed capacity.

6.59 Feed-in Tariffs are predicted to stimulate fast growth in the small-medium wind market (15–100 kW), in which generated energy is predominantly used to satisfy on-site demand[3]. Small wind system technology can be subdivided into three categories: micro wind turbines (0–1.5 kW), small wind turbines (1.5–15 kW) and small–medium wind turbines (15–100 kW). The two main designs are the horizontal axis wind turbines (HAWT) and vertical axis wind turbines (VAWT). At the end of 2012 there were 4,625 FiT wind installations, with a combined capacity of 132.2 MW; in addition there were 19 MW of ROOFIT and 4 MW of MCS.

[3] Renewable-UK, "Small Wind Systems – UK Market Report" (April 2010)

6.60 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 FiTs 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.

Offshore wind power

6.61 The UK has the largest offshore wind resource in Europe, with relatively shallow waters and strong winds. The UK has the world's largest offshore wind installed capacity, with nearly 3 GW installed at the end of 2012, across 20 full operational wind farms (2.68 GW) and two under construction with partial generation (0.32 GW). A further two wind farms were also under construction, totalling an additional 1.22 GW. The Renewable Energy Roadmap – referred to in paragraph 6.44 – highlights offshore wind as a key technology that will help the UK meet the 2020 RED target, with a central range of upto 18 GW for deployment by 2020 subject to cost reduction. This would correspond to around 17 per cent of the UK's net electricity production.

6.62 Offshore winds tend to blow 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). As a result, offshore turbines are generally larger than their onshore counterparts with the current commercially available turbines having a rated capacity of between 3 MW and 5 MW, although a number of larger, offshore specific, turbines are currently being developed. 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 and transportation of large components are reduced offshore.

6.63 In the development of the UK's offshore wind capacity, the Crown Estate have run a number of leasing rounds under which areas of the seabed have been made available for the development of offshore wind farms. Round 1 started in December 2000 and Round 2 in July 2003. In January 2010, the Crown Estate announced the successful development partners for each of the nine new Round 3 offshore wind zones, potentially totalling up to 33 GW in capacity. The Round 3 zones were identified through a combination of consultation with key national stakeholders and the Crown Estate's marine asset planning expertise. The Round 3 capacity is in addition to the 8 GW already enabled across Rounds 1 and 2. The combined total of all leasing rounds is over 49 GW (including sites in Scottish Territorial Waters and Round 1 and 2 extensions).

Wave and tidal stream power

6.64 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; it is estimated that feasibly exploitable UK resource could deliver around 40-50TWh/year of electricity for wave and 20-30TWh/year for tidal[4]. 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 Pelamis P2, the Aquamarine Oyster, Siemens SeaGen tidal turbine and several others.

6.65 Tidal range power can be extracted from tidal barrage and tidal lagoon systems. With a tidal barrage across an estuary, water is collected during the flood tide, creating a head of water. During the ebb tide the water flows out of the pool through low-head hydro turbines thus generating electricity. Some technologies also allow generation on ebb and flood. A tidal lagoon works in a similar manner, but an artificial pool is used to collect the water. A tidal barrage has been in operation at La Rance on

[4] www.carbontrust.com/media/168547/tina-marine-energy-summary-report.pdf

the northern French coast for more than 40 years, and schemes have previously been proposed in the UK, notably in the Severn Estuary. Some estimates suggest up to 5 per cent of the UK's current electricity demand could be met by a Severn Barrage. The environmental impacts and costs of such a scheme would however be considerable and the UK Government has decided not to pursue such a scheme through public funds.

Large scale hydro

6.66 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 1,471 MW of installed capacity for large-scale hydroelectric schemes in the UK. The data in this Chapter exclude pumped storage stations (see paragraph 5.73). The UK has one mixed pump storage and natural flow hydro station, at Foyers in Scotland. Whilst it is primarily a pumped storage site, the generation attributed to the natural flow component of this station can be calculated, and is included in the large-scale hydro generation figures in this Chapter. However, the natural flow share of the capacity cannot be separated, and is therefore not included.

Small scale hydro

6.67 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. Currently there is 215 MW of installed small-scale hydro schemes. Of this, 60 per cent is owned by small-scale energy producers with the remainder owned by major power producers. There are 371 FITs and 273 non-FITs schemes in operation; around three quarters (76 per cent) of these non-FITs schemes claim ROCs, with 11 schemes having current NFFO contracts. There was a small increase in installed capacity during 2012 of 11 MW.

Deep geothermal energy

6.68 There are two broad types of deep geothermal technology – for direct heat use (where temperatures are above 60^{o}C and those for power generation (though usually as combined heat and power plants) usually where the resource temperature is above 120^{o}C . The UK's deep geothermal resources include hot aquifers (i.e. subterranean bodies of water) in the North East, Wessex and Cheshire. The 'hot dry rocks' in Cornwall are likely to have the greatest potential (at 5km depth) for power generation. There are two simple models for deep geothermal projects. Where a hot aquifer has been identified, it is possible to simply pump the hot water to the surface and use it directly, for example in a heat network. The water then needs to be either disposed of or re-injected into the ground via a second borehole. An alternative model is to pump cold water from the surface down into a volume of hot rock, exploiting existing fractures in the rock or creating these through Enhanced Geothermal System techniques, and then recovering it to the surface once it has been heated. Deep geothermal electricity generation is eligible for support under the Renewables Obligation. Deep geothermal energy for direct heat use is eligible for support under the Renewable Heat Incentive. The Government has also provided grant support for the sector. At present there are no deep geothermal power plants in the UK. The UK's only existing geothermal heat generating station is at Southampton, where an 1800m borehole taps into the edge of the aquifer under Wessex and provides heat to the Southampton district heat network, although this borehole is currently being refurbished.

6.69 Geothermal is currently supported in the non-domestic RHI under the ground source heat pump tariff, the consultation in September 2012 proposed introducing a specific tariff for geothermal heat. DECC will confirm the way forward on this consultation in summer 2013.

Heat pumps

6.70 A ground source heat pump (GSHP) uses electricity to power a vapour compression cycle to pump heat from underground heat exchange coils and boreholes to a target heating system. An air source heat pump (ASHP) uses a vapour compression cycle to pump heat from ambient air to the

target heating system. The ASHP data included in the Digest are air to water heat pumps extracting heat from external air only, and the renewable energy component of exhaust air systems. Information on GSHP and ASHP installations in the UK has been obtained from an annual market survey conducted by the research organisation BSRIA.

6.71 Ground source heat pumps are currently supported in the non-domestic RHI and support for air to water air source heat pumps was proposed in the September 2012 consultation on expansions to the non-domestic scheme, DECC also asked the question as to whether or not air to air air source heat pumps should be supported. The proposals for the introduction of a domestic scheme included ground source and air to water air source heat pumps. DECC will confirm the way forward in Summer 2013.

6.72 Heat pumps use electricity to operate the compression cycle. The ratio of the heating output of a heat pump over the amount of electricity it uses gives the coefficient of performance (COP) of the heat pump. The seasonal performance factor (SPF), is the average COP for a heat pump over a whole year and reflects the efficiency a heat pump achieves when installed. The Renewable Energy Directive (Annex VII) sets out the equation for calculating how much of the energy generated by heat pumps should be considered renewable and a minimum SPF is part of that equation. The SPF is dependent on pan-EU average electricity generation efficiency. Heat pumps which do not meet the minimum SPF are not counted as renewable under the Directive. The latest available guidance from the European Commission gives a minimum SPF of 2.5. It is assumed that the heat pumps installed in 2008 and later in the UK have an SPF which meets this minimum standard.

6.73 The RHI has a current requirement for heat pumps to meet a minimum COP of 2.9, but in September 2012 a change was proposed to base the efficiency requirements on the European Commission guidance. DECC will confirm the way forward in Summer 2013.

Bioenergy and wastes

(a) Landfill gas

6.74 Landfill gas is a methane-rich gas formed from the natural decomposition of organic material in landfill sites. 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 resulted in a large rise in electricity generation from 1992. Information on generation comes from Ofgem's ROCs database, supplemented by a RESTATS survey carried out by Ricardo-AEA in 2008 on behalf of DECC. In 2012 there were 432 operating landfill gas sites with an installed capacity of 1,036 MW.

(b) Sewage sludge digestion

6.75 Sewage sludge digestion is the break down of the solid part of sewage by natural bacteria in a sealed tank in the absence of oxygen to produce a methane rich sewage gas. Some plants only use the sewage gas to generate heat but many use combined heat and power (CHP) systems, with the electricity generated being used on site or sold under the NFFO. Information on the projects was provided from the CHAPSTATS Database, which is compiled and maintained by Ricardo-AEA on behalf of DECC (see Chapter 7). The majority of the information in the database is gathered through the CHP Quality Assurance (CHPQA) Programme. However, many sewage treatment works are not part of the CHPQA Programme and information on these plants comes from Ofgem's ROC registers. 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 77 percent of the schemes (88 per cent of the capacity) were from RESTATS (i.e. ROCs registers) with the remainder from CHPQA; all schemes, however, were vetted by CHPQA before being accepted by RESTATS.

(c) Domestic wood combustion

6.76 Domestic wood use includes the use of logs in open fires, "AGA"-type cooker boilers and other wood burning stoves. Statistics on domestic wood use is one of a few cases where good data are not available and detailed surveys to improve this have been unsuccessful to date. Domestic wood use was for a long time estimated based on the historic survey results of 1989. Although there were two subsequent survey attempts (the final one in 2002) to improve these data, in both cases the results

were not statistically sound to warrant changes to the current approach. The domestic wood use figure of 204 ktoe had therefore remained unchanged up to 2002 since it was originally surveyed in 1989.

6.77 During the survey of 2003, Ricardo-AEA were asked to examine an accumulating body of anecdotal evidence that implied that there was considerable growth in this area, suggesting that the use of this resource might start to be underestimated. This was based on the amount that was being burnt on open fires rather than dedicated wood-burning stoves, which has previously been overlooked. A revision in 2003 to subsequent domestic wood use figures was based on a 50 per cent growth rate in sales/installations over a 2-3 year period supported with anecdotal information from the sources listed below:

- HETAS, the official body recognised by Government to approve solid fuel domestic heating appliances, fuels and services;
- the National Association of Chimney Sweeps; and
- Discussions with a risk assessor acting on behalf of insurance companies.

6.78 Estimates from 2003 onwards are now made from annual discussions with representatives of these associations, using 2002 baseline data that are extrapolated forward, that are independently peer reviewed by the Forestry Commission prior to publication. The accuracy of these estimates is, however, dependent on the accuracy of the base level figures for domestic wood use in 2002.

(d) Non-domestic wood combustion

6.79 In 1997, the industrial wood figure (which includes sawmill residues, furniture manufacturing waste etc.) was included as a separate category for the first time. Surveys in 2000 and 2006 highlighted that the in-house use of wood wastes had declined due to the imposition of more stringent emissions controls. Since these surveys, there has been increased interest in the use of wood, usually from forestry and woodland management but also in-house and recycled by-products. Typically these are being used for space heating and hot water in commercial and public sector properties such as hotels, schools, hospitals, nursing homes, poultry farms, horticulture and government buildings. This has been almost exclusively in response to incentives, most notably the Renewable Heat Incentive which has supported some 260 GWh of heat from biomass, mostly wood, to June 2013 since its inception in November 2011. This is equivalent to some 93 thousand tonnes of commercial wood chip.

(e) Energy crops and forestry residues

6.80 Several plantations of short rotation willow coppice (SRC) and Miscanthus have been established to support fledgling biomass projects, some of which are no longer operational. However the rate of uptake has been very slow, despite support for the growing of energy crops as part of the Rural Development Programme for England (RDPE) 2007-2013, administered by Natural England. During the first phase of the Energy Crops Scheme (ECS 1) 6,376 hectares of Miscanthus and 1,815 hectares of short rotation coppice were established. The second phase of the scheme runs until 2013 and has contracted a further 989 hectares of Miscanthus and 316 hectares of short rotation coppice as of April 2011.

(f) Straw combustion

6.81 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

6.82 Domestic, industrial and commercial wastes represent a significant resource for materials and energy recovery. Unprocessed wastes may be combusted in purpose built incinerators or the waste can be processed into a range of refuse derived fuels (RDF) for both on-site and off-site use. RDF 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. Only the 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.

6.83 **Municipal solid waste (MSW) combustion:** MSW comprises domestic waste plus other feedstocks, such as, general industrial waste, building demolition waste and tree clippings from civil amenities. Sample areas for the analysis of household collected waste are selected using ACORN socio-economic profiles (ACORN stands for A Classification Of Residential Neighbourhoods). This 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. For several years, the analysis calculated that UK domestic waste had a biodegradable content of 67.5 per cent $\pm$ 1 per cent and this accounted for about 62.5 per cent of the energy generated from its combustion but work in 2009 revised this upwards to 63.5 per cent. The same figures has been used for this years' survey but will be reviewed on an annual basis. Information on the direct combustion of unprocessed MSW and the combustion of RDF was provided via a RESTATS questionnaire.

6.84 **General industrial waste (GIW) combustion:** 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. A survey conducted in 2001 noted that GIW was 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.

6.85 In 2012, 34 energy from waste plants were in operation, burning municipal solid waste (MSW), refuse derived fuel (RDF) and general industrial waste (GIW).

6.86 **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.

6.87 **Specialist non-biodegradable waste**. 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.

6.88 **Hospital waste**. Information is based on a RESTATS survey undertaken in 2007, repeated in 2010 and reviewed again in 2013. Additional information on sites that reclaim energy was obtained from the Environment Agency's clinical waste incineration database. Sites were contacted to confirm their operational status and verify the electrical installed capacity and generation. The results continue to show an ongoing process of centralisation and consolidation, in response to changes in pollution emissions and clinical waste regulations. Generation is focusing on larger plants and many smaller facilities have closed as they were no longer viable due to the cost of compliance with regulations.

6.89 **Animal biomass**. 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.

(h) Anaerobic digestion (AD)

6.90 Anaerobic Digestion uses natural bacteria to break down biomass in a sealed tank in the absence of oxygen to produce a methane rich biogas. The biomass fuel includes wet wastes such as animal manures and slurries, crop residues and food waste and/ or purpose grown crops such as maize. The biogas can be used for process heat, or for heat and electricity generation using a combined heat and power unit. Alternatively, the biogas can be upgraded to biomethane for use in transport applications or injection into the gas grid. The leftover indigestible material is called

digestate; this is rich in nutrients and can be used as a fertiliser. Digestate can be used whole and spread on land. Alternatively, it can be separated into liquor and fibres. Separated fibre can be used fresh as a soil conditioner or, after further aerobic composting to stabilise it, the material is suitable for making into a compost product.

6.91 Information on operational AD sites in the UK was obtained from a number of sources including; the CHPQA database, information from previous AD surveys conducted for RESTATS, the AD portal run by NNFCC, the REA, the Renewable Energy Planning Database, ROCs and FiTs returns and Ricardo-AEA internal information. Electricity and heat production was estimated using survey information, where available, or information from ROCs and FiTs if no survey information existed. Where neither of these sources was available the electricity production was calculated from the capacity and estimated load factor based on ROC data from operating schemes and date of commissioning where applicable. There were 89 AD plants generating at the end of 2012. Of these 45 (45 MW) qualified as CHP plant, 26 (26 MW) were electricity only and 18 were heat only. A further 49 (38 MW) schemes were registered under FITs. The majority of the heat only schemes were small on farm schemes with one producing biomethane for grid injection.

(i) Co-firing of biomass with fossil fuels

6.92 Compared with some other renewables, co-firing has a relatively low capital cost and is quick to implement. Biomass fuel is usually fed into a conventional power station boiler by means of the existing firing mechanism as a partial substitute for fossil fuel. The pulverised fuel preparation, transport and combustion system of a modern power plant may cope with approximately 5 - 10 per cent substitution without any major mechanical changes. The boiler design and airflows however may permit much higher percentages if the burner systems are modified. Specially designed burners have been introduced on some installations in the UK.

(j) Biodiesel and bioethanol (Liquid Biofuels for Transport)

6.93 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

Combined Heat and Power (CHP)

6.94 A CHP plant is an installation where useful heat and power (usually electricity) are supplied from a single generation process. Some CHP installations are fuelled either wholly or partially by renewable fuels. The main renewable fuel currently used in CHP is sewage gas, closely followed by other biomass.

6.95 Chapter 7 of this Digest summarises information on the contribution made by CHP to the United Kingdom's energy requirements in 2008 to 2012 using the results of annual studies undertaken to identify all CHP schemes (CHAPSTATS). Included in Tables 7.1 to 7.9 of that chapter is information on the contribution of renewable sources to CHP generation in each year from 2008 to 2012. Corresponding data for 1996 to 2007 are available on the DECC section of the gov.uk website. 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 come from 'good quality' CHP; further details on 'good quality' CHP are to be found in Chapter 7. 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

6.96 The electrical capacities are given in Table 6.4 as installed capacities i.e. 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, 0.33 for shoreline wave, and 0.17 for solar photovoltaics. 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 6.1.1 on the DECC section of the gov.uk website.

6.97 Plant load factors shown in Table 6.5 have been calculated in terms of installed capacity (i.e. 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. Additionally the unchanged configuration load factor has now been used for a number of years, which calculates 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.

6.98 It is recognised that one of the shortcomings of the differences in the reporting periods for the data contained in the Digest (end of calendar year) and Ofgem's finalised ROCs data (end of financial year), is that the finalised Ofgem figures are not available for use during the compilation process for the Digest. This chapter utilises ROCs data as reported in April 2013, when 2012 data were still provisional. In particular this can have an impact on the schemes included in the unchanged configuration definition as new data could include or remove particular schemes. This should be kept in mind if users wish to reanalyse these results.

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6.1 Commodity balances 2012

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 (4)	Sewage gas	Landfill gas
Supply						
Production	402	573	443	727	308	1,704
Other sources	-	-	-	-	-	-
Imports	32	3	-	1,016	-	-
Exports	-131	-119	-	-22	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply (2)	**303**	**456**	**443**	**1,721**	**308**	**1,704**
Statistical difference *(3)*	-	-	-	-	-	-
Total demand	**303**	**456**	**443**	**1,721**	**308**	**1,704**
Transformation	**12**	**-**	**396**	**1,497**	**236**	**1,690**
Electricity generation	-	-	396	1,446	236	1,690
Major power producers	-	-	188	1,177	-	-
Autogenerators	-	-	209	269	236	1,690
Heat generation	12	-	-	51	-	-
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	**292**	**456**	**47**	**224**	**72**	**14**
Industry	**292**	**-**	**32**	**97**	**-**	**14**
Unclassified	292	-	32	97	-	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	**-**	**456**	**15**	**127**	**72**	**-**
Domestic	-	456	-	-	-	-
Public administration	-	-	-	-	72	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	15	127	-	-
Miscellaneous	-	-	-	-	-	-
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**

(1) Stock fall (+), stock rise (-).
(2) Including non-biodegradable wastes, which accounted for 696 ktoe.
(3) Total supply minus total demand.
(4) SRC is short rotation coppice.
(5) Municipal solid waste, general industrial waste and hospital waste.
(6) The amount of shoreline wave and tidal included is 0.3 ktoe.

6.1 Commodity balances 2012 (continued)

Renewables and waste

Thousand tonnes of oil equivalent

Waste *(5)* and tyres	Geothermal, active solar heat and PV	Heat pumps	Hydro	Wind wave and tidal *(6)*	Liquid biofuels	Total renewables	
							Supply
1,688	256	56	454	1,684	317	8,613	Production
-	-	-	-	-	-	-	Other sources
-	-	-	-	-	674	1,725	Imports
-	-	-	-	-	-33	-306	Exports
-	-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	-	Transfers
1,688	**256**	**56**	**454**	**1,684**	**958**	**10,032**	**Total supply** *(2)*
-	-	-	-	-	-	-	**Statistical difference** *(3)*
1,688	**256**	**56**	**454**	**1,684**	**958**	**10,032**	**Total demand**
1,568	**102**	**-**	**454**	**1,684**	**-**	**7,640**	**Transformation**
1,517	102	-	454	1,684	-	7,526	Electricity generation
401	-	-	359	1,452	-	3,576	Major power producers
1,116	102	-	96	232	-	3,950	Autogenerators
51	-	-	-	-	-	114	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**
119	**154**	**56**	**-**	**-**	**958**	**2,392**	**Final consumption**
52	**-**	**1**	**-**	**-**	**-**	**487**	**Industry**
52	-	1	-	-	-	487	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
-	-	-	-	-	**958**	**958**	**Transport**
-	-	-	-	-	-	-	Air
-	-	-	-	-	-	-	Rail
-	-	-	-	-	958	958	Road
-	-	-	-	-	-	-	National navigation
-	-	-	-	-	-	-	Pipelines
67	**154**	**56**	**-**	**-**	**-**	**947**	**Other**
15	153	45	-	-	-	669	Domestic
36	0	-	-	-	-	108	Public administration
16	0	11	-	-	-	27	Commercial
-	-	-	-	-	-	142	Agriculture
-	-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	**-**	**Non energy use**

6.2 Commodity balances 2011

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	383r	458r	361r	722r	317r	1,684r
Other sources	-	-	-	-	-	-
Imports	29r	3	-	876r	-	-
Exports	-131	-35	-	-17	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**282r**	**425**	**361r**	**1,580r**	**317r**	**1,684r**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**282r**	**425**	**361r**	**1,580r**	**317r**	**1,684r**
Transformation	**11r**	**-**	**315r**	**1,326r**	**250r**	**1,670r**
Electricity generation	-	-	315r	1,291r	250r	1,670r
Major power producers	-	-	192	961r	-	-
Autogenerators	-	-	123r	331r	250r	1,670r
Heat generation	11r	-	-	35r	-	-
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	**271r**	**425**	**46r**	**254r**	**66**	**14**
Industry	**271r**	**-**	**36r**	**107r**	**-**	**14**
Unclassified	271r	-	36r	107r	-	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	**-**	**425**	**10**	**147r**	**66**	**-**
Domestic	-	425	-	-	-	-
Public administration	-	-	-	-	66	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	10	147r	-	-
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.

