Digest of United Kingdom Energy Statistics 2012

Production team: **Iain MacLeay**
Kevin Harris
Anwar Annut
and chapter authors

A National Statistics publication **London: TSO**

First published 2012

ISBN 9780115155284

Digest of United Kingdom Energy Statistics

Enquiries about statistics in this publication should be made to the contact named at the end of the relevant chapter. Brief extracts from this publication may be reproduced provided that the source is fully acknowledged. General enquiries about the publication, and proposals for reproduction of larger extracts, should be addressed to Kevin Harris, at the address given in paragraph XXIX of the Introduction.

The Department of Energy and Climate Change reserves the right to revise or discontinue the text or any table contained in this Digest without prior notice.

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 and Electricity at:

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

Information on Energy Prices is available at:

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

A list of tables

Chapter 6 Renewable sources of energy

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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

II The current issue updates the figures given in the Department of Energy and Climate Change's (DECC) *Digest of United Kingdom Energy Statistics 2011*, published in July 2011.

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 2008 are included on the internet, and tables that show five years in this printed version show fourteen 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 2012 - Annex D
(only Major events for 2010 to 2012 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 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 AEA Energy & Environment 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 website for each fuel at:
www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/source.aspx.

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

XIV An explanation of the terms used to describe electricity generating companies is given in Chapter 5, paragraphs 5.66 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 2011 Digest, even though some figures may have

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

Revisions to data published in the *Digest of UK Energy Statistics*.
It is intended that any revisions should be made to previous years' data only at the time of the publication of the Digest (ie in July 2012 when this Digest is published, revisions can be made to 2010 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 2012) are published in *Energy Trends* in March of the following year (eg March 2013), percentage growth rates are liable to be distorted if the prior year (ie 2011) data are constrained to the Digest total, when revisions are known to be required. In these circumstances the prior year (ie 2011) 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 2012 data published in *Energy Trends* prior to publication in the 2013 edition of the *Digest of UK Energy Statistics.*

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

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

Energy data on the internet

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

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

XXIII Short term statistics are published:

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

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

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 negligible (less than half the final digit shown)
r	Revised since the previous edition

Rounding convention

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

Acknowledgements

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

Cover photograph

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

Contacts

XXIX For general enquiries on energy statistics contact:

Clive Sarjantson on 0300 068 5056
(e-mail:clive.sarjantson@decc.gsi.gov.uk) **or** Kevin Harris on 0300 068 5041
(e-mail: kevin.harris@decc.gsi.gov.uk)

Department of Energy and Climate Change
Energy Statistics Team
6th Floor, Area B
Whitehall Place
London SW1A 2AW
Fax: 0300 068 5006

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

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

Kevin Harris, Production Team
July 2012

Contact List

The following people in the Department of Energy and Climate Change may be contacted for further information about the topics listed:

Topic	Contact	Telephone 0300 068	E-mail
Total energy	Iain MacLeay	5048	Iain.MacLeay@decc.gsi.gov.uk
Solid fuels and derived gases	Mita Kerai	5044	Mita.Kerai@decc.gsi.gov.uk
Oil and upstream gas resources	Clive Evans	5040	Clive.Evans@decc.gsi.gov.uk
North Sea profits, operating costs and investments	Mike Earp	5784	Mike.Earp@decc.gsi.gov.uk
Petroleum (downstream)	Warren Evans	5059	Warren.Evans@decc.gsi.gov.uk
Gas supply (downstream)	Warren Evans	5059	Warren.Evans@decc.gsi.gov.uk
Electricity	James Hemingway	5042	James.Hemingway@decc.gsi.gov.uk
Renewable sources of energy	Julian Prime	5054	Julian.Prime@decc.gsi.gov.uk
Combined heat and power	Laura Williams	5045	Laura.Williams@decc.gsi.gov.uk
Prices and values, industrial, international and oil prices	Jo Marvin	5049	Jo.Marvin@decc.gsi.gov.uk
Regional and Local Authority Energy	Julian Prime	5054	Julian.Prime@decc.gsi.gov.uk
Calorific values and conversion factors	Iain MacLeay	5048	Iain.MacLeay@decc.gsi.gov.uk
General enquiries (energy helpdesk)	Clive Sarjantson	5056	Clive.Sarjantson@decc.gsi.gov.uk