6.2 Commodity balances 2011 (continued)

Renewables and waste

Thousand tonnes of oil equivalent

Waste *(4)* and tyres	Geothermal, active solar heat and PV	Heat pumps	Hydro	Wind wave and tidal *(5)*	Liquid biofuels	Total renewables	
							Supply
1,317r	144r	39r	489	1,334r	182	7,429r	Production
-	-	-	-	-	-	-	Other sources
-	-	-	-	-	947	1,854r	Imports
-	-	-	-	-	-1	-184	Exports
-	-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	-	Transfers
1,317r	**144r**	**39r**	**489**	**1,334r**	**1,128**	**9,099r**	**Total supply**
-	-	-	-	-	-	-	**Statistical difference** *(2)*
1,317r	**144r**	**39r**	**489**	**1,334r**	**1,128**	**9,099r**	**Total demand**
1,187r	**21r**	**-**	**489**	**1,334r**	**-**	**6,604r**	**Transformation**
1,136r	21r	-	489	1,334r	-	6,507r	Electricity generation
110r	-	-	395	1,090	-	2,747r	Major power producers
1,026r	21r	-	94	244r	-	3,760r	Autogenerators
51r	-	-	-	-	-	97r	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**
129r	**123r**	**39r**	**-**	**-**	**1,128**	**2,495r**	**Final consumption**
77r	**-**	**0**	**-**	**-**	**-**	**505r**	**Industry**
77r	-	0	-	-	-	505r	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
-	-	-	-	-	**1,128**	**1,128**	**Transport**
-	-	-	-	-	-	-	Air
-	-	-	-	-	-	-	Rail
-	-	-	-	-	1,128	1,128	Road
-	-	-	-	-	-	-	National navigation
-	-	-	-	-	-	-	Pipelines
52r	**123r**	**39r**	**-**	**-**	**-**	**862r**	**Other**
14r	122r	31r	-	-	-	592r	Domestic
29r	0	-	-	-	-	96r	Public administration
9	0	8r	-	-	-	18r	Commercial
-	-	-	-	-	-	156r	Agriculture
-	-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	-	**Non energy use**

6.3 Commodity balances 2010

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	254r	417r	334r	588r	286r	1,666r
Other sources	-	-	-	-	-	-
Imports	47r	1	-	883	-	-
Exports	-45	-38	-	-24	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**256**	**380r**	**334r**	**1,447r**	**286r**	**1,666r**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**256**	**380r**	**334r**	**1,447r**	**286r**	**1,666r**
Transformation	**2**	**-**	**289r**	**1,177**	**229**	**1,652r**
Electricity generation	-	-	289r	1,177	229	1,652r
Major power producers	-	-	190	734	-	-
Autogenerators	-	-	99r	444	229	1,652r
Heat generation	2r	-	-	-	-	-
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	**254r**	**380r**	**45**	**270r**	**58**	**14**
Industry	**254r**	**-**	**40**	**88**	**-**	**14**
Unclassified	254r	-	40	88	-	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	**-**	**380r**	**5**	**182r**	**58**	**-**
Domestic	-	380r	-	-	-	-
Public administration	-	-	-	-	58	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	5	182r	-	-
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 0.2 ktoe.

6.3 Commodity balances 2010 (continued)

Renewables and waste

Thousand tonnes of oil equivalent

Waste *(4)* and tyres	Geothermal, active solar heat and PV	Heat pumps	Hydro	Wind wave and tidal *(5)*	Liquid biofuels	Total renewables	
							Supply
1,205	102r	24r	307r	876	302	6,360r	Production
-	-	-	-	-	-	-	Other sources
-	-	-	-	-	996r	1,928r	Imports
-	-	-	-	-	-81	-189	Exports
-	-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	-	Transfers
1,205	**102r**	**24r**	**307r**	**876**	**1,217r**	**8,099r**	**Total supply**
-	-	-	-	-	-	-	**Statistical difference** *(2)*
1,205	**102r**	**24r**	**307r**	**876**	**1,217r**	**8,099r**	**Total demand**
1,083r	**3**	**-**	**307r**	**876**	**-**	**5,618r**	**Transformation**
1,044r	3	-	307r	876	-	5,577r	Electricity generation
90	-	-	232r	700r	-	1,946r	Major power producers
954r	3	-	75r	176r	-	3,631r	Autogenerators
39r	-	-	-	-	-	41r	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**
122r	**98r**	**24r**	**-**	**-**	**1,217r**	**2,481r**	**Final consumption**
53r	**-**	**0**	**-**	**-**	**-**	**449r**	**Industry**
53r	-	0	-	-	-	449r	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
-	-	-	-	-	**1,217r**	**1,217r**	**Transport**
-	-	-	-	-	-	-	Air
-	-	-	-	-	-	-	Rail
-	-	-	-	-	1,217r	1,217r	Road
-	-	-	-	-	-	-	National navigation
-	-	-	-	-	-	-	Pipelines
69r	**98r**	**23r**	**-**	**-**	**-**	**815r**	**Other**
15	98r	18r	-	-	-	510r	Domestic
43r	0	-	-	-	-	102r	Public administration
11	0	5r	-	-	-	17r	Commercial
-	-	-	-	-	-	187r	Agriculture
-	-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	**-**	**Non energy use**

6.4 Capacity of, and electricity generated from, renewable sources

	2008	2009	2010	2011	2012
Installed Capacity (MW) *(1)*					
Wind:					
Onshore	2,824r	3,477r	4,045r	4,638r	5,893
Offshore	586	951r	1,341	1,838	2,995
Shoreline wave / tidal	1r	2	3	3	7
Solar photovoltaics	23r	27r	94r	993r	1,706
Hydro:					
Small scale	170	179	187r	204r	215
Large scale *(2)*	1,456	1,459	1,453	1,471	1,471
Bioenergy:					
Landfill gas	892r	968r	1,008r	1,050r	1,036
Sewage sludge digestion	153r	157	193r	198	199
Energy from waste *(3)*	368r	384r	428r	544r	593
Animal Biomass (non-AD)*(4)*	111	111	111	111	111
Anaerobic digestion	7r	12r	38r	66r	110
Plant Biomass *(5)*	211r	284r	315r	1,149r	1,203
Total bioenergy and wastes	1,742r	1,916r	2,092r	3,117r	3,251
Total	6,802r	8,011r	9,215r	12,264r	15,538
Co-firing (6)	180	208	266	338	204
Generation (GWh)					
Wind:					
Onshore *(7)*	5,788r	7,553r	7,140r	10,384r	12,121
Offshore	1,305	1,754r	3,044	5,126	7,463
Shoreline wave / tidal *(8)*	0	1	2	1	4
Solar photovoltaics	17	20	40r	244r	1,188
Hydro:					
Small scale *(7)*	555	577	483r	701r	653
Large scale *(2)*	4,600	4,664	3,092r	4,989	4,631
Bioenergy:					
Landfill gas	4,729r	4,929r	5,037r	5,092r	5,154
Sewage sludge digestion	549r	604r	697r	764r	720
Biodegradable energy from waste *(9)*	1,239	1,509	1,597	1,739	2,279
Co-firing with fossil fuels	1,575	1,625	2,332	2,964	1,783
Animal Biomass *(4)*	620	637	627	615r	643
Anaerobic digestion	16r	43r	151r	278r	523
Plant Biomass *(5)*	807r	1,327r	1,594r	1,749r	4,098
Total bioenergy	9,535r	10,674r	12,037r	13,200r	15,198
Total generation	21,800r	25,243r	25,838r	34,645r	41,258
Non-biodegradable wastes *(10)*	744	868r	919r	1,000r	1,311
Total generation from sources eligible for the Renewable Obligation *(11)*	17,887r	21,085r	21,838r	28,903r	32,763

(1) Capacity on a DNC basis is shown in Long Term Trends Table 6.1.1 available on the DECC web site - see paragraph 6.5.
(2) Excluding pumped storage stations. Capacities are as at the end of December.
(3) Includes waste tyres and hospital waste.
(4) Includes the use of poultry litter and meat & bone.
(5) Includes the use of straw combustion and short rotation coppice energy crops.
(6) This is the proportion 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) Includes electricity from the EMEC test facility.
(9) Biodegradable part only.
(10) Non-biodegradable part of municipal solid waste plus waste tyres, hosptal waste and general industrial waste.
(11) See paragraphs 6.45 to 6.47 for definition and coverage.

6.5 Load factors for renewable electricity generation

Per cent

	2008	2009	2010	2011	2012
Load factors - based on average beginning and end of year capacity (1)					
Wind	27.4	27.1	23.7	29.9r	29.0
Onshore wind	26.9r	27.4	21.7	27.3	26.2
Offshore wind	30.3	26.0	30.3r	36.8	35.2
Shoreline wave / tidal	0.8	4.8	8.4	3.8	8.3
Solar photovoltaics	9.5	9.3	7.5r	5.1	10.0
Hydro	37.3	36.7	24.9r	39.2r	35.8
Hydro (small scale)	38.0	37.8	30.2r	40.9r	35.4
Hydro (large scale)	37.2	36.5	24.2r	39.0	35.8
Bioenergy (excludes cofiring and non-biodegradable wastes)	52.2	56.5r	55.3r	44.9r	48.0
Landfill gas	60.1r	60.5r	58.2r	56.5r	56.2
Sewage sludge digestion	41.2r	44.5r	45.5r	44.7r	41.3
Energy from waste (3)	39.2r	45.8r	44.9r	40.9r	45.6
Animal Biomass (4)	63.9	65.8	64.8	63.5r	66.2
Anaerobic Digestion	32.3r	51.8r	69.0r	60.9r	67.6
Plant Biomass (5)	43.5r	61.2r	60.7r	27.3r	39.7
All renewable technologies (excluding cofiring and non-biodegradable wastes)	36.7r	36.4r	31.2r	33.7r	32.3
Load factors - for schemes operating on an unchanged configuration basis (2)					
Wind	30.4	27.4	23.3	29.3	28.0
Onshore wind	29.4	26.5	21.6	27.2	25.6
Offshore wind	34.9	32.1	29.5	35.0	33.7
Hydro	..	38.2	26.4	41.7	35.3
Hydro (small scale)	..	37.2	29.4	43.2	36.0
Hydro (large scale)	..	38.4	26.1	41.5	35.3
Bioenergy (excludes cofiring and non-biodegradable wastes)	..	60.4	59.8	61.0	62.5
Landfill gas	..	59.5	57.7	59.5	58.6
Sewage sludge digestion	..	50.8	51.9	53.5	48.0
Energy from waste (3)	..	66.5	68.9	63.0	68.1
Animal Biomass (4)	..	56.9	59.6	68.9	66.2
Anaerobic Digestion	..	38.6	51.5	56.1	65.4
Plant Biomass (5)	..	61.7	65.8	60.9	67.4
All renewable technologies (excluding cofiring and non-biodegradable wastes)	..	37.4	31.9	37.3	35.9

(1) See paragraph 6.17 for details of the calculation.

(2) See paragraph 6.21 for details of the calculation.

(3) Calculation is based on biodegradable waste generation but all waste capacity; this reduces the load factor.

(4) Includes the use of poultry litter and meat & bone.

(5) Includes the use of straw combustion and short rotation coppice energy crops.

6.6 Renewable sources used to generate electricity and heat and for transport fuels*(1)(2)*

Thousand tonnes of oil equivalent

	2008	2009	2010	2011	2012
Used to generate electricity *(3)*					
Wind:					
Onshore	497.7r	649.5r	614.0r	892.9r	1,042.2
Offshore	112.2	150.8r	261.7	440.7	641.7
Shoreline wave / tidal (4)	0.0	0.1	0.2	0.1	0.3
Solar photovoltaics	1.5	1.7	3.4r	21.0r	102.1
Hydro:					
Small scale	47.7	49.6	41.6r	60.3r	56.2
Large scale *(5)*	395.5	401.0	265.9r	429.0	398.2
Bioenergy:					
Landfill gas	1,550.9r	1,616.7r	1,652.0r	1,670.1r	1,690.3
Sewage sludge digestion	180.0r	198.0r	228.6r	250.5r	236.0
Biodegradable energy from waste	506.8	624.5	659.0	717.3	959.3
Co-firing with fossil fuels	516.7	533.0	765.0	764.6r	400.5
Animal Biomass *(6)*	260.4r	232.0r	238.9r	224.0r	225.0
Anaerobic digestion	5.1r	14.3r	49.6r	91.1r	171.4
Plant Biomass *(7)*	189.5	367.3	412.3	526.9r	1,045.3
Total bioenergy	3,209.4r	3,585.7r	4,005.4r	4,244.6r	4,727.9
Total	**4,263.9r**	**4,838.4r**	**5,192.0r**	**6,088.5r**	**6,968.7**
Non-biodegradable wastes *(8)*	310.3	365.2r	385.1r	418.6r	557.7
Used to generate heat					
Active solar heating	46.8r	77.0r	97.5r	122.4r	153.1
Bioenergy:					
Landfill gas	13.6	13.6	13.6	13.6	13.6
Sewage sludge digestion	49.8	51.0	57.8	66.1	72.1
Wood combustion - domestic	316.3r	344.8r	379.6r	425.4r	456.3
Wood combustion - industrial	220.3	223.4	255.7	281.9r	303.3
Animal Biomass *(9)*	40.4	38.3	40.3	35.8r	31.5
Anaerobic digestion	2.0	2.0	4.8	9.8	15.1
Plant Biomass *(10)*	193.9r	227.4r	270.0r	288.5r	275.1
Biodegradable energy from waste *(6)*	31.8r	31.6r	25.9r	33.0r	32.2
Total bioenergy	868.1r	932.1r	1,047.7r	1,154.0r	1,199.1
Deep geothermal	0.8	0.8	0.8	0.8	0.8
Heat Pumps	2.7	11.3r	23.6r	39.1r	56.1
Total	**918.4r**	**1,021.2r**	**1,169.7r**	**1,316.3r**	**1,409.2**
Non-biodegradable wastes *(8)*	153.4r	143.9r	135.0r	147.7r	138.6
Renewable sources used as transport fuels					
as Bioethanol	116.3	180.4	355.4	367.5	436.9
as Biodiesel	728.2	858.1	861.9r	760.0	520.9
Total	**844.5**	**1,038.5**	**1,217.3r**	**1,127.5**	**957.8**
Total use of renewable sources and wastes					
Solar heating and photovoltaics	48.2r	78.7r	101.0r	143.4r	255.3
Onshore wind	497.7r	649.5r	614.0r	892.9r	1,042.2
Offshore wind	112.2	150.8r	261.7	440.7	641.7
Shoreline wave / tidal	0.0	0.1	0.2	0.1	0.3
Hydro	443.2	450.6	307.4r	489.3r	454.4
Bioenergy	4,077.5r	4,517.8r	5,053.0r	5,398.6r	5,927.0
Deep geothermal	0.8	0.8	0.8	0.8	0.8
Heat Pumps	2.7	11.3r	23.6r	39.1r	56.1
Transport biofuels	844.5	1,038.5	1,217.3r	1,127.5	957.8
Total	6,026.9r	6,898.0r	7,579.0r	8,532.4r	**9,335.6**
Non-biodegradable wastes *(8)*	463.8r	509.1r	520.1r	566.4r	696.3
All renewables and wastes *(11)*	6,490.6r	7,407.2r	8,099.2r	9,098.7r	**10,032.0**

(1) Includes some waste of fossil fuel origin.
(2) See the Digest of UK Energy Statistics 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 bioenergy the figures represent the energy content of the fuel used.
(4) Includes the EMEC test facility.
(5) Excluding pumped storage stations.
(6) Includes electricity from poultry litter combustion and meat & bone combustion.
(7) Includes electricity from straw and energy crops.
(8) Non-biodegradable part of municipal solid waste plus waste tyres, hospital waste, and general industrial waste.
(9) Includes heat from farm waste digestion, and meat and bone combustion.
(10) Includes heat from straw, energy crops, paper and packaging.
(11) The figures in this row correspond to the total demand and total supply figures in Tables 6.1, 6.2 and 6.3.

6.7 Renewable sources data used to indicate progress under the 2009 EU Renewable Energy Directive (measured using net calorific values)

Thousand tonnes of oil equivalent

	2008	2009	2010	2011	2012
Electricity generation component:					
Normalised hydro generation *(1) (2)*	421	420	410r	431	438
Normalised wind generation *(3)*	602	803	967r	1,213r	1,605
Electricity generation from renewables other than wind, hydro, and compliant biofuels	821r	920r	1,039r	1,156r	1,409
Electricity generation from compliant biofuels	-	-	-	-	-
Total renewable generation from all compliant sources	1,845r	2,143r	2,415r	2,799r	3,453r
Total Gross Electricity Consumption *(2)*	34,033r	32,324r	32,784r	31,881r	32,065r
Percentage of electricity from renewable sources	5.4%	6.6%	7.4%	8.8%	10.8%
Heat component:					
Renewable energy for heating and cooling	864r	956r	1,080r	1,221r	1,304
Total Gross energy consumption for heating and cooling	61,878r	56,208r	61,687r	52,255r	55,988
Percentage of heating and cooling energy from renewable sources	1.4%	1.7%	1.8%	2.3%	2.3%
Transport component (excluding air transport):					
Road transport renewable electricity	0	0	0	0	0
Non-road transport renewable electricity	49	54	58	58	58
Biofuels (restricted to those meeting sustainability criteria from 2011)	806	988	1,150r	880r	740
Total electricity consumption in transport	337r	346r	349r	349r	349
Total petrol and diesel consumption in transport	39,500r	38,122r	37,659r	37,205r	37,070
Total transport component numerator (including weighted components) *(4)*	855r	1,043r	1,209r	939r	1,212
Total transport component denominator (including weighted components) (4)	40,645r	39,458r	39,160r	38,619r	38,318
Percentage of transport energy from renewable sources *(4)*	2.1%	2.6%	3.1%	2.4%	3.2%
Overall directive target:					
Renewables used for:					
Electricity generation	1,845r	2,143r	2,415r	2,799r	3,453
Heating and Cooling	864r	956r	1,080r	1,221r	1,304
Transport biofuels (restricted to those meeting sustainability criteria from 2011)	806	988	1,150r	880r	740
Total Final Consumption of Renewable Energy ["Row A"]	3,514	4,087	4,645r	4,900r	5,497
Final Electricity Consumption *(5)*	29,390r	27,664r	28,272r	27,330r	27,304
Transport Final Energy Consumption (including air transport) *(6)*	53,404r	51,538r	50,760r	50,723r	49,991
Heating and Cooling Final Energy Consumption	61,878r	56,208r	61,687r	52,255r	55,988
Total Final Energy Consumption *(7)*	144,671r	135,410r	140,719r	130,308r	133,284
plus Distribution losses for electricity	2,415r	2,423r	2,288r	2,363r	2,458
plus Distribution losses for heat	-	-	-	-	-
plus Consumption of electricity in the electricity and heat generation sectors	1,405r	1,425	1,385	1,412r	1,548
plus Consumption of heat in the electricity and heat generation sectors	-	-	-	-	-
Gross Final Energy Consumption (GFEC)	148,491r	139,258r	144,391r	134,084r	137,290
of which Air transport	12,755r	12,114	11,673	12,162	11,788
Air transport as a proportion of GFEC	8.59%	8.70%	8.08%	9.07%	8.59%
Air transport cap specificed in Directive	6.18%	6.18%	6.18%	6.18%	6.18%
Capped air transport	9,177r	8,606r	8,923r	8,286r	8,485
Capped Gross Final Energy Consumption (CGFEC) ["Row B"] *(8)*	144,913r	135,751r	141,641r	130,208r	133,987
Headline Directive percentage : Renewable Energy Consumption as a percentage of Capped Gross Final Energy Consumption ["Row A" divided by "Row B"]	2.4%	3.0%	3.3%	3.8%	4.1%

(1) Based on a 15 year average hydro load factor.
(2) Excludes generation from pumped storage.
(3) Based on a 5 year average wind load factor.
(4) Some sustainable biofuels are double weighted in the numerator of this calculation, as specified by the Directive.
(5) Final Electricity Consumption is Gross Electricity Consumption minus generators' own use of electricity and losses.
(6) Includes consumption of petrol and diesel, biofuels, other oil products, and coal.
(7) Total final consumption less non-energy use, as shown in Annex I, Table I.1, available on the DECC website.
(8) This row includes adjustments for loses, and generators own use of electricity, combined with the capping mechanism for air transport as specified in the Directive.

Chapter 7
Combined heat and power

Key points

- Good Quality CHP capacity increased by nearly 3 per cent between 2011 and 2012 from 5,970 MWe to 6,136 MWe (Table 7.1).
- The amount of good quality electricity produced also increased by nearly 3 per cent to 23.4 TWh in 2012. This corresponds to 6.4 per cent of all electricity produced in the UK (Table 7.4).
- Sixty-nine per cent of the fuel used in CHP schemes was natural gas. The use of renewable fuel has again increased and now stands at over 8 per cent of total CHP fuel reported in this Chapter (Table 7.2).
- The CO_2 savings delivered by CHP in 2012 were higher than in either 2011 or 2010. This is due to a combination of the quantity of CHP electricity and heat outputs generated in 2012 relative to 2011 and an increase in the CO_2 intensity of grid electricity (reflecting greater coal use). (Table 7l)

Introduction

7.1 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 CHPQA methodology in respect of data obtained from other sources. 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.

7.2 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 industrial processes, hot water and space heating or cooling.

7.3 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 transmission and distribution losses. These gains are reflected in the calculation of CO_2 savings delivered by CHP (see 7.29). CHP can also provide important network services such as black start 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 7.40 later in this chapter.

UK energy markets, and their effect on CHP

7.4 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 both for own use and export. 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). Energy price trends that are applicable to CHP schemes differ depending upon the size and sector of the scheme. Volatility of energy prices continues to have an impact on the viability of CHP. Due to the long term nature of CHP investments long term trends in the spark gap need to be taken into account.

[1] *But not always, see paragraph 7.5. In such cases there is an impact upon the electrical capacity and electrical output classified as CHP.*

Use of CHPQA in producing CHP statistics

7.5 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[2], 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 7E, where the power efficiencies, heat efficiencies and heat to power ratios stated in that table for 2012 are those of the scheme, which may not be just the prime mover.
- The output of a scheme is based on gross power output. This means that power consumed by parasitic plant such as pumps and fans is included in the power output of the scheme.
- The main purpose of a number of CHP schemes is the generation of electricity including export to other businesses and the grid. 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 (see www.chpqa.com). 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.

  For year of operation 2011 onwards, new scale back criteria came into force in order to be consistent with the EU Cogeneration Directive. This results in a more severe scale back than was previously the case. This has contributed to some of the decrease in Good Quality electricity output and associated fuel consumption between 2010 and 2011 shown in the statistics tables (see paragraph 7.10 for further details).
- There are two load factors presented in Table 7A. Load Factor (CHPQA) is based on the Good Quality Power Output and Good Quality Power Capacity reported in this Chapter. Load Factor (Actual) is based on the Total Power Capacity and the Total Power Output. The Load Factor (CHPQA) is lower than the Load Factor (Actual) for schemes that have been scaled back on the power outputs. The load factor gives an indication of the degree to which the power generating capacity is utilized. Since 2007, there has been a downward trend in the load factor in each industrial sector and this trend has been particularly noticeable in the chemicals sector.

2 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 7A: A summary of the recent development of CHP[1]

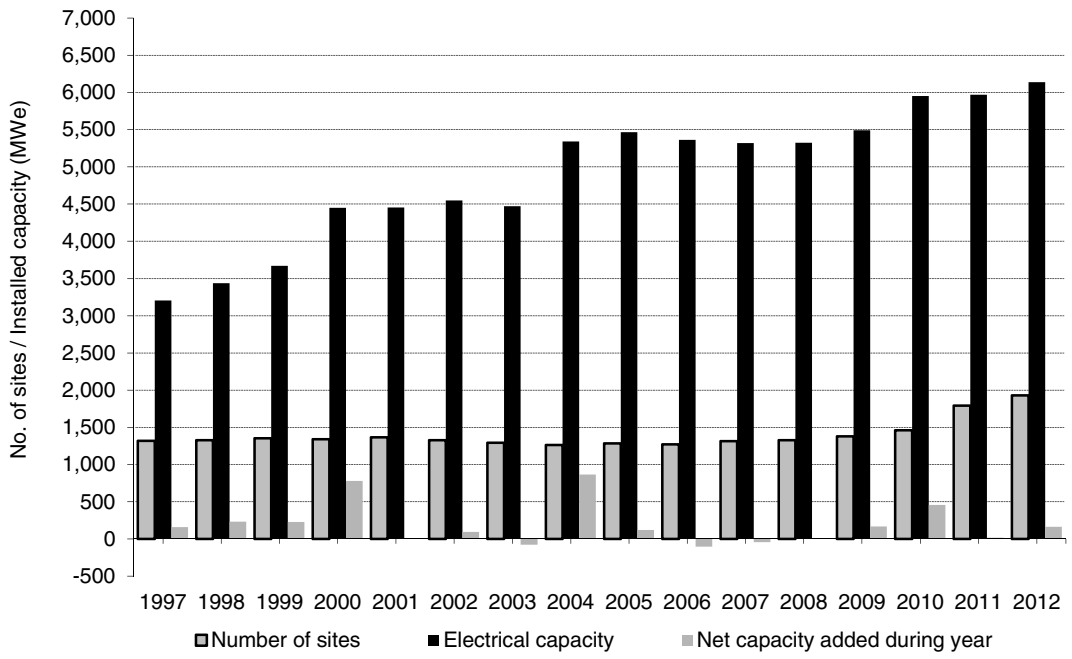
	Unit	2008	2009	2010	2011	2012
Number of schemes		1,327	1,380	1,460	1,794	1,929
Net No. of schemes added during year (2)		13	53	80	334	135
Electrical capacity (CHP_{QPC})	MWe	5,323	5,492	5,950	5,970	6,136
Net capacity added during year		5	169	458	20	166
Capacity added in percentage terms	Per cent	0.1	3.2	8.3	0.3	2.8
Heat capacity	MWth	21,133	22,258	22,204	22,168	22,837
Heat to power ratio *(3)*		1.89	1.82	1.80	2.12	2.10
Fuel input	GWh	118,685	111,291	112,560	98,194	103,181
Electricity generation (CHP_{QPO})	GWh	27,528	26,425	26,768	22,766	23,360
Heat generation (CHP_{QHO})	GWh	51,911	48,092	48,267	48,183	49,134
Overall efficiency *(4)*	Per cent	66.9	67.0	66.7	72.3	70.3
Load factor (CHPQA) *(5)*	Per cent	59.0	54.9	51.4	43.5	43.5
Load factor (Actual) *(6)*	Per cent	65.5	57.3	55.2	57.8	53.3

(1) All data in this table for 2008 to 2011 have been revised since last year's Digest (see text for explanation).
(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 (CHPQA) 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) Overall efficiencies are calculated using gross calorific values; overall net efficiencies are some 7 percentage points higher.
(6) The load factor (Actual) is based on the total power generated and total capacity

Changes in CHP capacity

7.6 Chart 7.1 shows the change in installed CHP capacity since 1997. Installed capacity at the end of 2012 stood at 6,136 MWe, an increase of 2.8 per cent in comparison to 2011. There was a net increase of 135 schemes between 2011 and 2012 and a net increase of 166 MWe in installed capacity. Overall, between 2011 and 2012, there were 154 new schemes included in the database and a removal of 19 schemes.

Chart 7.1: Installed CHP capacity by year



7.7 The data relating to the number of schemes and capacity in Table 7A for 2011 and earlier years has been revised relative to the same table in earlier editions of the Digest. A substantial part of this revision is due to the removal from the statistics, for the first time, of 'mothballed' schemes. In previous editions of the Digest the capacity of these schemes has been retained in the statistics on the basis that these schemes are still able to operate. However, in this year's Digest all mothballed

schemes have been removed from the statistics[3] and schemes that have been mothballed since before 2010 are assumed to be 'dead'. There were 117 mothballed schemes with a total capacity of 101 MWe removed from the statistics. Of these, 95 schemes with a total capacity of 74 MWe were marked as 'dead'. The remaining 22 schemes with a total capacity of 27 MWe were mothballed in 2010 and later. While these schemes are not included in the statistics tables of this chapter, they are nevertheless retained in the database of schemes on the basis that they may be operating again in the future.

7.8 Table 7A gives a summary of the overall CHP market. The electricity generated by CHP schemes in 2012 was 23,360 GWh, an increase of 2.6 per cent in comparison to 2011. This generated electricity represents 6.4 per cent of the total electricity generated in the UK. The sectors accounting for the largest proportions of the increase in electricity generated were refineries, transport, commerce and administration and iron and steel and non-ferrous metals sectors.

7.9 In 2012 CHP schemes supplied a total of 49,134 GWh of heat, which was an increase of 2.0 per cent compared to 2011.

7.10 The electricity generated and reported in this year's Digest for 2011 is appreciably lower than that reported for 2011 in DUKES 2012. Data reported for the same year in different editions of the Digest are often different due to the revisions made possible by the availability of more up to date data. While this explains part of the decrease in electricity generated for 2011, the majority of the decrease is due to a change in the way Good Quality CHP power output is calculated. This change is in line with the EU Cogeneration Directive and took effect for the first time for a number of schemes for 2011. This change has led to a larger proportion of total power output being regarded as power only and a consequential fall on the power output reported in this chapter as Good Quality CHP power output. At the time of compiling the data for 2011, for the 2012 edition of the Digest, the actual 2011 data for a number of affected schemes was not available and so the 2010 data, calculated on the previous basis, was copied forward. This change in the calculation of the Good Quality CHP power output also explains the step up in heat to power ratio in Table 7A in 2011, where, for a given level of CHP QHO (Qualifying Heat Output) a higher heat to power ratio is returned due to a lower QPO (Qualifying Power Output). Table 7B shows the effect on the statistics for 2011 of the change in the way Good Quality CHP electricity is calculated. The column 'Old Basis' shows key data for 2011 if the schemes whose outputs were calculated on the old basis in DUKES 2012 continued to have their outputs calculated in this way in DUKES 2013. The column 'New Basis' shows the key data for 2011 where the outputs of all schemes are calculated on the new basis.

Table 7B: Impact of new scale back criteria

	Unit	2011 (old basis)	2011 (new basis)
Number of schemes		1,794	1,794
Electrical capacity (CHP_{QPC})	MWe	5,970	5,970
Heat capacity	MWth	22,168	22,168
Fuel input	GWh	109,035	98,194
Electricity generation (CHP_{QPO})	GWh	26,392	22,766
Heat generation (CHP_{QHO})	GWh	48,183	48,183
Overall efficiency	Per cent	68.4	72.3

7.11 In terms of electrical capacity by size of scheme, schemes larger than 10 MWe represent about 82 per cent of the total electrical capacity of CHP schemes as shown in Table 7C. However, schemes less than 1 MWe constitute the majority (83 per cent) in terms of the number of schemes. Table 7.5 provides data on electrical capacity for each type of CHP installation and the map on page 199 shows how these schemes are located around the country.

3 *This treatment is similar to that used in chapter 5 of this Digest.*

Table 7C: CHP schemes by capacity size ranges in 2012

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	531	27.5	32	0.5
100 kWe - 999 kWe	1,072	55.6	256	4.1
1 MWe - 9.9 MWe	257	13.3	836	13.6
Greater than 10 MWe	69	3.6	5012	81.7
Total	**1,929**	**100.0%**	**6136**	**100.0%**

7.12 Seventy-nine per cent of electrical capacity is now gas turbine based[4], with about 91 per cent of this (72 per cent of total capacity) in combined cycle (CCGT) mode. There has been an increase in CCGT capacity owing to the reclassification of some schemes by technology. After combined cycle, reciprocating engines represent the second largest technology in terms of installed electrical capacity, followed by open cycle gas turbines (OCGT).

7.13 Excluded from the statistics tables presented in this chapter are a number of very small CHP schemes installed since 2010 in response to the Feed-in Tariff (FiT) scheme. The overwhelming majority of these schemes are domestic. At the end of 2012 there were 423 such schemes registered with Ofgem for FiTs with a total installed capacity of 430 kWe. There are no data on electricity generation or fuel consumption and, consequently, these schemes have been left out of the statistics tables. However, if included, there would have a negligible impact upon the capacity and generation figures presented in the statistics tables.

7.14 Table 7.7 provides data on heat capacity for each type of CHP installation. In this edition of the Digest there has been a change implemented in how the heat capacity has been derived for each scheme. For a number of schemes the data held on heat capacity has either not been complete or has not been a true reflection of the capacity of the scheme to generate heat in CHP operating mode. To allow for this, a standard methodology has been developed and applied for the first time in this year's Digest for the determination of the heat capacity of each CHP scheme. Details of this methodology may be found in paragraph 7.44.

Fuel used by types of CHP installation

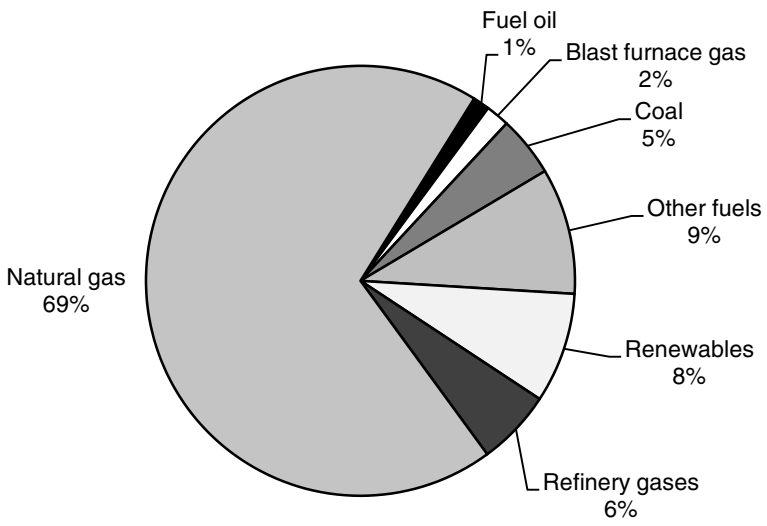
7.15 In 2012, 69 per cent of the total fuel use was natural gas a small decrease compared with 2011. CHP schemes accounted for 9 per cent of UK gas demand in 2012 (see Table 4.3). Over the last 11 years, the refineries sector has seen a decrease in the proportion of fuel use that is heavy fuel oil and an increase in the proportion of fuel use that is natural gas. Table 7.2 shows the fuel used to generate electricity and heat in CHP schemes (see paragraphs 7.41 to 7.43, for an explanation of the convention for dividing fuel between electricity and heat production). Table 7.3 gives the overall fuel used by types of CHP installation (which are explained in paragraph 7.40). Total fuel use is summarised in Chart 7.2

7.16 The proportion of renewable fuels increased in 2012 on that reported in 2011, from 7.0 per cent in 2011 to 8.3 per cent in 2012, mainly due to an increase in the use of liquid biofuels (these are recorded under the 'other plant based biomass' column in the renewables balance in chapter 6).

7.17 Other fuels (liquids, solids or gases which are by-products or waste products from industrial processes) account for 17 per cent of all fuel used in CHP in 2012. Some of these fuels 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 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 and 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.

4 See table 7.5 Gas turbine and Combined cycle.

Chart 7.2: Types of fuel used by CHP schemes in 2012



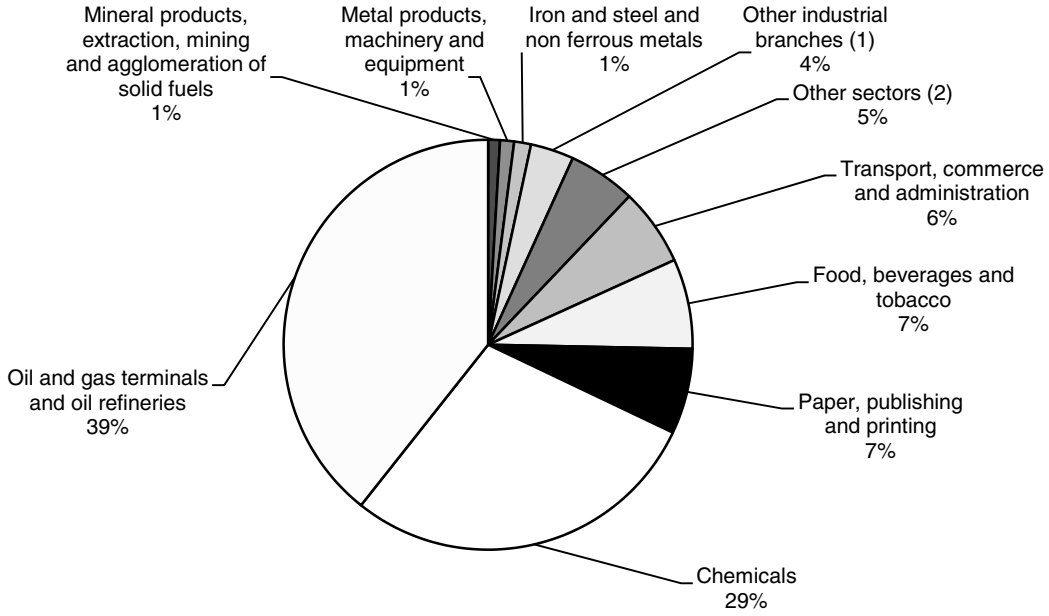
CHP capacity, output and fuel use by sector

7.18 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.

7.19 Table 7.8 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 1.59 and Table 1H:

- 375 schemes (89 per cent of electrical capacity) are in the industrial sector and 1,554 schemes (11 per cent of capacity) are in the agricultural, commercial, public administration, residential and transport sectors.
- Four industrial sectors account for about 82 per cent of the CHP electrical capacity – oil refineries (39 per cent), chemicals (29 per cent), paper and publishing and printing (7 per cent) and food, beverages and tobacco (7 per cent). Capacity by sector is shown in Chart 7.3. The capacity attributed to oil refineries grew between 2011 and 2012, while the capacity attributable to the chemicals sector was static. In terms of installed capacity, the food, beverages and tobacco sector became larger than the paper, publishing and printing sector for the first time in 2011. Up until 2008 the chemicals sector had the largest share of CHP electrical capacity.

Chart 7.3: CHP electrical capacity by sector in 2012



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

7.20 Table 7D gives a summary of the 1,396 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 7.8 and 7.9. 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 the health sector (34 per cent), mainly hospitals. Leisure and hotels account for half of all schemes associated with buildings but only 22 per cent of the capacity. Table 7.9 gives details of the quantities of fuels used in each sector.

Table 7D: Number and capacity of CHP schemes installed in buildings by sector in 2012

	Number of schemes	Electrical capacity (MWe)	Heat capacity (MWth)
Leisure	446	60.0	102.1
Hotels	256	37.0	61.4
Health	187	146.7	874.7
Residential Group Heating	86	34.0	99.6
Universities	81	70.3	419.4
Offices	40	14.4	18.8
Education	54	14.0	46.8
Government Estate	30	13.5	47.4
Retail	213	42.4	69.3
Other *(1)*	3	0.7	1.1
Total	**1396**	**433.1**	**1740.5**

(1) All schemes under Other are at airports

7.21 CHP is used within District Heating applications, where the heat outputs of the CHP are used to provide space heating and hot water to more than one building. In this year's Digest we provide indicative statistics for the use of CHP in District Heating applications, which will be refined in later editions of the Digest as more information is forthcoming. From the CHP statistics database and other work on District Heating within the UK, there are an estimated 147 separate CHP schemes supplying heat to District Heating schemes, with an electrical generating capacity of about 177 MWe.

CHP performance by main prime mover

7.22 Table 7E gives a summary of the performance of schemes in 2012 by main prime mover type. In 2012 the prime mover type with the highest average operating hours was gas turbines followed by reciprocating engines. Combined cycle schemes have historically had the highest average operating hours. However, after 2009 this ceased to be the case. In this year additional combined cycle capacity was installed which has since been under-utilised. This has a distorting effect on the average operating hours for this technology type in the statistics.

7.23 As mentioned previously (paragraph 7.5), for the year of operation 2011 there was a change in the methodology for calculating the Good Quality electricity outputs and this substantially explains the step down in electricity generation between 2010 and 2011 in Table 7A. This change also has an impact upon the average operating hours shown in Table 7E. For prime mover types most affected by the calculation change, there is a noticeable fall in the average operating hours. This is because, for the same total electricity output, the Good Quality electricity output is lower. As the operating hours are calculated by dividing power generation by capacity, this gives a lower value of operating hours than would have been the case under the previous method for calculating Good Quality electricity output.