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

Chapter	2009	2010	2011	2012	Chapter	2009	2010	2011	2012
ENERGY	-	-	-	1.1	**NATURAL GAS**	4.1	4.1	4.1	4.1
	-	-	1.1	1.2		4.2	4.2	4.2	4.2
	-	1.1	1.2	1.3		4.3	4.3	4.3	4.3
	1.1	1.2	1.3	-		4.4	4.4	4.4	4.4
	1.2	1.3	-	-		4.5	4.5	4.5	4.5
	1.3	-	-	-		-	-	4.6	4.6
	-	-	-	1.4					
	-	-	1.4	1.5	**ELECTRICITY**	5.1	5.1	5.1	5.1
	-	1.4	1.5	1.6		5.2	5.2	5.2	5.2
	1.4	1.5	1.6	-		5.3	5.3	5.3	5.3
	1.5	1.6	-	-		5.4	5.4	5.4	5.4
	1.6	-	-	-		5.5	5.5	5.5	5.5
	1.7	1.7	1.7	1.7		5.6	5.6	5.6	5.6
	1.8	1.8	1.8	1.8		5.7	5.7	5.7	5.7
	1.9	1.9	1.9	1.9		5.8	5.8	5.8	5.8
						5.9	5.9	5.9	5.9
SOLID FUELS	-	-	-	2.1		5.10	5.10	5.10	5.10
& DERIVED	-	-	2.1	2.2		5.11	5.11	5.11	5.11
GASES	-	2.1	2.2	2.3		5.12	5.12	5.12	5.12
	2.1	2.2	2.3	-					
	2.2	2.3	-	-	**RENEWABLE**	-	-	-	6.1
	2.3	-	-	-	**SOURCES OF**	-	-	7.1	6.2
	-	-	-	2.4	**ENERGY**	-	7.1	7.2	6.3
	-	-	2.4	2.5		7.1	7.2	7.3	-
	-	2.4	2.5	2.6		7.2	7.3	-	-
	2.4	2.5	2.6	-		7.3	-	-	-
	2.5	2.6	-	-		7.4/5	7.4/5	7.4/5	6.4
	2.6	-	-	-		7.4	7.4	7.4	6.5
	2.7	2.7	2.7	2.7		7.6	7.6	7.6	6.6
	2.8	2.8	2.8	2.8		7.7	7.7	7.7	6.7
	2.9	2.9	2.9	2.9					
	2.10	2.10	2.10	2.10	**COMBINED**	6.1	6.1	6.1	7.1
	2.11	2.11	2.11	2.11	**HEAT AND**	6.2	6.2	6.2	7.2
					POWER	6.3	6.3	6.3	7.3
PETROLEUM	-	-	-	3.1		6.4	6.4	6.4	7.4
	-	-	3.1	3.1		6.5	6.5	6.5	7.5
	-	3.1	3.1	3.1		6.6	6.6	6.6	7.6
	3.1	3.1	3.1	-		6.7	6.7	6.7	7.7
	3.1	3.1	-	-		6.8	6.8	6.8	7.8
	3.1	-	-	-		6.9	6.9	6.9	7.9
	-	-	-	3.2					
	-	-	3.2	3.3	**ANNEX A**	A.1	A.1	A.1	A.1
	-	3.2	3.3	3.4	**CALORIFIC**	A.2	A.2	A.2	A.2
	3.2	3.3	3.4	-	**VALUES**	A.3	A.3	A.3	A.3
	3.3	3.4	-	-					
	3.4	-	-	-					
	3.5	3.5	3.5	3.5					
	3.6	3.6	3.6	3.6					
	3.7	3.7	3.7	3.7					
	-	-	3.8	3.8					