7.24 In 2012, the average operating hours were 3,807 hours. The average operating hours for 2011 (revised for application of the new calculation methodology across all schemes) was about the same at 3,813 hours.

7.25 In 2012, the average electrical efficiency was 23 per cent and the heat efficiency 48 per cent, giving an overall average of 70 per cent (rounded), which is lower than in 2011 (72 per cent). The afore-mentioned efficiencies for 2011 and 2012 are based on Good Quality electricity outputs calculated using the updated methodology and based on fuel consumption expressed on a gross calorific value (GCV) basis.

Table 7E: A summary of scheme performance in 2012

	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	3,053	9	75	84	8.1
Pass out condensing steam turbine	3,650	11	52	63	4.7
Gas turbine	5,368	23	49	73	2.1
Combined cycle	3,706	24	46	71	1.9
Reciprocating engine	3,784	25	37	62	1.5
All schemes	**3,807**	**23**	**48**	**70**	**2.1**

CHP schemes which export and schemes with mechanical power output

7.26 Table 7F shows the electrical exports from CHP schemes between 2010 and 2012. 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 7.5). Exports accounted for about 46 per cent of power generation from CHP in 2012 (compared to 37 per cent. in 2011). Declaration of electrical exports remains voluntary under CHPQA and so the figures presented in Table 7F may be an underestimate of the true situation.

Table 7F: Electrical exports from CHP

GWh

	2010	2011	2012
To part of same qualifying group *(1)*	350	171	34
To a firm NOT part of same qualifying group	1,138	1,456	1,122
To an electricity supplier	8,216	6,745	9,660
Total	**9,703**	**8,372**	**10,816**

(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.

7.27 In 2012, 39 large schemes also exported heat, with some exporting to more than one customer. As Table 7G shows, together they supplied 9,222 GWh of heat in 2012.

Table 7G: Heat exports from CHP

GWh

	2010	2011	2012
To part of same qualifying group *(1)*	1,919	1,812	2,090
To a firm NOT part of same qualifying group	6,498	7,086	7,132
Total	**8,416**	**8,898**	**9,222**

(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.

7.28 There are an estimated 12 schemes with mechanical power output. For those schemes, mechanical power accounts for around 9 per cent of their total power capacity (Table 7H). 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 7H: CHP schemes with mechanical power output in 2012

	Unit	
Number of schemes		12
Total Power Capacity of these schemes (CHP_{TPC})	MWe	2,450
Mechanical power capacity of these schemes	MWe	231

Emissions savings

7.29 The calculation of carbon emissions savings from CHP 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. 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 2012 as compared to the fossil fuel basket were 15.73 $MtCO_2$, which equates to 2.56 Mt CO_2 per 1,000 MWe installed capacity. Against the total basket, CHP saved 10.25 Mt CO_2 which equates to 1.57 Mt CO_2 per 1,000 MWe installed capacity.

7.30 Corresponding figures for 2010 and 2011 are shown in Table 7I. The 2010 and 2011 CO_2 savings are revised based on revisions to the relevant data for these years in Tables 7.1, 7.4, 7.6 and 7.9. Both absolute savings ($MtCO_2$) and relative savings ($MtCO_2$/1000 MWe) are sensitive to the load factor of the installed CHP and the CO_2 intensity of the grid electricity being displaced by CHP electricity. The increase in absolute and relative savings in 2012 with respect to 2011 is a combination of higher power outputs and higher grid electricity CO_2 intensity factors in 2012 than in 2011 (reflecting higher coal use).

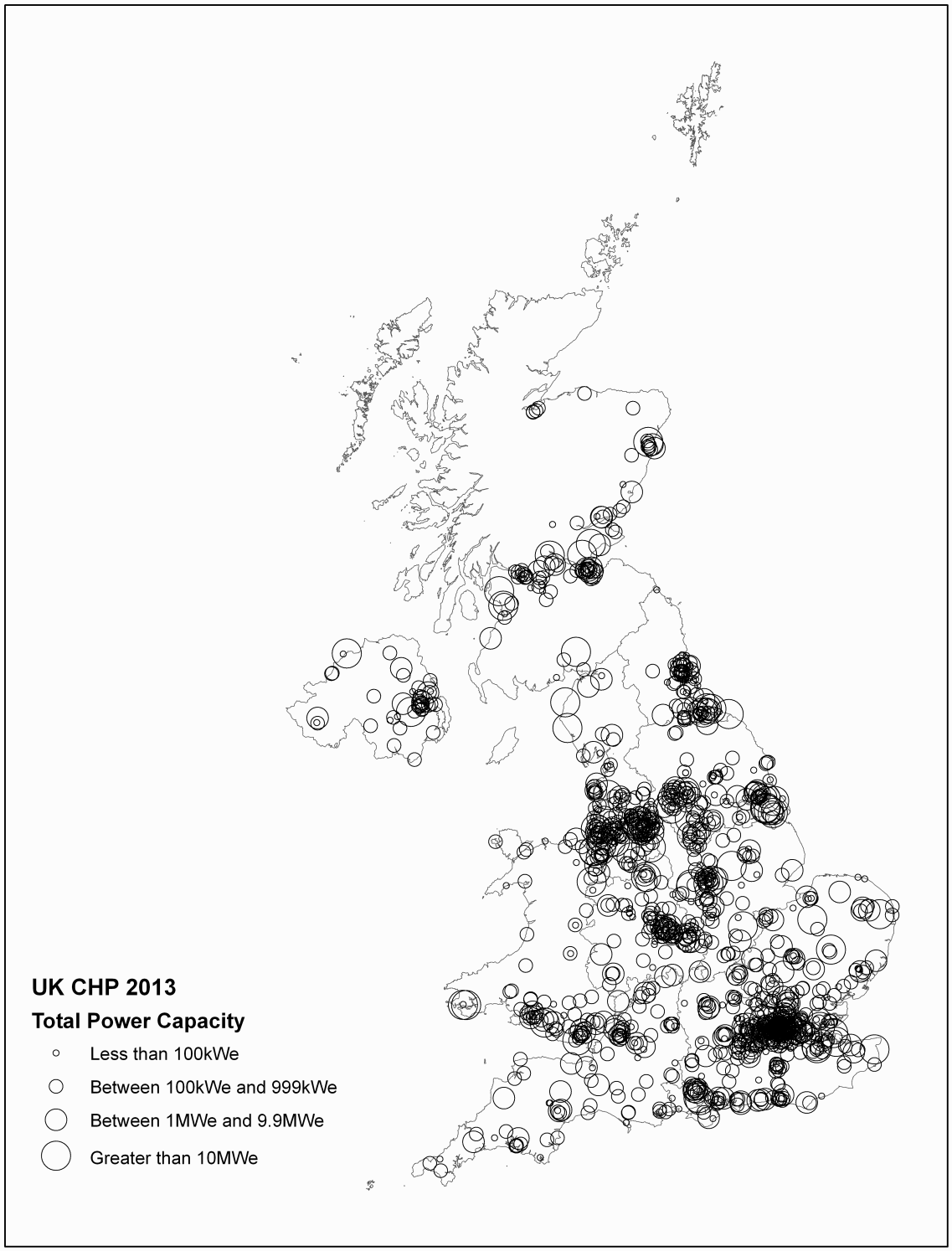
Table 7I: Carbon dioxide savings due to CHP, absolute and per 1,000 MWe of installed good quality CHP capacity

	2010		2011		2012	
	$MtCO_2$	$MtCO_2$/1000 MWe	$MtCO_2$	$MtCO_2$/1000 MWe	$MtCO_2$	$MtCO_2$/1000 MWe
Carbon savings against all fossil fuels	13.23	2.22	13.27	2.22	15.73	2.56
Carbon savings against all fuels (including nuclear and renewables)	9.26	1.56	9.04	1.51	10.25	1.57

Note: (1) The CO_2 savings in Table 7I 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 2012 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. The CO_2 savings quoted above for 2010 and 2011 have also been revised in response to changes in the CO_2 intensity factors for electricity for these years since reporting in DUKES 2012.

CHP schemes in the United Kingdom by power capacity, 2012



Government policy towards CHP

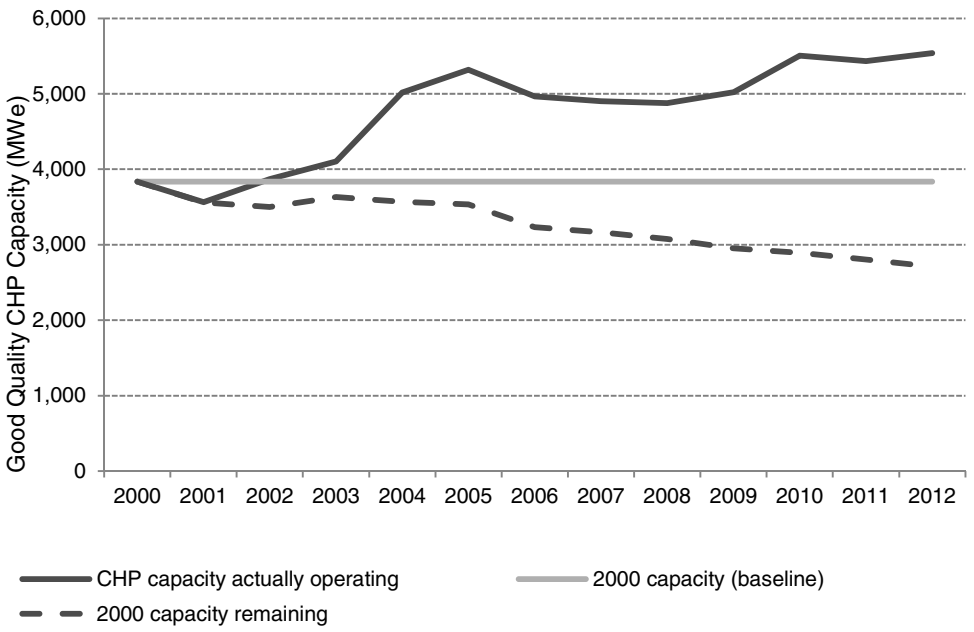
7.31 Good Quality CHP denotes schemes that have been certified as being highly efficient through the UK's CHP Quality Assurance (CHPQA) programme. The criteria used are in line with the requirements for high efficiency CHP set down in the Energy Efficiency Directive (2012/27/EU). A Good Quality CHP scheme, with installed capacity >1 MWe, must achieve 10 per cent primary energy savings compared with the EU reference values for separate generation of heat and power i.e. via a boiler and power station. Only Good Quality CHP schemes are eligible for Government support.

7.32 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 Good Quality CHP and electricity outputs consumed onsite or supplied direct to a third known party.
- Eligibility to Enhanced Capital Allowances for Good Quality CHP plant and machinery.
- Business Rates exemption for CHP power generation plant and machinery.
- Reduction of VAT (from 20 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 1.5 to 2 ROCs for Good Quality electricity output of CHP fuelled by biomass.
- The Carbon Reduction Commitment (CRC) is a mandatory emissions trading scheme that covers 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 are 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 the simplified CRC, CHP will have to purchase allowances only for electricity consumed onsite, meaning that allowances will not have to be purchased by a site to cover any heat from CHP.

7.33 Table 7.1 shows the installed Good Quality CHP capacity in each year. However, this table hides the underlying market activity that replaces older capacity as it is taken out of service over time. Chart 7.4 gives an idea of the scale of this activity since 2000 for CHP schemes certified under CHPQA. The lower line shows how much of the Good Quality CHPQA capacity that was in place in 2000 remained in place in subsequent years, while the upper line shows the actual Good Quality CHPQA capacity in place in each year. For any year since 2000, the gap between these two lines represents the new Good Quality CHPQA capacity installed between 2000 and that year. By 2012 there had been just over 2.8 GWe of new Good Quality CHPQA capacity installed since 2000.

Chart 7.4: Underlying market activity – installed Good Quality CHP versus retained Good Quality CHP



International context

7.34 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. 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 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.

7.35 Phase III of EU ETS will run from 2013 until 2027. Under this Phase there will be no allocation made in respect of CO_2 emissions associated with the generation of electricity, including electricity generated by CHP. However, there will be an allocation made in respect of CO_2 emissions associated with the generation of heat. The allocation will be based upon harmonised benchmarks for heat production, and a heat generating installation will, in 2013, receive 80% of the allocations determined using this benchmark, declining linearly to 30% by 2020 and then to 0% by 2027. The benchmark for heat adopted by the European Commission is based on the use of natural gas with a conversion efficiency of 90% (N.C.V.). An allocation is only made in respect of measurable heat consumed. This means that the benchmark allocation made for each MWh of heat generated by a CHP scheme and subsequently consumed is 0.224 tCO_2[5].

5 Where the CHP supplies heat to an EU ETS Phase III sub-installation or installation and the sub-installation or installation produces a product that is product benchmarked, then an allocation is not made in respect of the heat supplied but in respect of the product produced.

Technical notes and definitions

7.36 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 1.28 to 1.60.

Data for 2012

7.37 The data are summarised from the results of a long-term project undertaken by Ricardo-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.

7.38 The project continues to be overseen by a Steering Group that comprises officials from DECC, the Office of Gas and Electricity Markets (Ofgem) and the Combined Heat and Power Association (CHPA) 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.

7.39 Data for 2012 were based on data supplied to the CHPQA programme, on information from the Iron and Steel Statistics Bureau (ISSB), on information from Ofgem in respect of "Renewables Obligation Certificates" (ROCs), from the CHP Sales database maintained by the CHPA and from a survey of anaerobic digestion sites (AD survey). Approximately 95 per cent of the total capacity is from schemes that have been certified under the CHPQA programme. 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 2.5 per cent of total electrical capacity. The balance of the capacity is for schemes covered by ISSB sources (1 per cent.), CHPA Sales Database (<1 per cent.), schemes included in the AD survey (<1 per cent.) and for schemes not covered by the above sources which were interpolated from historical data (<1 per cent.).

Definitions of schemes

7.40 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

7.41 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.

7.42 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.

7.43 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.

Determining heat capacity of CHP schemes

7.44 The heat capacity figures presented in this edition of the Digest were determined as follows, where:

- THC = Total Heat Capacity of Scheme (as presented in this Chapter)
- THC(FB) = Total Heat Capacity of Fired Boilers within the Scheme
- THC(HRB) = Total Heat Capacity of Heat Recovery Boilers within the Scheme
- $THC(FB)_{to\ ST}$ = Total Heat Capacity of Fired Boilers supplying steam to Scheme Steam Turbines
- $THC(HRB)_{to\ ST}$ = Total Heat Capacity of Heat Recovery Boilers supplying steam to Scheme Steam Turbines
- THC(GT or HRB) = Total Heat Capacity for the Gas Turbines or associated Heat Recovery Boilers within the Scheme
- THC(RE) = Total Heat Capacity for the engine cooling circuits of the Reciprocating Engines within the Scheme
- TPC = Total Power Capacity of the Scheme
- TPC_{ST} = Total Power Capacity of Steam Turbines within the Scheme

Pack-pressure and Pass-out Condensing Steam Turbine Systems – For schemes certified under CHPQA, the Total Heat Capacity (THC) is given by:

$$THC = THC(FB) + THC(HRB) - TPC_{ST}$$

For schemes not certified under CHPQA, the THC is given by:

$$THC = TPC \times 2.22$$

Where 2.22 is the standard heat to power ratio for steam turbines given in Annex I of the EU Directive on energy efficiency (2012/27/EU).

Combined Cycle Systems – For schemes certified under CHPQA, the Total Heat Capacity (THC) is given by:

$THC = THC(FB)_{to\ ST} + THC(HRB)_{to\ ST} - TPC_{ST}$

For schemes not certified under CHPQA, the THC is given by:

THC = TPC x 1.052

Where 1.052 is the standard heat to power ratio for combined cycle gas turbines given in Annex I of the EU Directive on energy efficiency (2012/27/EU).

Gas Turbine Systems - For schemes certified under CHPQA, the Total Heat Capacity (THC) is given by:

THC = THC(GT or HRB) + THC(FB)

For schemes not certified under CHPQA, the THC is given by:

THC = TPC x 1.81

Where 1.81 is the standard heat to power ratio for gas turbines given in Annex I of the EU Directive on energy efficiency (2012/27/EU).

Reciprocating Engine Systems – For schemes certified under CHPQA, the Total Heat Capacity (THC) is given by:

THC = THC(RE) + THC(FB) + THC(HRB)

For schemes not certified under CHPQA, the THC is given by:

THC = TPC x 1.33

Where 1.33 is the standard heat to power ratio for reciprocating engines given in Annex I of the EU Directive on energy efficiency (2012/27/EU).

The effects on the statistics of using CHPQA

7.45 Paragraph 7.10 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 7J where it is seen that 232 schemes were scaled back. For information, in 2011, 269 (revised) schemes were scaled back.

7.46 In 2012, the power output from these schemes was scaled back from a total of 35,311 GWh to 14,957 GWh. The total fuel input to these schemes was 116,721 GWh of which 50,966 GWh was regarded as being for power only. For 2011, the total power output was scaled back from 32,290 GWh (revised) to 14,463 GWh (revised).

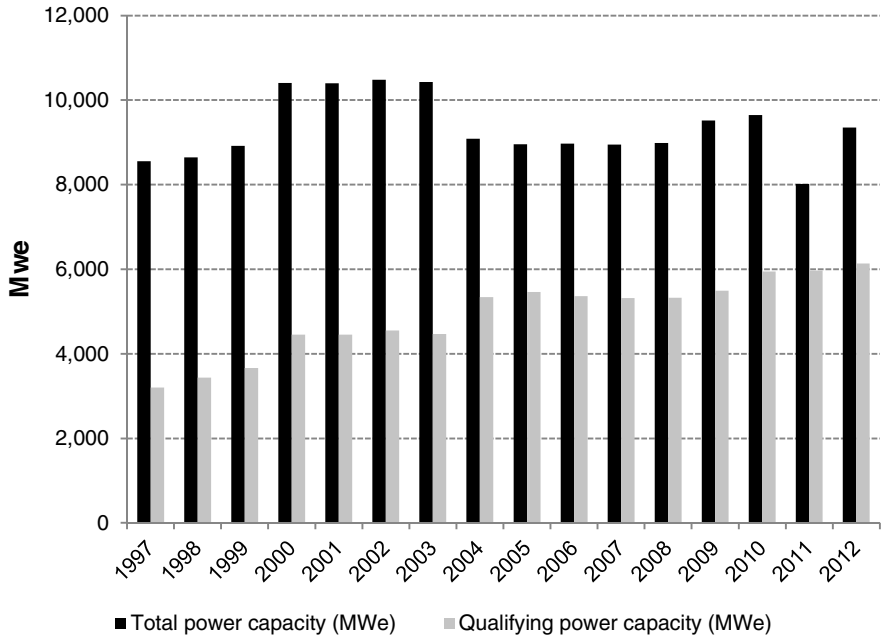
Table 7J: CHP capacity, output and fuel use which has been scaled back in 2012

	Units	
Number of schemes requiring scaling back		232
Total Power Capacity of these schemes (CHP_{TPC})	MWe	7,590
Qualifying Power Capacity of these schemes (CHP_{QPC})	MWe	4,371
Total power output of these schemes (CHP_{TPO})	GWh	35,311
Qualifying Power Output of these schemes (CHP_{QPO})	GWh	14,597
Electricity regarded as "Power only" not from CHP (CHP_{TPO} - CHP_{QPO})	GWh	20,355
Total Fuel Input of these schemes (CHP_{TFI})	GWh	116,721
Fuel input regarded as being for "Power only" use i.e. not for CHP	GWh	50,966

**This figure includes generation from major power producers*

7.47 The evolution of Total Power Capacity (TPC) and Qualifying Power Capacity (QPC) over time is shown in Chart 7.5.

Chart 7.5: Installed CHP capacity by year (Total versus Qualifying)



Exports of electricity and heat

7.48 The figures quoted in Tables 7F and 7G 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 7F. 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 7F.

This approach for Table 7F was adopted for the first time in DUKES 2009. The data presented for previous years in this edition of DUKES have been compiled on the same basis as for 2012.

Exports of heat, quoted in Table 7G, continue to be compiled on the basis of volunteered data only.

Typical Power and Heat Efficiencies and Heat to Power Ratios of Prime Movers

7.49 The figures quoted above in Table 7E are for CHP schemes. These schemes may contain supplementary boilers, supplementary firing and auxiliary firing. The figures are, therefore, not reflective of the power and heat efficiencies and the heat to power ratios of the prime mover when it is considered in isolation.