Chapter 1
Energy

Key points

- In 2011 UK energy production was down a record 13.2 per cent on a year earlier, its fastest rate of decline for over 40 years, as a number of oil and gas production facilities were affected by maintenance issues. (Tables 1.1 and 1.2).
- Primary energy consumption was down 6.9 per cent. Final energy consumption fell by 7.3 per cent with less energy used for heating (more details are available in Energy Consumption in the UK www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx).
- On a temperature adjusted basis, primary energy consumption was down 1.7 per cent continuing the downward trend of the last six years. In 2011 the average UK temperature was 10.7 degrees Celsius, 1.8 degrees higher than in 2010, and 1.0 degrees higher than the average temperature between 1971 and 2000 (Table 1.1.7).
- The UK remained a net importer of energy, with a dependency level that increased to 36 per cent. Fossil fuels remain the dominant source, accounting for 87.5 per cent of supply, though this is a record low level. Supply from renewables increased, with its contribution accounting for 3.8 per cent of consumption on the EU agreed basis (see chapter 6).
- In 2011 within electricity generation, there was reduced use of gas, but there were increases in coal and nuclear output, and higher levels of renewables output, with sharp increases from both wind and hydro (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, 2011. Energy value balances then follow this for the same years (Tables 1.4 to 1.6) and Table 1.7 shows sales of electricity and gas by sector in value terms. Table 1.8 covers final energy consumption by the main industrial sectors over the last five years, followed by Table 1.9, which shows the fuels used for electricity generation by these industrial sectors. The explanation of the principles behind the energy balance and commodity balance presentations, and how this links with the figures presented in other chapters, is set out in Annex A. Information on long term trends (Tables 1.1.1 to 1.1.8) for production, consumption, and expenditure on energy, as well as long term temperature data and analyses such as the relationship between energy consumption and the economy of the UK are available on DECC's energy statistics web site at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Calorific values when producing energy statistics

1.3 In this publication Gross Calorific Values (GCVs) are used to convert fuel from their original units to tonnes of oil equivalent (toe). An alternative is to use Net Calorific Values (NCVs) as detailed in paragraph XVII of the introduction. The fuel specific NCVs are shown at Annex A. However, as the EU renewables target is calculated on data converted using net calorific values, aggregate energy

balances for the most recent years have been calculated using NCVs; these are used in table 6.7, and are available on the internet version, Annex I, of this publication at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx.

The energy industries

1.4 The energy industries in the UK play a central role in the economy by producing, transforming and supplying energy in its various forms to all sectors. They are also major contributors to the UK's Balance of Payments through the exports of crude oil and oil products. The box below summarises the energy industries' contribution to the economy in 2011:

- 4.4 per cent of GDP;
- 10.1 per cent of total investment in 2010;
- 51.8 per cent of industrial investment in 2010;
- 171,000 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 2011, the primary supply of fuels was 211.7 million tonnes of oil equivalent, a 6.7 per cent decrease compared to 2010. Indigenous production in 2011 was a record 13.2 per cent lower than in 2010, and has fallen in each year since 1999 (chart 1.1). The large fall in 2011 is mainly due to reduced production from the UK Continental Shelf as a number of oil and gas production facilities were affected by maintenance issues. Chart 1.2 illustrates the figures for the production and consumption of individual primary fuels in 2011. In 2011, 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 2011 the UK imported more coal, crude oil, electricity and gas than it exported; however, the UK remained a net exporter of petroleum products. In 2011, net imports accounted for 36.5 per cent of energy used in the UK.