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7.1 CHP installations by capacity and size range

	2008	2009	2010	2011	2012
Number of schemes *(1,2)*	**1,327r**	**1,380r**	**1,460r**	**1,794r**	**1,929**
Less than 100 kWe	409r	398r	395r	491r	531
100 kWe to 999 kWe	659r	713r	775r	987r	1,072
1 MWe to 9.9 MWe	189r	198r	221r	248r	257
10.0 MWe and above	70r	71r	69r	68r	69
					MWe
Total capacity	**5,323r**	**5,492r**	**5,950r**	**5,970r**	**6,136**
Less than 100 kWe	26r	25r	25r	31r	32
100 kWe to 999 kWe	166r	179r	194r	237r	256
1 MWe to 9.9 MWe	667r	688r	758r	806r	836
10.0 MWe and above	4,464r	4,600r	4,973r	4,897r	5,012

(1) A site may contain more than one CHP scheme.

(2) MicroCHP schemes installed under FIT are not included in these figures (or any subsequent figures in chapter 7) At the end of 2012 423 such schemes were registered on Ofgems Central FIT Register totalling 430kWe (0.43MWe)

7.2 Fuel used to generate electricity and heat in CHP installations

GWh

	2008	2009	2010	2011	2012
Fuel used to generate electricity *(1)*					
Coal *(2)*	1,856	1,545	1,484	1,616r	1,774
Fuel oil	887	880	694	530r	567
Natural gas	45,410r	42,853r	43,244r	35,008r	36,753
Renewable fuels *(3)*	2,313	2,844	3,418r	3,638r	4,775
Other fuels *(4)*	10,100	9,520	9,674	6,086r	6,114
Total all fuels	**60,565r**	**57,641r**	**58,514r**	**46,877r**	**49,983**
Fuel used to generate heat					
Coal *(2)*	2,418	2,134	2,061	2,685r	2,918
Fuel oil	1,178	1,265	887	682r	731
Natural gas	38,670r	34,987r	35,261r	33,453r	34,390
Renewable fuels *(3)*	2,281	2,491	3,115	3,215r	3,783
Other fuels *(4)*	13,574	12,772	12,722r	11,281r	11,376
Total all fuels	**58,121r**	**53,649r**	**54,046r**	**51,317r**	**53,198**
Overall fuel use					
Coal *(2)*	4,274	3,679	3,544	4,301r	4,692
Fuel oil	2,065	2,146	1,581	1,212r	1,298
Natural gas	84,079r	77,840r	78,505r	68,461r	71,143
Renewable fuels *(3)*	4,594	5,334	6,533r	6,854r	8,558
Other fuels *(4)*	23,673r	22,291r	22,396r	17,367r	17,491
Total all fuels	**118,685r**	**111,291r**	**112,560r**	**98,194r**	**103,181**

(1) See paragraphs 7.40 to 7.42 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.

7.3 Fuel used by types of CHP installation

GWh

	2008	2009	2010	2011	2012
Coal					
Back pressure steam turbine	521	513	549	542r	542
Gas turbine	29	-	-	-	-
Combined cycle	3,313r	2,806r	2,672r	3,468r	3,859
Reciprocating engine	8	1	-	4	4
Pass out condensing steam turbine	402r	359r	323r	286r	286
Total coal	**4,274**	**3,679**	**3,544**	**4,301r**	**4,692**
Fuel oil					
Back pressure steam turbine	140	185	142	158r	159
Gas turbine	1	1	5	2	0
Combined cycle	1,601r	1,593r	1,268r	916r	996
Reciprocating engine	153	131	119	118	122
Pass out condensing steam turbine	170r	235r	47r	18r	21
Total fuel oil	**2,065**	**2,146**	**1,581**	**1,212r**	**1,298**
Natural gas					
Back pressure steam turbine	1,692r	1,727r	1,659r	1,549r	1,592
Gas turbine	9,232r	8,945r	9,023r	9,176r	9,383
Combined cycle	66,078r	59,362r	58,833r	48,640r	50,228
Reciprocating engine	6,810r	7,534r	8,599r	8,766r	9,593
Pass out condensing steam turbine	268r	272r	391r	330r	346
Total natural gas	**84,079r**	**77,840r**	**78,505r**	**68,461r**	**71,143**
Renewable fuels *(1)*					
Back pressure steam turbine	1,521	1,339	1,507	1,413r	1,505
Gas turbine	2r	4r	5r	11r	6
Combined cycle	520	562	584	514r	503
Reciprocating engine	1,505r	1,725r	2,121r	2,610r	4,007
Pass out condensing steam turbine	1,046	1,704	2,315	2,306r	2,537
Total renewable fuels	**4,594**	**5,334**	**6,533r**	**6,854r**	**8,558**
Other fuels *(2)*					
Back pressure steam turbine	5,089	4,932	4,564	3,409r	3,174
Gas turbine	501r	581r	537r	222r	208
Combined cycle	14,796r	13,535r	13,910r	11,596r	11,384
Reciprocating engine	35r	48r	97r	93r	137
Pass out condensing steam turbine	3,252r	3,196r	3,288r	2,047r	2,588
Total other fuels	**23,673r**	**22,291r**	**22,396r**	**17,367r**	**17,491**
Total - all fuels					
Back pressure steam turbine	8,963r	8,696r	8,421r	7,072r	6,972
Gas turbine	9,765r	9,531r	9,570r	9,410r	9,598
Combined cycle	86,309r	77,859r	77,267r	65,134r	66,970
Reciprocating engine	8,511r	9,439r	10,937r	11,591r	13,863
Pass out condensing steam turbine	5,138r	5,765r	6,364r	4,986r	5,779
Total all fuels	**118,685r**	**111,291r**	**112,560r**	**98,194r**	**103,181**

(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.

7.4 CHP - electricity generated by fuel and type of installation

GWh

	2008	2009	2010	2011	2012
Coal					
Back pressure steam turbine	57	52	64	60r	60
Gas turbine	5	-	-	-	-
Combined cycle	653r	538r	513r	577r	647
Reciprocating engine	1	0	-	1	1
Pass out condensing steam turbine	19r	19r	28r	20r	20
Total coal	**736**	**610**	**604**	**659r**	**728**
Fuel oil					
Back pressure steam turbine	16	20	18	19	19
Gas turbine	0	0	1	0	0
Combined cycle	328r	309r	260r	194r	211
Reciprocating engine	51	45	41	41	41
Pass out condensing steam turbine	19r	33r	6r	1r	1
Total fuel oil	**413**	**408**	**325**	**255r**	**272**
Natural gas					
Back pressure steam turbine	121r	125	126	121r	128
Gas turbine	2,028r	2,042r	2,096r	2,169r	2,210
Combined cycle	17,172r	15,962r	15,797r	12,776r	12,967
Reciprocating engine	1,699r	1,949r	2,194r	2,357r	2,577
Pass out condensing steam turbine	16r	20r	40r	24r	24
Total natural gas	**21,036r**	**20,097r**	**20,253r**	**17,447r**	**17,907**
Renewable fuels *(1)*					
Back pressure steam turbine	215	201	214	218r	225
Gas turbine	1r	1r	1r	2r	1
Combined cycle	10	16	11	4	1
Reciprocating engine	459r	526r	601r	760r	839
Pass out condensing steam turbine	200	327	442	419r	422
Total renewable fuels	**886r**	**1,071**	**1,270**	**1,402r**	**1,489**
Other fuels *(2)*					
Back pressure steam turbine	628	604	556	226r	214
Gas turbine	111r	131r	102r	41r	38
Combined cycle	3,427r	3,107r	3,244r	2,612r	2,510
Reciprocating engine	8	12	25	25r	30
Pass out condensing steam turbine	284r	385r	389r	100r	172
Total other fuels	**4,457r**	**4,239r**	**4,317**	**3,004r**	**2,963**
Total - all fuels					
Back pressure steam turbine	1,037	1,002r	978r	643r	647
Gas turbine	2,145r	2,174r	2,201r	2,212r	2,249
Combined cycle	21,589r	19,933r	19,824r	16,163r	16,336
Reciprocating engine	2,219r	2,533r	2,862r	3,184r	3,488
Pass out condensing steam turbine	538r	784r	903r	564r	640
Total all fuels	**27,528r**	**26,425r**	**26,768r**	**22,766r**	**23,360**

(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.

7.5 CHP - electrical capacity by fuel and type of installation

MWe

	2008	2009	2010	2011	2012
Coal					
Back pressure steam turbine	20	19	20	20	20
Gas turbine	1	-	-	-	-
Combined cycle	165r	159r	152r	282r	314
Reciprocating engine	1	0	-	0	0
Pass out condensing steam turbine	6r	6r	4r	4r	4
Total coal	**193**	**184**	**176**	**306r**	**338**
Fuel oil					
Back pressure steam turbine	7	7	6	6	6
Gas turbine	0	0	0r	0r	0
Combined cycle	67r	70r	55r	41r	45
Reciprocating engine	9r	8r	7r	7r	6
Pass out condensing steam turbine	4r	5r	1r	1r	1
Total fuel oil	**87r**	**90r**	**70r**	**55r**	**58**
Natural gas					
Back pressure steam turbine	37	39	36	31r	40
Gas turbine	397r	400r	390r	401r	407
Combined cycle	3,075r	3,195r	3,509r	3,308r	3,402
Reciprocating engine	517r	565r	619r	676r	708
Pass out condensing steam turbine	4r	5r	6r	6r	6
Total natural gas	**4,030r**	**4,203r**	**4,560r**	**4,423r**	**4,563**
Renewable fuels *(1)*					
Back pressure steam turbine	37	35	37	38	39
Gas turbine	0r	0	0	1r	0
Combined cycle	3	3	3	3	3
Reciprocating engine	115r	128r	131r	175	185
Pass out condensing steam turbine	45	71	85	88r	88
Total renewable fuels	**200r**	**237r**	**257r**	**306r**	**316**
Other fuels *(2)*					
Back pressure steam turbine	109	109	109	109	107
Gas turbine	18r	19r	28r	13r	12
Combined cycle	618r	581r	653r	659r	644
Reciprocating engine	3	5	24r	23	22
Pass out condensing steam turbine	64r	64r	74r	76r	76
Total other fuels	**813r**	**778r**	**888r**	**880r**	**861**
Total - all fuels					
Back pressure steam turbine	210	210	209	205r	212
Gas turbine	417r	419r	418r	415r	419
Combined cycle	3,928r	4,009r	4,372r	4,293r	4,408
Reciprocating engine	645r	705r	781r	882r	922
Pass out condensing steam turbine	124r	151r	170r	175r	175
Total all fuels	**5,323r**	**5,492r**	**5,950r**	**5,970r**	**6,136**

(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.

7.6 CHP - heat generated by fuel and type of installation

GWh

	2008	2009	2010	2011	2012
Coal					
Back pressure steam turbine	373	367	421	421r	421
Gas turbine	19	-	-	-	-
Combined cycle	1,272r	1,108r	1,080r	1,558r	1,780
Reciprocating engine	4	0	-	2	2
Pass out condensing steam turbine	360r	300r	275r	274r	274
Total coal	**2,028**	**1,775**	**1,777**	**2,255r**	**2,477**
Fuel oil					
Back pressure steam turbine	117	136	117	134	134
Gas turbine	1	1	2	1	0
Combined cycle	842r	875r	660r	481r	526
Reciprocating engine	49	40	36	35	35
Pass out condensing steam turbine	78r	109r	21r	10r	14
Total fuel oil	**1,086**	**1,160**	**835**	**660r**	**709**
Natural gas					
Back pressure steam turbine	1,277r	1,282r	945r	1,139r	1,185
Gas turbine	4,666r	4,282r	4,426r	4,773r	4,639
Combined cycle	26,764r	23,657r	23,313r	22,684r	22,806
Reciprocating engine	3,059	3,299r	3,858r	3,774r	4,237
Pass out condensing steam turbine	154r	170r	277r	278r	286
Total natural gas	**35,920r**	**32,690r**	**32,819r**	**32,648r**	**33,153**
Renewable fuels *(1)*					
Back pressure steam turbine	755	745	728	718r	665
Gas turbine	1r	2r	3r	2r	3
Combined cycle	82	77	79	57r	51
Reciprocating engine	492r	510r	612r	728r	816
Pass out condensing steam turbine	231	432	701	688r	719
Total renewable fuels	**1,560**	**1,766**	**2,122r**	**2,194r**	**2,255**
Other fuels *(2)*					
Back pressure steam turbine	3,079	2,879	2,754	3,023r	2,819
Gas turbine	199r	233r	271r	127r	108
Combined cycle	6,560r	6,129r	6,147r	6,044r	5,884
Reciprocating engine	11	14r	23r	17r	25
Pass out condensing steam turbine	1,468r	1,445r	1,518r	1,216r	1,704
Total other fuels	**11,317**	**10,700r**	**10,714**	**10,426r**	**10,540**
Total - all fuels					
Back pressure steam turbine	5,600r	5,409r	4,966r	5,434r	5,224
Gas turbine	4,885r	4,518r	4,702r	4,903r	4,750
Combined cycle	35,519r	31,846r	31,278r	30,825r	31,047
Reciprocating engine	3,615r	3,863r	4,529r	4,555r	5,115
Pass out condensing steam turbine	2,292r	2,456r	2,792r	2,466r	2,997
Total all fuels	**51,911r**	**48,092r**	**48,267r**	**48,183r**	**49,134**

(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.

7.7 CHP - heat capacity by fuel and type of installation

MWth

	2008	2009	2010	2011	2012
Coal					
Back pressure steam turbine	123r	118r	125r	122r	122
Gas turbine	13r	-	-	-	-
Combined cycle	392r	375r	351r	595r	572
Reciprocating engine	6r	0	-	3r	3
Pass out condensing steam turbine	132r	118r	93r	90r	90
Total coal	**666r**	**611r**	**569r**	**809r**	**786**
Fuel oil					
Back pressure steam turbine	48r	49r	44r	43r	43
Gas turbine	0	0	1r	0r	0
Combined cycle	246r	262r	201r	145r	165
Reciprocating engine	10r	9r	8r	7r	12
Pass out condensing steam turbine	35r	45r	10r	7r	5
Total fuel oil	**340r**	**365r**	**263r**	**203r**	**225**
Natural gas					
Back pressure steam turbine	520r	527r	447r	446r	466
Gas turbine	1,800r	1,788r	1,682r	1,717r	1,753
Combined cycle	9,843r	10,575r	10,427r	9,973r	10,688
Reciprocating engine	2,011r	2,235r	2,432r	2,530r	2,600
Pass out condensing steam turbine	63r	72r	101r	99r	100
Total natural gas	**14,236r**	**15,196r**	**15,088r**	**14,765r**	**15,607**
Renewable fuels *(1)*					
Back pressure steam turbine	134r	130r	134r	137r	142
Gas turbine	0r	1r	1r	3r	2
Combined cycle	1,524r	1,555r	1,525r	1,598r	1,596
Reciprocating engine	161r	180r	184r	237r	249
Pass out condensing steam turbine	240r	333r	407r	519r	517
Total renewable fuels	**2,058r**	**2,199r**	**2,252r**	**2,495r**	**2,506**
Other fuels *(2)*					
Back pressure steam turbine	964r	965r	964r	964r	944
Gas turbine	81r	83r	165r	54r	48
Combined cycle	2,149r	2,203r	2,204r	2,171r	2,012
Reciprocating engine	8r	9r	21r	18r	19
Pass out condensing steam turbine	629r	625r	678r	687r	690
Total other fuels	**3,832r**	**3,885r**	**4,031r**	**3,895r**	**3,712**
Total - all fuels					
Back pressure steam turbine	1,789r	1,789r	1,713r	1,713r	1,717
Gas turbine	1,894r	1,872r	1,849r	1,774r	1,803
Combined cycle	14,154r	14,969r	14,709r	14,483r	15,032
Reciprocating engine	2,195r	2,433r	2,644r	2,795r	2,883
Pass out condensing steam turbine	1,100r	1,193r	1,289r	1,402r	1,402
Total all fuels	**21,133r**	**22,258r**	**22,204r**	**22,168r**	**22,837**

(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.

7.8 CHP capacity, output and total fuel use[(1)] by sector

	Unit	2008	2009	2010	2011	2012
Iron and steel and non ferrous metals						
Number of sites		7r	7r	7r	7r	7
Electrical capacity	MWe	77r	77r	81r	82r	82
Heat capacity	MWth	675r	675r	675r	675r	675
Electrical output	GWh	349	467	441	148r	221
Heat output	GWh	1,592	1,589	1,576	1,267r	1,772
Fuel use	GWh	3,593	3,569	3,462	2,208r	2,774
of which : for electricity	GWh	1,024	1,232	1,203	375r	503
for heat	GWh	2,569	2,337	2,259	1,833r	2,271
Chemicals						
Number of sites		43r	44r	49r	53r	53
Electrical capacity	MWe	1,734r	1,764r	1,772r	1,755r	1,756
Heat capacity	MWth	5,621r	5,739r	5,642r	5,664r	5,546
Electrical output	GWh	9,284	7,204	7,486	6,689r	6,634
Heat output	GWh	17,121	14,173	14,944	15,287r	15,255
Fuel use	GWh	41,002	33,401	34,717	31,978r	32,225
of which : for electricity	GWh	21,463	17,093	17,563	14,932r	15,151
for heat	GWh	19,539	16,308	17,154	17,046r	17,074
Oil and gas terminals and oil refineries						
Number of sites		9	9	11	11	12
Electrical capacity	MWe	1,726	1,864	2,293	2,298r	2,413
Heat capacity	MWth	5,969r	6,858r	7,039r	7,039r	7,705
Electrical output	GWh	9,823	10,672	10,999	8,239r	8,611
Heat output	GWh	17,244	16,727	16,903	16,786r	16,838
Fuel use	GWh	39,543	39,766	40,536	30,964r	32,834
of which : for electricity	GWh	20,884	21,898	22,501	14,998r	16,446
for heat	GWh	18,659	17,868	18,035	15,965r	16,388
Paper, publishing and printing						
Number of sites		25r	23r	22r	21r	21
Electrical capacity	MWe	555r	508r	476r	407r	413
Heat capacity	MWth	2,394r	2,338r	2,072r	1,857r	1,857
Electrical output	GWh	3,074	2,710	2,255	2,020r	1,938
Heat output	GWh	6,386	5,966	5,102	4,806r	4,770
Fuel use	GWh	13,126	12,179	10,417	9,299r	9,221
of which : for electricity	GWh	6,374	5,769	4,871	4,250r	4,117
for heat	GWh	6,752	6,409	5,546	5,049r	5,103
Food, beverages and tobacco						
Number of sites		35r	36r	38r	44	46
Electrical capacity	MWe	403r	403r	406r	426r	435
Heat capacity	MWth	1,736r	1,743r	1,717r	1,678r	1,706
Electrical output	GWh	1,961	2,103	2,102	2,112r	2,119
Heat output	GWh	4,349	4,355	3,761	4,105r	4,078
Fuel use	GWh	8,359	8,712	8,278	8,272r	8,108
of which : for electricity	GWh	3,975	4,241	4,388	4,193r	4,127
for heat	GWh	4,384	4,472	3,890	4,079r	3,981
Metal products, machinery and equipment						
Number of sites		16r	16r	16r	19r	19
Electrical capacity	MWe	67r	67r	67r	69r	68
Heat capacity	MWth	287r	287r	287r	288r	288
Electrical output	GWh	206	172	174	94r	101
Heat output	GWh	221	196	206	149r	152
Fuel use	GWh	619	558	634	581r	594
of which : for electricity	GWh	389	342	383	250r	263
for heat	GWh	229	216	251	331r	331

For footnotes see page 216

7.8 CHP capacity, output and total fuel use[1] by sector (continued)

	Unit	2008	2009	2010	2011	2012
Mineral products, extraction, mining and agglomeration of solid fuels						
Number of sites		9	8	8	8	8
Electrical capacity	MWe	65	57	57	57	57
Heat capacity	MWth	214r	184r	183r	183r	183
Electrical output	GWh	156	137	134	111r	105
Heat output	GWh	602	502	577	544r	508
Fuel use	GWh	1,059	915	971	892r	840
of which : for electricity	GWh	369	325	318	258r	245
for heat	GWh	690	590	653	634r	595
Sewage treatment						
Number of sites		153r	166r	171r	193r	199
Electrical capacity	MWe	133r	145r	149r	166	167
Heat capacity	MWth	193r	208r	212r	233	245
Electrical output	GWh	532	598	644	691r	724
Heat output	GWh	579	593	672	743r	833
Fuel use	GWh	1,765	1,981	2,296	2,495r	3,981
of which : for electricity	GWh	1,154	1,341	1,522r	1,628r	2,582
for heat	GWh	611	640	773r	867r	1,400
Other industrial branches *(2)*						
Number of sites		8	8	10	11	10
Electrical capacity	MWe	41	41	42	42	43
Heat capacity	MWth	154r	154r	155r	141r	141
Electrical output	GWh	247	245	223	219r	208
Heat output	GWh	348	340	358	377r	357
Fuel use	GWh	884	862	836	818r	794
of which : for electricity	GWh	527	516	469	440r	427
for heat	GWh	357	346	367	378r	367
Total industry						
Number of sites		305r	317r	332r	367r	375
Electrical capacity	MWe	4,801r	4,926r	5,344r	5,302r	5,435
Heat capacity	MWth	17,243r	18,184r	17,982r	17,758r	18,348
Electrical output	GWh	25,632	24,308	24,459	20,322r	20,662
Heat output	GWh	48,443	44,441	44,098r	44,064r	44,564
Fuel use	GWh	109,950	101,944	102,147	87,506r	91,371
of which : for electricity	GWh	56,160	52,758	53,218	41,324r	43,861
for heat	GWh	53,790	49,186	48,929	46,182r	47,509
Transport, commerce and administration						
Number of sites		548r	586r	653r	871r	950
Electrical capacity	MWe	259r	286r	319r	349r	374
Heat capacity	MWth	1,266r	1,403r	1,541r	1,561r	1,630
Electrical output	GWh	1,080	1,183r	1,328r	1,407r	1,605
Heat output	GWh	2,108r	2,174r	2,590r	2,583r	2,942
Fuel use	GWh	4,611r	4,909r	5,715r	5,838r	6,584
of which : for electricity	GWh	2,315r	2,534r	2,877r	3,006r	3,386
for heat	GWh	2,296r	2,375r	2,838r	2,832r	3,198
Other *(3)*						
Number of sites		474r	477r	475r	556r	604
Electrical capacity	MWe	263r	280r	287r	318r	327
Heat capacity	MWth	2,624r	2,671r	2,681r	2,849r	2,859
Electrical output	GWh	816r	934r	982	1,038r	1,092
Heat output	GWh	1,360r	1,477	1,579	1,536r	1,628
Fuel use	GWh	4,124r	4,438r	4,698r	4,850r	5,227
of which : for electricity	GWh	2,090r	2,349r	2,419r	2,547r	2,736
for heat	GWh	2,034r	2,088r	2,279r	2,303r	2,491
Total CHP usage by all sectors						
Number of sites		1,327r	1,380r	1,460r	1,794r	1,929
Electrical capacity	MWe	5,323r	5,492r	5,950r	5,970r	6,136
Heat capacity	MWth	21,133r	22,258r	22,204r	22,168r	22,837
Electrical output	GWh	27,528r	26,425r	26,768r	22,766r	23,360
Heat output	GWh	51,911r	48,092r	48,267r	48,183r	49,134
Fuel use	GWh	118,685r	111,291r	112,560r	98,194r	103,181
of which : for electricity	GWh	60,565r	57,641r	58,514r	46,877r	49,983
for heat	GWh	58,121r	53,649r	54,046r	51,317r	53,198

(1) The allocation of fuel use between electricity and heat is largely notional and the methodology is outlined in paragraphs 7.41 to 7.43.

(2) Other industry includes Textiles, clothing and footwear sector.

(3) Sectors included under Other are agriculture, community heating, leisure, landfill and incineration.

7.9 CHP - use of fuels by sector

GWh

	2008	2009	2010	2011	2012
Iron and steel and non ferrous metals					
Coal	-	-	-	-	-
Fuel oil	170	235	47	18r	21
Natural gas	313	277	274	232r	250
Blast furnace gas	2,490	2,232	1,920	1,397r	1,838
Coke oven gas	621	826	1,221	486r	584
Other fuels *(1)*	-	-	-	75r	81
Total iron and steel and non ferrous metals	**3,593**	**3,569**	**3,462**	**2,208r**	**2,774**
Chemicals					
Coal	3,653	3,103	3,016	3,783r	4,174
Fuel oil	137	132	132	131	134
Gas oil	21	11	189	43	8
Natural gas	33,593	26,487	27,230	23,778r	23,446
Refinery gas	1,181	1,181	1,181	1,181	1,181
Renewable fuels *(2)*	-	3	81	33r	23
Other fuels *(1)*	2,417	2,485	2,888	3,029r	3,260
Total chemical industry	**41,002**	**33,401**	**34,717**	**31,978r**	**32,225**
Oil and gas terminals and oil refineries					
Fuel oil	1,466	1,464	1,140	789r	864
Gas oil	112	159	141	106r	52
Natural gas	21,618	23,240	25,008	19,520r	21,963
Refinery gas	5,703	5,795	7,335	5,618r	4,676
Other fuels *(1)*	10,644	9,108	6,912	4,931r	5,278
Total oil refineries	**39,543**	**39,766**	**40,536**	**30,964r**	**32,834**
Paper, publishing and printing					
Coal	402	359	323	286	286
Fuel oil	12	0	-	-	0
Gas oil	20	23	13	2r	7
Natural gas	11,552	10,124	8,024	7,227r	7,168
Renewable fuels *(2)*	1,032	1,590	1,905	1,620r	1,611
Other fuels *(1)*	108	83	151	164r	147
Total paper, publishing and printing	**13,126**	**12,179**	**10,417**	**9,299r**	**9,221**
Food, beverages and tobacco					
Coal	156	194	186	209	209
Fuel oil	127	183	142	157r	157
Gas oil	26	44	93	32r	19
Natural gas	8,043	8,272	7,792	7,774r	7,583
Renewable fuels *(2)*	7	18	66	99r	138
Other fuels *(1)*	-	2	0	2	2
Total food, beverages and tobacco	**8,359**	**8,712**	**8,278**	**8,272r**	**8,108**
Metal products, machinery and equipment					
Coal	-	-	-	-	-
Fuel oil	89	89	89	89	89
Gas oil	0	0	0	0	0
Natural gas	504	434	478	412r	426
Renewable fuels *(2)*	26	34	67	80	80
Other fuels *(1)*	-	-	-	-	-
Total metal products, machinery and equipment	**619**	**558**	**634**	**581r**	**594**

7.9 CHP - use of fuels by sector (continued)

GWh

	2008	2009	2010	2011	2012
Mineral products, extraction, mining and agglomeration of solid fuels					
Coal	-	-	-	-	-
Fuel oil	-	-	-	-	-
Gas oil	0	3	1	-	-
Natural gas	767	624	707	663r	610
Coke oven gas	291	288	264	229	230
Total mineral products, extraction, mining and agglomeration of solid fuels	**1,059**	**915**	**971**	**892r**	**840**
Sewage treatment					
Fuel oil	62	30	29	29	32
Gas oil	17	27	40	37	73
Natural gas	179	215	189	197r	409
Renewable fuels *(2)*	1,507	1,709	2,038r	2,232r	3,467
Total sewage treatment	**1,765**	**1,981**	**2,296**	**2,495r**	**3,981**
Other industrial branches					
Fuel oil	-	-	-	-	-
Gas oil	3	0	0	0	14
Natural gas	881	862	836	817r	780
Total other industrial branches	**884**	**862**	**836**	**818r**	**794**
Transport, commerce and administration					
Coal	29	-	-	-	-
Fuel oil	0	11	1	0	0
Gas oil	7	16	18	2	8
Natural gas	4,444r	4,712r	5,268r	5,358r	5,959
Refinery gas	-	-	-	-	-
Renewable fuels *(2)*	131	170	421	471r	611
Other fuels *(1)*	-	-	7	6r	6
Total transport, commerce and administration	**4,611r**	**4,909r**	**5,715r**	**5,838r**	**6,584**
Other *(3)*					
Coal	33	24	19	23	23
Fuel oil	1	1	1	-	0
Gas oil	13	9	18	16r	16
Natural gas	2,186	2,594	2,700	2,483r	2,549
Renewable fuels *(2)*	1,892	1,810	1,955	2,318r	2,628
Other fuels *(1)*	-r	-r	5r	11r	10
Total other	**4,124r**	**4,438**	**4,698r**	**4,850r**	**5,227**
Total - all sectors					
Coal	4,274	3,679	3,544	4,301r	4,692
Fuel oil	2,065	2,146	1,581	1,212r	1,298
Gas oil	218	292	514	238r	199
Natural gas	84,079r	77,840r	78,505r	68,461r	71,143
Blast furnace gas	2,490	2,232	1,920	1,397r	1,838
Coke oven gas	912	1,114	1,484	715r	814
Refinery gas	6,884	6,976	8,515	6,798r	5,856
Renewable fuels *(2)*	4,594	5,334	6,533r	6,854r	8,558
Other fuels *(1)*	13,169r	11,679r	9,962r	8,217r	8,784
Total CHP fuel use	**118,685r**	**111,291r**	**112,560r**	**98,194r**	**103,181**

(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.

Digest of United Kingdom Energy Statistics 2013

Annexes

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

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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.

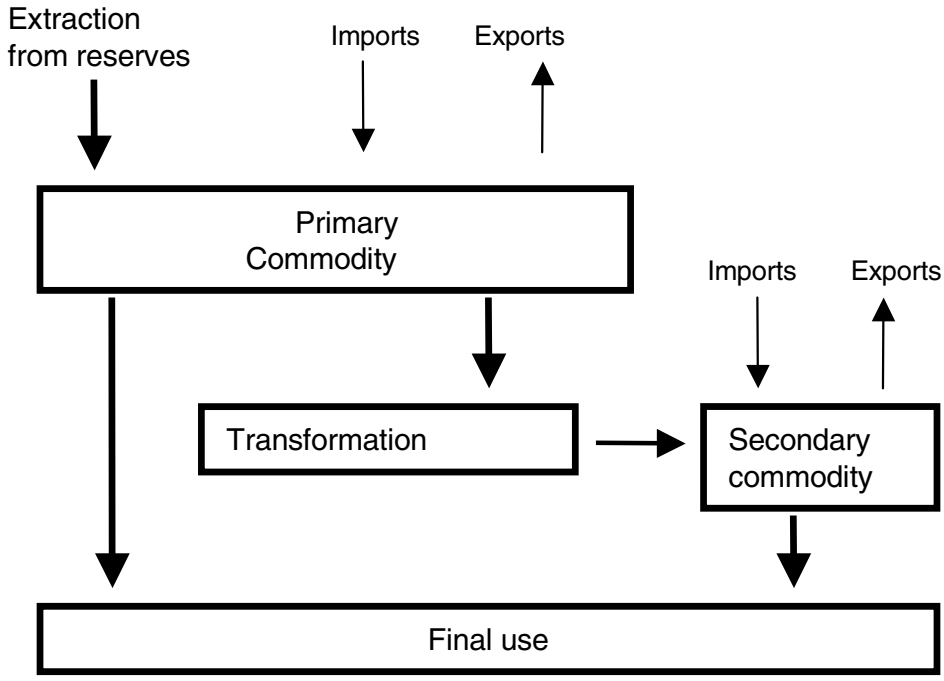
A.5 A simplified model of the commodity flow underlying the balance structure is given in Chart A.1. It illustrates how primary commodities may be used directly and/or be transformed into secondary commodities. The secondary fuels then enter final consumption or may also be transformed into another energy 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 2.3, 3.1 to 3.4, 4.1, 5.1, 5.3 and 6.1 to 6.3)

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 their 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 (SIC2007).* The qualifications to, and constraints on, the classification are described in the technical notes to Chapter 1. Table 1G in Chapter 1 shows the breakdown of final consumers used, and how this corresponds to the SIC2007.

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 may include some fuel that is actually consumed in some "off-road" activities. Similarly, figures for railway fuels may include some amounts of burning oil not used directly for transport purposes. Transport sector use of electricity includes electricity used by rail companies (both over and underground) for traction purposes, and electricity used by electric road vehicles. The electricity used for non-traction purposes in industries classified to SIC2007 Groups 49 to 51 is included within the commercial sector. 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 and transport*, follows *SIC2007* and is described in Table 1G 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 eg 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 rearrangements 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 the 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, solar photovoltaics). 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, photovoltaics 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 and photovoltaics. 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, electricity from wind generation and from solar photovoltaics. 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 39.8 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 this electricity is in 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, bioenergy and waste* 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 = 1.120 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 2012

	Litres per tonne
Crude oil:	
Indigenous	1,199
Imported	1,181
Average of refining throughput	1,192
Ethane	2,730
Propane	1,969
Butane	1,735
Naphtha	1,467
Aviation gasoline	1,401
Motor spirit:	
All grades	1,368
Super	1,356
Premium	1,369
Middle distillate feedstock	1,093
Kerosene:	
Aviation turbine fuel	1,251
Burning oil	1,247

	Litres per tonne
DERV fuel:	
0.005% or less sulphur	1,195
Gas /Marine diesel oil	1,170
Fuel oil (1% or less sulphur)	
All grades:	1,015
Light:	1,057
Medium	1,018
Heavy:	1,011
Lubricating oils:	
White	1,138
Greases	..
Bitumen	997
Petroleum coke	843
Petroleum waxes	1,184
Industrial spirit	1,247
White spirit	1,282

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 2012. The litres to tonnes conversions are made at a standard temperature of 15°C.

.. Denotes commercially sensitive as too few companies are producting this to be able to report it.

Fuel conversion factors for converting fossil fuels to carbon dioxide, 2012

	kg CO_2 per tonne	kg CO_2 per kWh	kg CO_2 per litre
Gases			
Natural Gas		0.184	
LPG		0.214	1.491
Liquid fuels			
Gas oil	3190	0.253	2.731
Fuel oil	3220	0.268	
Burning oil	3150	0.244	2.526
Naptha	3131	0.236	
Petrol	3135	0.240	2.302
Diesel	3164	0.249	2.650
Aviation spirit	3128	0.238	2.217
Aviation turbine fuel	3150	0.245	2.516
Solid fuels			
Industrial coal	2295	0.307	
Domestic coal	2485	0.296	
Coking coal	3106	0.349	

All emission factors are based on a Gross Calorific Value basis

The information above is based on the 2013 Greenhouse gas conversion factors for company reporting, available at: www.ukconversionfactorscarbonsmart.co.uk/. 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 2012 edition of this Digest, available at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes, together with information from the National Atmospheric Emissions Inventory. More information on the Inventory is available at: http://naei.defra.gov.uk/reports/. 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.

A.1 Estimated average calorific values of fuels 2012

	GJ per tonne net	GJ per tonne gross
Coal:		
All consumers (weighted average) *(1)*	25.5	26.9
Power stations *(2)*	24.1	25.3
Coke ovens *(1)*	30.2	31.8
Low temperature carbonisation plants and manufactured fuel plants	27.0	28.4
Collieries	27.5	29.0
Agriculture	28.1	29.5
Iron and steel	28.9	30.4
Other industries (weighted average)	25.5	26.8
Non-ferrous metals	23.8	25.1
Food, beverages and tobacco	27.9	29.4
Chemicals	25.3	26.6
Textiles, clothing, leather etc.	28.1	29.5
Pulp, paper, printing etc.	23.0	24.2
Mineral products	26.3	27.7
Engineering (mechanical and electrical engineering and vehicles)	28.0	29.5
Other industries	30.9	32.5
Domestic		
House coal	28.7	30.2
Anthracite and dry steam coal	32.8	34.5
Other consumers	25.0	26.3
Imported coal (weighted average)	26.1	27.4
Exports (weighted average)	30.8	32.4
Coke (including low temperature carbonisation cokes)	29.8	29.8
Coke breeze	29.8	29.8
Other manufactured solid fuel	31.0	32.6

	GJ per tonne net	GJ per tonne gross
Renewable sources:		
Domestic wood *(3)*	12.3	13.9
Industrial wood *(4)*	12.1	13.7
Straw	13.4	15.8
Poultry litter (5)	7.6	9.1
Meat and bone	16.8	20.0
General industrial waste	15.2	16.0
Hospital waste	13.3	14.0
Municipal solid waste *(6)*	6.7	9.6
Refuse derived waste *(6)*	13.0	18.5
Short rotation coppice *(7)*	9.3	11.1
Tyres	30.4	32.0
Wood pellets	16.8	17.2
Biodiesel	37.2	38.7
Bioethanol	26.8	29.7
Petroleum:		
Crude oil (weighted average)	43.4	45.7
Petroleum products (weighted average)	43.0	45.2
Ethane	46.6	50.7
Butane and propane (LPG)	46.0	49.3
Light distillate feedstock for gasworks	45.4	47.8
Aviation spirit and wide cut gasoline	45.0	47.4
Aviation turbine fuel	43.9	46.2
Motor spirit	44.8	47.1
Burning oil	43.9	46.2
Gas/diesel oil	42.6	45.3
DERV	42.9	45.7
Fuel oil	40.7	43.3
Power station oil	40.7	43.3
Non-fuel products (notional value)	40.9	43.1

	MJ per cubic metre net	MJ per cubic metre gross
Natural gas produced *(8)*	35.6	39.6
Natural gas consumed *(9)*	35.4	39.3
Coke oven gas	16.2	18.0
Blast furnace gas	3.0	3.0
Landfill gas *(10)*	19-23	21-25
Sewage gas *(10)*	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) Home produced coal only.

(3) On an "as received" basis; seasoned logs at 25% moisture content. On a "dry" basis 18.6 GJ per tonne.

(4) Average figure covering a range of possible feedstock; at 25% moisture content. On a "dry" basis 18.6 GJ per tonne.

(5) The calorific value of poultry litter typically ranges on a net basis from 5 GJ/tonne to 10 GJ/tonne depending upon the moisture content of the fuel. For poultry manure, much lower calorific values should be used.

(6) Average figure based on survey returns.

(7) On an "as received" basis; at 40% moisture content. On a "dry" basis 18.6 GJ per tonne.

(8) The gross calorific value of natural gas can also be expressed as 11.012 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.

(9) UK produced and imported gas. This weighted average of calorific values will approximate the average for the year of entering the National Transmission System. It can also be expressed as 10.945 kWh per cubic metre.

(10) Calorific value varies depending on the methane content of the gas.

Note: The above estimated average calorific values apply only to the year 2012. 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 1.54 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 1.31. 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 1.28 to 1.29.

A.2 Estimated average gross calorific values of fuels 1980, 1990, 2000 and 2009 to 2012

GJ per tonne (gross)

	1980	1990	2000	2009	2010	2011	2012
Coal							
All consumers *(1)(2)*	25.6	25.5	26.2	25.7	25.8	25.9	26.0
All consumers - home produced plus imports minus exports *(1)*	..	..	27.0	26.8	27.1	26.9	26.9
Power stations *(2)*	23.8	24.8	25.6	24.9	24.9	25.2	25.3
Power stations - home produced plus imports *(1)*	..	..	26.0	26.0	25.8	26.0	26.2
Coke ovens *(2)*	30.5	30.2	31.2	32.6	30.5	32.0	31.8
Coke ovens - home produced plus imports *(1)*	..	..	30.4	32.6	30.5	32.0	31.8
Low temperature carbonisation plants and manufactured fuel plants	19.1	29.2	30.3	28.8	30.2	28.4	28.4
Collieries	27.0	28.6	29.6	29.4	29.3	29.0	29.0
Agriculture	30.1	28.9	29.2	28.0	28.0	29.5	29.5
Iron and steel industry *(3)*	29.1	28.9	30.7	30.4	30.4	30.4r	30.4
Other industries *(1)*	27.1	27.8	26.7	27.5	27.7	26.8	26.8
Non-ferrous metals	..	23.1	25.1	25.0	25.4	25.1	25.1
Food, beverages and tobacco	28.6	28.1	29.5	28.7	28.6	29.5	29.4
Chemicals	25.8	27.3	28.7	26.7	26.7	26.7	26.6
Textiles, clothing, leather and footwear	27.5	27.7	30.4	29.5	29.5	29.5	29.5
Pulp, paper, printing, etc.	26.5	27.9	28.7	23.9	24.1	24.2	24.2
Mineral products *(4)*	..	28.2	27.0	27.6	27.6	27.6	27.7
Engineering *(5)*	27.7	28.3	29.3	29.5	29.5	29.5	29.5
Other industry *(6)*	28.4	28.5	30.2	31.6	32.6	32.6	32.5
Domestic							
House coal	30.1	30.2	30.9	29.7	29.8	30.2	30.2
Anthracite and dry steam coal	33.3	33.6	33.5	34.7	34.7	34.6	34.5
Other consumers	27.5	27.5	29.2	26.4	25.5	26.4	26.3
Transport - Rail	..	..	..	30.0	30.3	30.3	30.2
Imported coal *(1)*	..	28.3	28.0	27.3	27.9	27.5	27.4
of which Steam coal	..	..	26.6	26.5	25.8	26.5	26.5
Coking coal	..	..	30.4	32.6r	30.5r	32.0	31.8
Anthracite	..	..	31.2	31.0	31.0	31.2	31.7
Exports *(1)*	..	29.0	32.0	32.7	32.3	32.3	32.4
of which Steam coal	..	..	31.0	31.4	31.2	31.2	31.2
Anthracite	..	..	32.6	33.2	33.2	32.7	32.7
Coke *(7)*	28.1	28.1	29.8	29.8	29.8	29.8	29.8
Coke breeze	24.4	24.8	24.8	29.8	29.8	29.8	29.8
Other manufactured solid fuels *(1)*	27.6	27.6	30.8	32.6	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	49.3	49.1	49.2	49.2	49.3	49.3
Ethane	52.3	50.6	50.7	50.7	50.7	50.7	50.7
LDF for gasworks/Naphtha	47.8	47.9	47.6	47.5	47.8	47.7	47.8
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	46.2r	46.2
Vaporising oil	45.9	45.9	..	..	..	..	..
Gas/diesel oil (8)	45.5	45.4	45.6	45.3r	45.3	45.3r	45.3
DERV (8)	..	..	..	45.7	45.6	45.7	45.7
Fuel oil	42.8	43.2	43.1	43.5	43.3	43.3	43.3
Power station oil	42.8	43.2	43.1	43.5	43.3	43.3	43.3
Non-fuel products (notional value)	42.2	43.2	43.8	43.1	43.1	43.1	43.1
Petroleum coke (Power stations)	..	..	..	31.0	30.9	30.3	31.1
Petroleum coke (Other)	..	39.5	35.8	35.8	35.8	35.8	35.8
Natural Gas *(9)*	..	38.4	39.4	40.0	40.1	39.8	39.6

(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) DERV included within gas/diesel oil until 2005.
(9) Natural Gas figures are shown in MJ per cubic metre.