Chart 1.1: UK energy production – annual growth rate

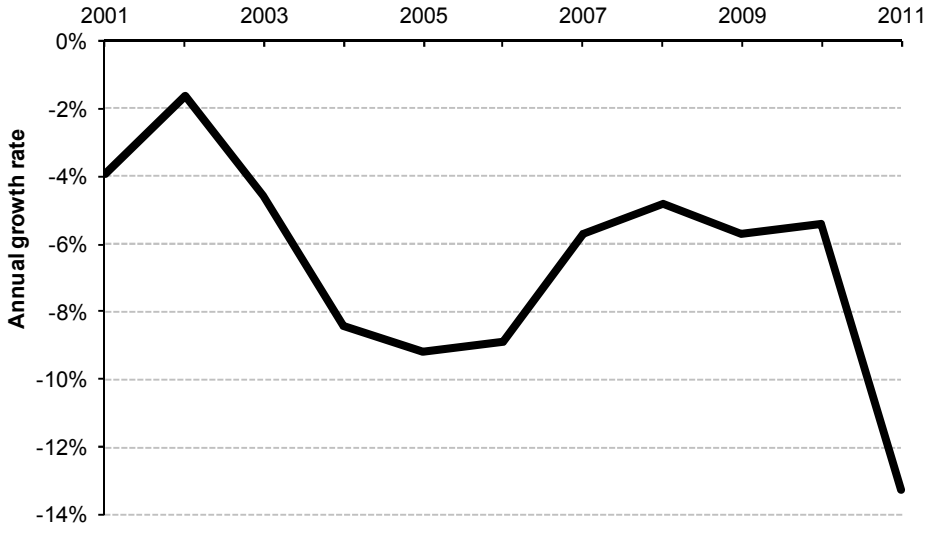
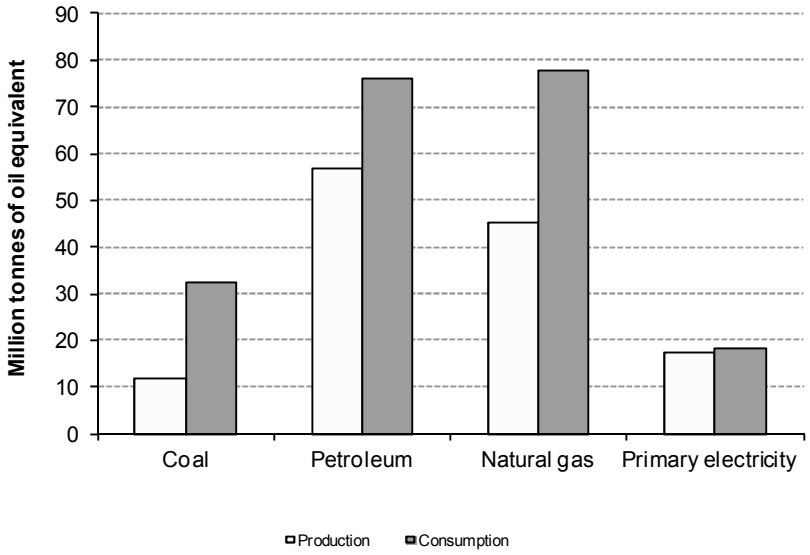


Chart 1.2: Production and consumption of primary fuels 2011



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

1.7 Total primary energy demand was 6.4 per cent lower in 2011 than in 2010 at 212.3 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 decrease in demand, continues the general trend seen since 2005, the rise in 2010 was due to the colder weather in that year. Primary energy consumption (primary supply less non energy use) was down by 6.9 per cent in 2011. Temperatures in 2011 were on average 1.8 degrees warmer than in 2010, and 1.0 degrees above the long term average, which is responsible for the much larger decrease in demand. On a temperature corrected basis, primary energy consumption was estimated to have fallen by 1.7 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. Chart 1.4 shows the composition of primary demand in 2011.