A.3 Estimated average net calorific values of fuels 1980, 1990, 2000 and 2009 to 2012

GJ per tonne (net)

	1980	1990	2000	2009	2010	2011	2012
Coal							
All consumers *(1)(2)*	24.3	24.2	24.9	24.4	24.5	24.6	24.7
All consumers - home produced plus imports minus exports *(1)*	..	..	25.6	25.4	25.7	25.6	25.5
Power stations *(2)*	22.6	23.6	24.3	23.7	23.6	24.0	24.1
Power stations - home produced plus imports *(1)*	..	..	24.7	24.7	24.5	24.7	24.9
Coke ovens *(2)*	29.0	28.7	29.6	31.0	29.0	30.4	30.2
Coke ovens - home produced plus imports *(1)*	..	..	28.9	31.0	29.0	30.4	30.2
Low temperature carbonisation plants and manufactured fuel plants	18.1	27.7	28.8	27.4	28.7	27.0	27.0
Collieries	25.7	27.2	28.1	27.9	27.9	27.5	27.5
Agriculture	28.6	27.5	27.8	26.6	26.6	28.0	28.1
Iron and steel industry *(3)*	27.6	27.5	29.2	28.9	28.9	28.9r	28.9
Other industries *(1)*	25.7	26.4	25.4	26.1	26.3	25.5	25.5
Non-ferrous metals	..	21.9	23.8	23.8	24.1	23.8	23.8
Food, beverages and tobacco	27.2	26.7	28.0	27.3	27.2	28.0	27.9
Chemicals	24.5	25.9	27.2	25.4	25.4	25.4	25.3
Textiles, clothing, leather and footwear	26.1	26.3	28.9	28.0	28.0	28.0	28.1
Pulp, paper, printing, etc.	25.2	26.5	27.3	22.7	22.9	23.0	23.0
Mineral products *(4)*	..	26.8	25.7	26.3	26.3	26.3	26.3
Engineering *(5)*	26.3	26.9	27.8	28.0	28.0	28.0	28.0
Other industry *(6)*	27.0	27.1	28.7	30.1	31.0	31.0	30.9
Domestic							
House coal	28.6	28.7	29.4	28.2	28.3	28.7	28.7
Anthracite and dry steam coal	31.6	31.9	31.9	32.9	32.9	32.9	32.8
Other consumers	26.1	26.1	27.7	25.1	24.3	25.1	25.0
Transport - Rail	..	..	..	28.5	28.8	28.8	28.7
Imported coal *(1)*	..	26.9	26.6	25.9	26.5	26.1	26.1
of which Steam coal	..	..	25.3	25.2	24.5	25.2	25.2
Coking coal	..	..	28.9	31.0r	29.0r	30.4	30.2
Anthracite	..	..	29.6	29.4	29.5	29.7	30.1
Exports *(1)*	..	27.6	30.4	31.0	30.7	30.7	30.8
of which Steam coal	..	..	29.4	29.8	29.6	29.6	29.6
Anthracite	..	..	30.9	31.6	31.6	31.1	31.1
Coke *(7)*	28.1	28.1	29.8	29.8	29.8	29.8	29.8
Coke breeze	24.4	24.8	24.8	29.8	29.8	29.8	29.8
Other manufactured solid fuels *(1)*	26.2	26.2	29.3	31.0	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	46.2	46.0	46.0	46.0	46.0	46.0	46.0
Ethane	48.1	46.6	46.6	46.6	46.6	46.6	46.6
LDF for gasworks/Naphtha	45.4	45.5	45.3	45.2	45.4	45.3	45.4
Aviation spirit and wide-cut gasoline (AVGAS and AVTAG)	44.8	44.9	44.9	45.1	45.0	45.1	45.0
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	44.8
Burning oil	44.2	43.9	43.9	43.9	43.9	43.9r	43.9
Vaporising oil	43.6	43.6	..	..	..	..	..
Gas/diesel oil (8)	42.8	42.7	42.9	42.6r	42.6	42.6r	42.6
DERV (8)	..	..	..	42.9	42.9	42.9	42.9
Fuel oil	40.2	40.6	40.5	40.8	40.7	40.7	40.7
Power station oil	40.2	40.6	40.5	40.8	40.7	40.7	40.7
Non-fuel products (notional value)	40.1	41.0	41.6	40.9	40.9	40.9	40.9
Petroleum coke (Power stations)	..	..	..	29.5	29.3	28.8	29.6
Petroleum coke (Other)	..	37.5	34.0	34.0	34.0	34.0	34.0
Natural Gas *(9)*	..	34.6	35.5	36.0	36.1	35.8	35.6

For footnotes see table A.2
The net calorific value of natural gas is the gross calorific value x 0.9.

Annex B
Glossary and Acronyms

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.

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).

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 constituent of motor fuel.

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 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.

Bioenergy — Bioenergy is renewable energy made from material of recent biological origin derived from plant or animal matter, known as biomass.

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.

Biomass — Renewable organic materials, such as wood, agricultural crops or wastes, and municipal wastes. Biomass can be burned directly or processed into biofuels such as ethanol and methane

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) derived unit of energy and heat is the Joule. This is the energy in a given quantity 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.

Carbon Emission Reduction Target (CERT) The Carbon Emissions Reduction Target (CERT) follows on from the Energy Efficiency Commitment (EEC). CERT requires gas and electricity suppliers to achieve targets for a reduction in carbon emissions generated by the domestic sector.

CCA Climate Change Agreement. Climate Change Agreements allow energy intensive business users to receive a 65 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 in 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 qualities 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 existing and abandoned deep mines and from coal beds 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.
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 chains or combining shorter carbon chain components of crude oil or other refinery feedstocks. 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 CRC Energy Efficiency scheme is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large public and private sector organistaions.
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.
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.
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.
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.
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 burning generators. The category also includes some domestic generators such as those with electric solar panels.
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.
ESA	European System of 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 Commission.

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.

Feed-In Tariffs The Feed-in Tariffs (FITs) scheme was introduced on 1 April 2010 to encourage deployment of small-scale (less than 5MW) low-carbon electricity generation. People with a qualifying technology receive a guaranteed payment from an electricity supplier of their choice for the electricity they generate and use, as well as a guaranteed payment for unused surplus electricity they export back to the grid.

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.

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 operation, 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.
Gigawatt (GW)	A unit of electrical power, equal to 10^9 watts.
Green Deal	A scheme by which energy-saving improvements can be made to a home or business without having to pay all the costs up front; energy-saving improvements include: • insulation - eg loft or cavity wall insulation • heating • draught-proofing • double glazing • renewable energy technologies - eg solar panels or wind turbines
Heat pumps	Heat pumps use a heat exchanger (much like that installed in fridges and freezers – although running in reverse) to take heat from the ground or air and convert it into heating in the home (either radiators, underfloor heating or warm air heating systems and hot water). Ground source heat pumps use pipes which are buried in the ground to extract heat. Air source heat pumps absorb heat from the outside air. Heat pumps need electricity to run, but the heat they extract from the ground or air is constantly being renewed naturally.
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	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	The extraction or capture of primary fuels: 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	International Steel Statistics Bureau

Joules	A joule is a generic unit of energy in the conventional SI system. 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.
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.
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 allocated, 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 components are methane, ethane, propane and 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.
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.
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

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.
Plant loads, demands and efficiency	Measures of how intensively and efficiently power stations are being used.
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 DECC energy statistics website 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.
RD	Renewables Directive – this proposes that EU Member States adopt national targets that are consistent with the overall EU target of 20 per cent of energy from renewables by 2020.
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 database for the UK.
Ricardo-AEA	Formerly known as AEA Energy & Environment.
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
Seasonal Performance Factor	The Seasonal Performance Factor (SPF) of a heat pump is the total useful heat delivered during a year divided by the annual electricity consumption of the pump. The SPF gives an indication of the efficiency of the pump, with values greater than 1 implying that more useful heat is produced than the electricity used to power the pump.
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.
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.
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.
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
TWh	Terawatt hour
UKCS	United Kingdom Continental Shelf
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.
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
Phone: 0845 504 9188
Email: deccteam@decc.ecgroup.net

and can also be found on the DECC section of the gov.uk website at:
www.gov.uk/government/organisations/department-of-energy-climate-change

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.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics

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 SSD/Finance, 2nd Floor, Foss House, 1-2 Peasholme Green, York YO1 7PX, Tel. 01904 455395. A subscription form is available at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-trends. An electronic version of previous 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 previous editions can be found at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/quarterly-energy-prices. 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 2012 edition of the chart shows the flows for 2011. 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.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-flow-charts

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.gov.uk/government/organisations/department-of-energy-climate-change/series/uk-energy-in-brief

UK Energy Sector Indicators

An annual publication designed to show the extent to which secure, diverse and sustainable supplies of energy to UK businesses and consumers, at competitive prices, are ensured. It is available on the Internet at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/uk-energy-sector-indicators.

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 and changes in efficiency, intensity and output since the 1970s, 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 is available on the Internet at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-consumption-in-the-uk

Sub-National Energy Consumption statistics

Sub-National data are produced by DECC to emphasise the importance of local and regional decision making for energy policy in delivering a number of national energy policy objectives. Data can be accessed on the Internet at: www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics

National Energy Efficiency Data-framework (NEED)

DECC has constructed a National Energy Efficiency Data-framework (NEED) to enable detailed statistical analysis of energy efficiency. The data framework matches the gas and electricity consumption data collected for DECC sub-national energy consumption statistics and records of energy efficiency measures in the Homes Energy Efficiency Database (HEED) run by the Energy Saving Trust (EST), as well as typographic data about dwellings and households. Data can be accessed on the Internet at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/national-energy-efficiency-data-need-framework

Annual report on Fuel Poverty statistics

A report, published separately from the UK Fuel Poverty Strategy, detailing the latest statistics on fuel poverty. It is available on the Internet at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/fuel-poverty-statistics

UK Greenhouse Gas Emissions statistics

Emissions data are produced by DECC to show progress against the UK's goals, both international and domestic, for reducing greenhouse gas emissions. Data can be accessed on the Internet at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/uk-greenhouse-gas-emissions

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.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-and-emissions-projections

Department of Energy and Climate Change policy publications

Energy Bill

On 29 November 2012, the Secretary of State for Energy and Climate Change confirmed the introduction of the Energy Bill to the House of Commons alongside the Annual Energy Statement (see below). This Bill will establish a legislative framework for delivering secure, affordable and low carbon energy, and includes provisions on:

- Decarbonisation;
- Electricity Market Reform (EMR);
- Nuclear regulation;
- Government pipeline and storage system;
- Strategy and Policy statement, and
- Consumer Protection.

Further information on the Bill is available on the Internet at:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-bill

Annual Energy Statement

In the Coalition Programme for Government, the Government committed to producing an Annual Energy Statement (AES) to provide market direction, set strategic energy policy and help guide investment. The first statement was delivered to Parliament on 27 June 2010, with the second statement delivered on 23 November 2011. The latest Statement, delivered on 29 November 2012, is available on the Internet at: www.gov.uk/government/publications/annual-energy-statement-2012

Energy Act 2011

The Energy Act 2011 was given Royal Assent on 18 October 2011. The Act is available on the Internet at: www.legislation.gov.uk/ukpga/2011/16/contents/enacted

Electricity Market Reform (EMR) White Paper

On 12 July 2011 the Government published 'Planning our electric future: a White Paper for secure, affordable and low-carbon electricity'. The White Paper sets out key measures to attract investment, reduce the impact on consumer bills, and create a secure mix of electricity sources including gas, new nuclear, renewables, and carbon capture and storage. The White Paper is available on the Internet at:
www.gov.uk/government/publications/planning-our-electric-future-a-white-paper-for-secure-affordable-and-low-carbon-energy

Energy Act 2010

The Energy Act 2010 was given Royal Assent on 8 April 2010. The Act is available on the Internet at:
www.legislation.gov.uk/ukpga/2010/27/contents

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:
http://webarchive.nationalarchives.gov.uk/20100509134746/http:/www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

Energy Act 2008

The Energy Act 2008 was granted Royal Assent on 26 November 2008. The Act is available on the Internet at: www.legislation.gov.uk/ukpga/2008/32/contents

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.legislation.gov.uk/ukpga/2008/27/contents

Other publications including energy information

General

Eurostat Yearbook (annual); *Statistical Office of the European Commission - Eurostat*
Eurostatistics (monthly); *Statistical Office of the European Commission – Eurostat*
Index of production (monthly); *Office for National Statistics*
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 Yearbook (annual); *Statistical Office of the European Commission – 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 Commission – Eurostat*
Energy Balance Sheets; *Statistical Office of the European Commission – 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*
World Energy Statistics; *International Energy Agency*

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 – Ten Year Statement - (annual); *National Grid*

Environment

Environmental Statistics (quarterly); *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*
Petroleum Review (monthly); *Energy Institute*

Prices

Energy Prices and Taxes (quarterly); *International Energy Agency*
Gas and Electricity Prices (bi-annual); *Statistical Office of the European Commission - Eurostat*

Renewables

Renewables Information (annual); *International Energy Agency*

Useful energy related websites

The DECC section of the gov.uk website can be found at: www.gov.uk/government/organisations/department-of-energy-climate-change, the energy information and statistics section is at: www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics

Other Government web sites

Department for Communities and Local Government.	www.gov.uk/government/organisations/department-for-communities-and-local-government
Department for Environment, Food and Rural Affairs	www.gov.uk/government/organisations/department-for-environment-food-rural-affairs
Department for Transport	www.gov.uk/government/organisations/department-for-transport
HM Government Online	www.gov.uk/
HM Revenue & Customs	www.gov.uk/government/organisations/hm-revenue-customs
Northern Ireland Executive	www.northernireland.gov.uk
Ofgem (The Office of Gas and Electricity Markets)	www.ofgem.gov.uk
The Scottish Government	http://home.scotland.gov.uk/home
The Scottish Parliament	www.scottish.parliament.uk
UK Parliament	www.parliament.uk
UK Statistics Authority	www.statisticsauthority.gov.uk
Welsh Government	http://wales.gov.uk/

Other useful energy related web sites

BP	www.bp.com
British Geological Survey	www.bgs.ac.uk
BRE (Building Research Establishment)	www.bre.co.uk
Coal Authority	http://coal.decc.gov.uk/
Consumer Futures	www.consumerfutures.org.uk/
Energy Institute	www.energyinst.org/home
Energy Networks Association	www.energynetworks.org
Energy UK	www.energy-uk.org.uk/
Europa (European Union Online)	http://europa.eu/
Eurostat	http://epp.eurostat.ec.europa.eu/
Interconnector	www.interconnector.com
International Energy Agency (IEA)	www.iea.org
Iron and Steel Statistics Bureau (ISSB)	www.issb.co.uk
National Grid	www.nationalgrid.com
Oil & Gas UK	www.oilandgasuk.co.uk/
Renewable UK	www.renewableuk.com/
Ricardo - AEA	www.ricardo-aea.com/cms/
The Stationery Office	www.tso.co.uk
UK Air Quality Archive	http://uk-air.defra.gov.uk/
UK Petroleum Industry Association	www.ukpia.com
United Nations Statistics Division	http://unstats.un.org/unsd/default.htm
US Department of Energy	http://energy.gov/
US Energy Information Administration	www.eia.gov/

Annex D

Major events in the Energy Industry

2013

Coal

In March 2013 the Daw Mill Colliery in Warwickshire closed following a major fire. The fire, the largest seen in a UK coal mine in over 30 years, brought an end to 47 years of coal production at Daw Mill.

Energy Policy

In April 2013, the carbon price floor - a tax on carbon - came into effect. As part of the scheme, changes were made to the Climate Change Levy (CCL), setting up new carbon price support (CPS) rates of CCL for gas, solid fuels and liquefied petroleum gas (LPG) used in electricity generation.

In March 2013 Ofgem published the final domestic proposals from its Retail Market Review (RMR), proposing a new set of rules for the retail market to allow consumers to make better choices about their gas and electricity supply. The proposals from this review included reducing complexity for consumers when choosing tariffs, and arming consumers with more useful information when choosing their gas or electricity supplier.

In March 2013 the Government published 'The Future of Heating: Meeting the Challenge' setting out an action plan to ensure affordable, secure, low carbon heating plays an important role in the nation's energy mix. The action plan looks at the potential to cut emissions from heat across the whole UK economy and focuses on a number of key actions to spur on the move to low carbon heating alternatives and drive forward green growth.

In January 2013, the Office of Fair Trading reported that on the basis of evidence gathered, that competition is working well in the UK road fuel sector, although it identified an absence of pricing information on motorways as a concern. In response to the report, the Government announced in March 2013 that it would work with motorway service stations and other relevant bodies to improve the availability and visibility of motorway fuel price information for motorway users.

The Government tabled new clauses to the Energy Bill in February 2013, to ensure that consumers get a better deal on their energy bills, and to press ahead with decarbonising the power sector by 2030. The complexity and number of energy tariffs available for consumers will be reduced, and bills simplified, to deliver on the Prime Minister's commitment to help consumers get the cheapest tariff available. Clauses were also tabled to grant Government powers to set a 2030 decarbonisation target range for the electricity sector in 2016, once the Committee on Climate Change has provided advice on the level of the 5th carbon budget, and when the level of this carbon budget is set in law.

Electricity

The Government gave consent to Galloper Wind Farm Limited in May 2013 to construct a 504MW wind farm off the coast of Suffolk and related infrastructure at Sizewell which will connect the wind farm to the electricity grid system. The 140 turbine development is expected to provide enough electricity to power the equivalent of as many as 500,000 homes a year when completed in 2017.

2013 (continued)

The Government gave consent to Ecotricity in February 2013, to construct a 66MW wind farm in East Heckington, Lincolnshire. It is estimated that the turbines will provide enough electricity to power the equivalent of as many as 39,700 homes a year.

Energy Efficiency

The Green Deal scheme, the Coalition Government's new initiative to transform Britain's homes, was launched in January 2013, giving people the opportunity to transform their homes by paying for energy efficient home improvements with the savings on their energy bills.

At the same time the Energy Company Obligation (ECO) came into force, working alongside the Green Deal, with the aims of saving carbon by supporting energy efficiency measures in harder to treat homes and enabling the installation of efficient boilers and insulation into the homes of vulnerable people across Great Britain.

Nuclear

Planning consent was given by the Government in March 2013 for construction of the first new nuclear power station in the UK since 1995. The station at Hinkley Point, Somerset – to be operated by NNB Generation - will generate enough low carbon electricity to power the equivalent of five million households, making it one of the largest power stations in the UK.

Oil and Gas

In May 2013, officials from the European Commission carried out unannounced inspections at the premises of several companies active in the crude oil, refined oil products and biofuels sectors. The Commission had concerns that the companies may have colluded in reporting distorted prices to a Price Reporting Agency to manipulate the published prices for a number of oil and biofuel products. The investigation remains ongoing.

The Government gave consent to Statoil in February 2013, to drill the Mariner heavy oil field. At its peak the field is expected to produce around 55,000 barrels of oil per day, five per cent of UK daily production.

Renewables

In March 2013 the Government gave approval for a 28 turbine wind power development at Brechfa Forest West, Carmarthenshire, which will be capable of providing power to 39,700 homes.

In February 2013 the Government gave approval for an extension at one of the first offshore wind farms built in the UK. Up to 17 new turbines will be added to Vattenfall's Kentish Flats offshore wind farm, which already hosts 30 turbines. Once extended it is estimated that the wind farm will be capable of providing power to an additional 35,000 homes.

2012

Carbon Capture and Storage (CCS)
In April 2012, the Government launched a new £1bn competition for CCS. At the same time a road map was published setting out the steps that the Government is talking to develop the industry.

Electricity
In September 2012 Ireland's first electricity link to Great Britain was officially opened. The EirGrid East West Interconnector runs between Deeside in North Wales and Woodland, County Meath in Ireland. Approximately 260km in length, the underground and undersea link has the capacity to transport 500 megawatts - enough energy to power 300,000 homes. The Interconnector will carry electricity both ways, benefiting consumers by helping to improve security of supply, increase competitiveness and to encourage the growth of renewable energy generation.

In July 2012, consent was given by the Government for the construction of two wind farms off the Norfolk Coast with a combined capacity of over 1GW. This means that 6.6GW of offshore wind power is now either operational, under construction or consented in the UK. The two wind farms at Race Bank (580MW) and Dudgeon (560MW) in the Greater Wash could generate enough electricity to power around 730,000 homes. The projects represent around £3bn of investment.

In May 2012, the Government gave consent to Vattenfall for the Pen Y Cymoedd project, a 299MW wind farm between Neath and Aberdare in South Wales. Made up of 76 turbines, it will have the highest generating capacity of any onshore wind farm in England and Wales, generating enough electricity to power up to 206,000 homes a year.

In March 2012, the Government gave consent to E.ON Climate and Renewables for a new biomass power station at Royal Portbury Dock in the Port of Bristol, North Somerset. The 150MW power station will be able to power up to 160,000 homes.

In February 2012, the world's oldest operating nuclear power station, Oldbury, near Bristol, finally stopped producing electricity, after 44 years of safe generation. Since it opened in 1967, Oldbury's twin reactors have generated 137.5 TWh of electricity, enough to power one million homes for over 20 years.

Energy Efficiency
In September 2012 seven cities across England were awarded a share of £12m by the Government to help them kick-start the Green Deal in their regions. The cities - Birmingham, Bristol, Leeds, Manchester, Newcastle, Nottingham and Sheffield - put forward ambitious proposals to lower their carbon emissions and this funding will support their plans to test key elements of the Green Deal.

The secondary legislation underpinning the Green Deal and Energy Company Obligation was laid in Parliament in June 2012. Alongside this, DECC is publishing supporting guidance for participants in the Green Deal, such as a Code of Practice.

The legislation will begin to take effect over the summer, with the Energy Company Obligation in operation from October 2012. DECC has confirmed the Green Deal will be introduced through a controlled approach from October with full national systems testing to ensure consumer quality standards are embedded from the start.

2012 (continued)

Energy Policy

In November 2012, the Government introduced a package of energy measures, setting a clear and comprehensive framework for energy policy combined with substantial clarity on much of the detail investors need to continue investing in the UK's energy infrastructure.

The Energy Bill was introduced in Parliament, alongside a series of other key documents including the Annual Energy Statement, the Energy Security Strategy and a consultation on electricity demand reduction.

The Energy Bill will establish a legislative framework for delivering secure, affordable and low carbon electricity. It will put in place measures to attract the investment which is needed to replace current generating capacity and rising demand for electricity. In addition, the Bill contains measures to reform the electricity market to deliver secure, clean and affordable electricity, including:

- Contracts for Difference (CfDs) will stabilise revenues for investors in low-carbon electricity generation projects helping developers secure the large upfront capital investment required for low carbon infrastructure while protecting consumers from rising energy bills;
- A new company to be established to act as a single counterparty to the CfDs with eligible generators;
- Powers to introduce a Capacity Market, allowing for capacity auctions from 2014 for delivery of capacity in the winter of 2018/19, if needed, to help ensure the lights stay on even at times of peak demand;

An Emissions Performance Standard (EPS) which will curb the most polluting fossil fuel power stations.

In November 2012, the Government published the Energy Efficiency Strategy. The Strategy is aimed at changing the way energy is used in sectors such as housing, transport and manufacturing over the coming decades. It also includes immediate action to kick start a revolution in UK energy efficiency, including:

- £39 million to fund five centres examining business and household energy demand.
- An energy efficiency labelling trial with John Lewis.
- A drive on financing energy efficiency for business and the public sector.

2012 (continued)

In September 2012 the Government set out measures to help ensure that energy consumers are treated fairly and to make it easier for households get a better deal for their gas and electricity, including:

- New powers for Ofgem. Ofgem will be able to require companies who have breached licence conditions to compensate consumers who have lost out directly, rather than necessarily having to rely on a voluntary approach. Consumers will benefit directly instead of fines just going to the Treasury. The Government has already strengthened Ofgem's hand by making it harder for energy companies to block licence changes, and introducing tougher rules on the information suppliers have to provide to their customers.
- Help for prepayment meter customers in debt. The Government wants energy consumers wherever possible to be able to choose the best energy tariff for them. At the moment, prepayment meter customers who are more than £200 in debt to their energy supplier cannot switch to another company - which means they could be missing out cheaper deals elsewhere. Following a review by Ofgem, a voluntary agreement with suppliers means that this threshold will be raised to £500. From 1 November tens of thousands more households will be able to shop around for a better tariff and switch if they find a cheaper deal.

- Collective Switching Competition – a scheme where people can club together to get a better deal on their energy. 'Collective purchasing and switching' as it is known has the potential to help the most vulnerable households to save. A £5m competition for the most innovative local authority or third sector schemes is to be launched.

- Better billing. Energy bills are rising, but fewer people than ever seem to be shopping around and switching to a better deal. The Government is working with Ofgem to ensure that consumers have clear information on their bills about the supplier's cheapest tariff and the savings consumers could make by switching. The Government is also working with suppliers to get better information for consumers, including the possibility of putting Quick Response (QR) codes on energy bills/annual statements to make it possible to switch through mobile phones.

- An independent suppliers summit. 99% of domestic households are customers of only six main energy suppliers. The Government wants to see more competition in the market, with companies working harder to win and then keep consumers' business. Building on the work the Government has already carried out to reduce barriers to entry and growth, a summit with independent suppliers will explore what more can be done.

A new Energy Bill was announced in the Queen's speech in May 2012. The purpose of the Bill is to reform the electricity market to enable large-scale investment in low-carbon generation capacity in the UK and deliver security of supply, in a cost-effective way.

Feed in Tariffs

At the start of April 2012, changes were made to the feed in tariffs for small scale solar PV installations. This followed a consultation process and subsequent legal challenges.

2012 (continued)

Further changes, following a consultation process, to solar PV tariffs and a PV tariff degression mechanism, came into effect in August 2012, whilst further tariff changes and degression for all other technologies as well as scheme administration issues came into effect in December 2012.

Fuel Poverty

A new way to measure fuel poverty in England was proposed by the Government in September 2012, following the independent review on this issue by Professor John Hills of the London School of Economics (LSE).

The proposal is to adopt a new definition based on the overall framework suggested by Hills in his review. The new definition includes dual indicators separating the extent of the issue (the number of people affected) from its depth (how badly people are affected) as a way to measure the problem.

Ensuring more accurate measurement will help to design effective solutions to fuel poverty, allowing the resources available to be targeted where they are needed most.

The Government is currently considering the responses to this consultation.

An independent report, by Professor John Hills of the London School of Economics, was published in March 2012, which advised the government how it could best tackle the problem of fuel poverty. Professor Hills started his research in March 2011 and looked at the definition of fuel poverty, targets, and the effectiveness of different policy interventions. Recommendations included in the report are:

- Professor Hills is clear that fuel poverty is currently measured in a way that is both flawed and unhelpful;

- Professor Hills has proposed a new way to define fuel poverty, separating the extent of the issue (the number of people affected) from its depth (how badly people are affected);

Professor Hills also shows how the impact of Government policies can be assessed against this new proposed definition, showing the positive impact current Government policies are having on tackling fuel poverty.

Oil and Gas

In December 2012, the Government announced that exploratory hydraulic fracturing (fracking) for shale gas could resume in the UK, subject to new controls to mitigate the risks of seismic activity.

In December 2012, the Government confirmed gas will continue to play an important role in the energy supply mix. The Gas Generation Strategy sets out a number of steps that will be taken to stimulate investment in gas generation. New gas-fired power stations (which emit half the CO2 of coal) will need to be built over the next two decades to replace retiring coal, older gas and nuclear power stations. The Strategy also confirms the Government's commitment to supporting the development and commercialisation of Carbon Capture and Storage (CCS) technology, which will help to decarbonise gas, as well as coal, in future.

In November 2012 the Government gave Chevron North Sea Ltd consent to drill the deepwater Cambo-5 well, West of the Shetland Isles.

2012 (continued)

In October 2012 the Government gave Shell consent for a new oil and gas development that will add two per cent to UK daily production. The Fram field, off the East Coast of Scotland, is one of the biggest developments to be given the go ahead in the past five years. Once production starts, the field is expected to recover an average of 35,000 barrels of oil equivalent per day.

In May 2012 it was announced that the Coryton refinery would close due to the refinery's administrators having failed to find a buyer. The refinery will now be turned into a diesel import terminal by Vopak, Shell and Greenergy; initially it will have a capacity of 500,000 cubic metres (18,000,000 cu ft).

In May 2012, Total announced that the gas leak from the Elgin platform that started on the 25th March 2012 had been stopped. A dynamic kill operation successfully used heavy mud to stem the flow of gas from the gas well.

In May 2012, the Government announced that the latest North Sea licensing round for oil and gas drilling has broken all previous records for the number of applications received by the Government. A total of 224 applications were submitted for the 27th Licensing Round covering 418 blocks of the UK Continental Shelf. It is the largest number since offshore licensing began in 1964 and is 37 more than the previous high total received in the last licensing round.

In March 2012, the Government gave BP consent to drill the deepwater North Uist well, northwest of the Shetland Islands.

Renewable Heat

In March 2012 the Government announced further support for the domestic sector under a second phase of the Renewable Heat Premium Payment Scheme (RHPP).

Renewables

In October 2012, the Government gave consent to a new 19 turbine/57 MW wind farm near Frodsham, Cheshire with the potential to generate enough power to supply the equivalent of 25,000 homes.

In October 2012, the Government gave consent to the construction of a 60MW energy from waste generating station at Lostock in Cheshire, which will generate enough power to supply 80,000 homes.

Smart Meters

In April 2012, the Government published its responses to consultations on the licence conditions and technical specifications for the roll-out of gas and electricity smart metering equipment, and on licence conditions for a code of practice for the installation of smart meters. At the same time, it published consultations on a consumer engagement strategy, data access and privacy, the Smart Energy Code, and elements of the regulatory framework for the Data and Communications Company. It also published its conclusions relating to the Smart Metering Equipment Technical Specifications and notified these to the European Commission, as required under the Technical Standards Directive.

2011

Carbon Capture and Storage

At a meeting in April 2011 in the United Arab Emirates, Energy Ministers from around the world agreed to proposals to help speed up the global deployment of carbon capture and storage. The proposals include:

- Advance policies that address the financial gap and risks associated with early-mover carbon capture and storage (CCS) projects;
- Identify and advance appropriate funding mechanisms to support the demonstration of large-scale CCS projects in developing economies;
- Advance the development of legal and regulatory frameworks for CCS;
- Promote the importance to global CCS deployment of ratifying key international marine treaty amendments;
- Support and encourage the development of best practice knowledge-sharing from early mover projects, in particular those with public funding;
- Review key gaps in storage data coverage and knowledge including capacity assessment; and
- Recognise the potential of CCS for industrial emission sources and review demonstration opportunities.

Climate Change

The United Nations climate conference in Durban took place from 28 November to the 11 December 2011. In the end, the talks resulted in:

- the adoption of a roadmap – the 'Durban Platform' – to a global legally binding agreement applicable to all countries.
- recognition that there is a global gap in ambition between existing emissions reduction pledges for the period to 2020 and the minimum necessary to stay below a global temperature increase of 2°C.
- agreement to adopt, next year, the second commitment period of the Kyoto Protocol.
- Operationalisation of the Green Climate Fund to support mitigation and adaptation policies and activities in developing countries, following a successful process over the last year of designing its structure and operation.
- establishment of a work programme to look at sources of long-term finance for developing countries (including, but not limited to, the Green Climate Fund), with the aim of mobilising at least $100 billion per year by 2020.

2011 (continued)

In December 2011, the Government published the Carbon Plan, which sets out plans to meet the fourth carbon budget and which shows how doing so puts the UK on a plausible pathway to 2050. The Plan sets out plans to halve emissions (from 1990) in the fourth carbon budget period of 2022 to 2027 by:

- insulating all cavity walls and lofts, where practicable, and up to 1.5 million solid wall insulations by 2020.
- insulating a further 1-3.7 million solid walls by 2030.
- completing 100,000 low carbon heat installations by 2020 and up to 8.6 million by 2030 as natural gas heating is phased out by 2050.
- building between 40 and 70 GW of low-carbon electricity capacity by 2030, on the path to 90 and 140 GW in 2050.
- reducing average new car emissions from 144gCO2/km to between 50 and 70g CO2/km in 2030, on the path to decarbonising road transport by 2050.

A fourth carbon budget of 1950 MtCO2e for the period that will span from 2023 to 2027, putting the UK on course to cut emissions by at least 80% by 2050, was announced by the Government in May 2011. The carbon budget will place the British economy at the leading edge of a new global industrial transformation, and ensure low carbon energy security and decarbonisation is achieved at least cost to the consumer.

Electricity

In December 2011, Tilbury B, a 1,062MW coal fired plant was converted to a 742MW biomass plant, to become the largest biomass burning power generating facility in the world.

In December 2011, the Government gave consent to Dalkia for a new waste wood biomass power station in Yorkshire. The 53MW power station at the former RAF airfield at Pollington will be fuelled by 360,000 tonnes of waste wood per annum, powering around 55,000 homes per year.

In October 2011, the government published a consultation on feed in tariffs, detailing a number of proposals.

In October 2011, the Government gave approval for two new power stations in Yorkshire that will generate enough energy to power almost two million homes. The plants are Ferrybridge, a 108 MW Multifuel (biomass and energy from waste) power plant in Wakefield, and Thorpe Marsh, a 1,500 MW Combined Cycle Gas Turbine power plant in North Doncaster.

In September 2011, the Government gave approval to Anglesey Aluminium Metal Renewables to construct a biomass fuelled power station at Penrhos Works, Holyhead, Anglesey. When operational the plant will generate 299 MW of electricity, enough to power approximately 300,000 homes – equivalent to around a quarter of the homes in Wales.

In August 2011, the Government gave approval for InterGen's proposals to construct a new 900MW gas power plant at the London Gateway Logistics Park, Coryton, Essex. The plant will consist of up to two CCGT generating units, each around 450MW in capacity.

2011 (continued)

In August 2011, the Government gave approval for the construction of two new biomass stations in Yorkshire and North Lincolnshire, which combined will produce enough electricity to meet the needs of over a million homes. A 299MW biomass-fuelled power station will be constructed on land at the existing 4000MW Drax Power Station site in Selby, North Yorkshire, and a 299MW biomass-fuelled power station will be built at South Killingholme near Immingham.

In March 2011, the Government gave approval for RWE npower to build a 2400 megawatt gas power plant on the site of the former Willington A and B power stations in South Derbyshire.

In February 2011, the Government gave approval for SSE to build a gas-fired power station near Port Talbot. The Abernedd Combined Cycle Gas Turbine Plant will be built at the Baglan Bay Energy Park, on the former site of a chemicals facility.

In January 2011, the Government gave approval for Scottish Power to construct a new 1,000 megawatt gas-fired power station near Hoo St Werburgh in Kent, adjacent to the existing Damhead Creek 800 MW gas-fired power station.

Emissions Trading

In January 2011, 4.4 million allowances were auctioned in the sixteenth auction as part of phase II of the EU ETS. In 2011, the UK plans to auction a total of 30.7 million allowances.

Energy Policy

A consultation on the Green Deal was published in November 2011 as part of the Energy and Climate Change Secretary's Annual Energy Statement to Parliament. £14 billion worth of private sector investment in home energy improvements over the next decade will help insulate households from rising global energy prices and create thousands of jobs in the British insulation and construction sector. The Green Deal framework will be launched from October 2012.

In July 2011, the Government published the Electricity Market Reform White Paper which sets out key measures to attract investment, reduce the impact on consumer bills, and create a secure mix of electricity sources including gas, new nuclear, renewables and carbon capture and storage. The Renewables Roadmap published alongside the White Paper outlines a plan of action to accelerate renewable energy deployment – to meet the target of 15% of all energy by 2020 – while driving down costs.

The Government published its finalised Energy National Policy Statements (NPSs) in June 2011 in order for them to be debated in Parliament. The Energy NPSs provide a clear framework for decision making and set out the need for a surge of investment in new energy sources, including 33GW of new renewable energy capacity.

Ofgem announced in March 2011 new rules that mean energy suppliers must give consumers at least 30 days advance notice before putting up their prices. The changes come into effect on 28 April 2011.

2011 (continued)

Measures designed to hasten the speed and scale of investment in low carbon energy projects as well as changes to oil and gas taxes were announced by the Chancellor of the Exchequer in the March 2011 Budget. These include:

- Green Investment Bank – the initial capitalisation of the Bank will be £3 billion and it will begin operation in 2012/13.
- Carbon price support – the Government is to introduce a floor to the carbon price for electricity generation from April 2013, this will start at around £16 per tonne of carbon dioxide and move to a target price of £30 per tonne in 2020.
- Oil and gas taxes – the rate of the supplementary charge levied on profits from UK oil and gas production will increase to 32 per cent from midnight on 24 March 2011.

In March 2011, the Energy Bill was introduced into the House of Commons with its First Reading. The Second Reading was heard on 10 May with Committee sessions being held during June 2011.

In March 2011, following a Call for Evidence, the Government revised aspects of the 2050 Calculator. Major changes include:

- Adding four new sectors to the 2050 Calculator, including the option to fit carbon capture and storage technology to gas-fired power plants;
- Adding three additional scenarios for international shipping emissions;
- Amending some of the boundaries of the choices, for example reflecting a higher capacity for the offshore wind level 4;
- Improving the five-day balancing 'stress test' and adding a short, sharp one-day stress test.

The world's first financial incentive of its kind to revolutionise the way heat is generated and used in buildings was launched by the Government and opened for applications in November 2011. The Renewable Heat Incentive (RHI) will support emerging technologies and businesses in the UK, strengthening security of supply by reducing dependence on fossil fuel heating and emissions.

Nuclear

The Nuclear National Policy Statement, published in June 2011, listed eight sites across the country, Bradwell, Hartlepool, Heysham, Hinkley Point, Oldbury, Sellafield, Sizewell, and Wylfa, as suitable for new nuclear power stations by 2025.

Oil and Gas

In October 2011, the Government gave consent to BP and its partners Shell, ConocoPhillips and Chevron for their £4.5 billion Clair Ridge development west of the Shetland Islands. The Clair Ridge project has the capability to produce an estimated 640 million barrels of oil and is planned to come on stream in 2016, extending the production life of the greater Clair area to the year 2050.

2011 (continued)

In June 2011 the UK joined its partners in the International Energy Agency (IEA) in releasing oil stocks to the market. A total of 60 million barrels of oil were made available for purchase, with the UK contributing some three million barrels. The release of stocks will help prevent short-term supply disruptions leading to volatile oil prices that could damage the economy. At the end of June 2011 Brent crude oil prices stood at $112 a barrel.

In January 2011 Brent crude oil prices topped $100 a barrel for the first time since October 2008 following concerns about political unrest in Egypt; prices rose to over $125 a barrel in April, the highest level for over two years, following continued unrest in oil producing nations in North Africa and the Middle East.

Renewables

In August 2011, the Government launched a £3 million scheme to help install eco-heaters in the homes of social housing tenants. Heating equipment including biomass boilers, solar hot water panels and heat pumps will be available under the new scheme. Registered Providers of social housing, such as local authorities and social housing associations, will be able to bid for a share of the £3 million, part of the £15 million Renewable Heat Premium Payment budget, to make home heating improvements to tenants' homes.

The outcome of the Government's fast track review on Feed-in Tariff (FIT) levels of support for large scale solar and anaerobic digestion installations was announced in June 2011. New tariffs for large scale and all stand-alone solar and farm-scale anaerobic digestion will start from 1st August 2011 for new installations, whilst money will be protected for householders, small businesses and communities and a range of technologies ensuring scheme longevity.

In February 2011, the Government gave permission for the construction of a 230MW wind farm off the coast of Humberside. The Humber Gateway wind farm will generate enough electricity to power up to around 150,000 homes.

Smart Meters

The Government published its plans for the national rollout of smart meters in March 2011. 53 million smart meters in 30 million homes and businesses will be installed across Great Britain, with an estimated net benefit to the nation of £7.3 billion over the next twenty years. The mass rollout will start in 2014, and will be completed in 2019.

For major events in earlier years see the DECC website version of this annex at: www.gov.uk/government/organisations/department-of-energy-climate-change/series/digest-of-uk-energy-statistics-dukes

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