Chart 1.3: Primary energy consumption

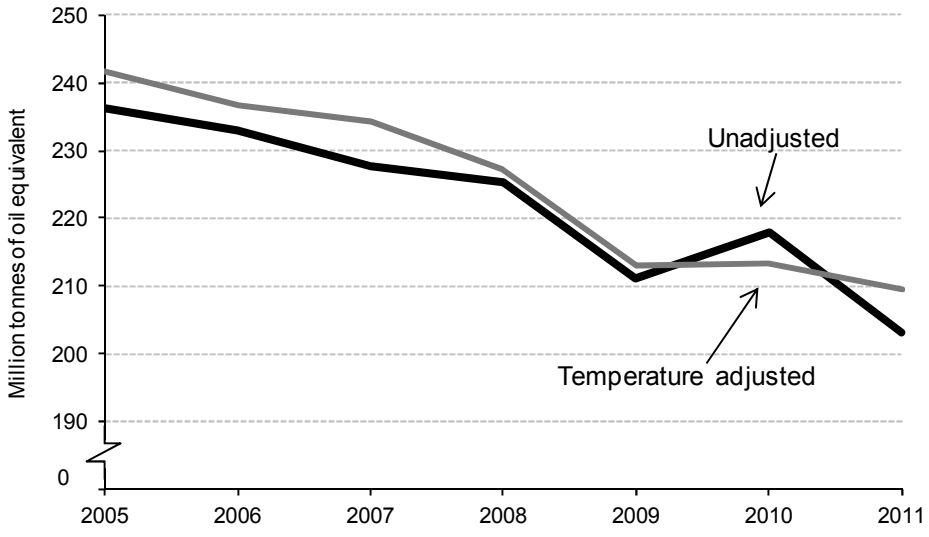
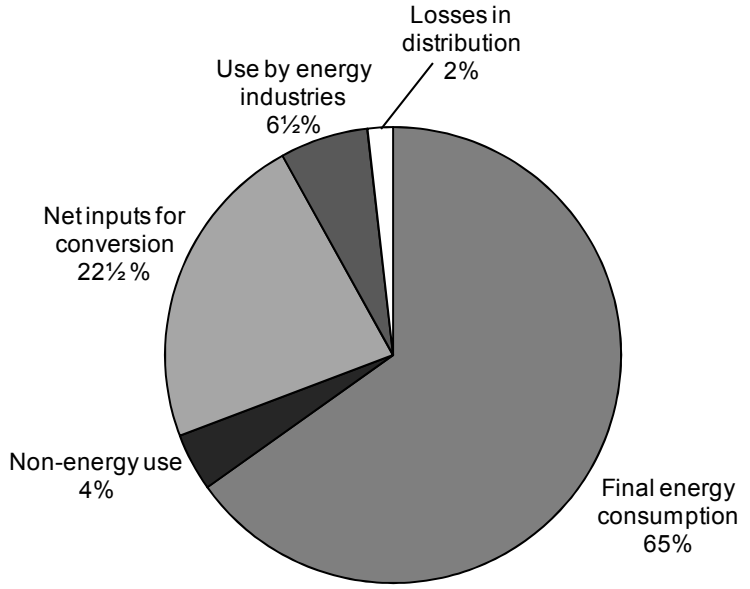


Chart 1.4: Primary demand 2011



Primary demand: 212.3 million tonnes of oil equivalent

1.8 The transformation section of the energy balance shows, for each fuel, the net inputs for transformation uses. For example, Table 1.1 shows that 4,121 thousand tonnes of oil equivalent of coal feeds into the production of 3,788 thousand tonnes of oil equivalent of coke, representing a loss of 333 thousand tonnes of oil equivalent in the manufacture of coke in 2011. In 2011, energy losses during the production of electricity and other secondary fuels amounted to 48.2 million tonnes of oil equivalent, shown in the transformation row in Table 1.1.

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

1.10 In 2011, generation by gas declined sharply, with fuel use down by 17.8 per cent, due to generally high gas prices throughout the year. However, there were increases in all the other major sources of electricity generation. Fuel use in generation from coal-fired stations was 1.8 per cent higher in 2011 than in 2010, but remains 27 per cent below the recent peak level in 2006. Generation from nuclear sources increased by 12.2 per cent due to increased availability in 2011 following maintenance outages at several stations in 2010. Generation from wind increased sharply up over 50 per cent with both higher wind speeds and greater capacity, hydro output was also up sharply, again with output over 50 per cent up with high rainfall in the 2011 following the low levels seen in 2010.

1.11 Lower gas and increased nuclear use and other low carbon sources for electricity generation contributed to the sharp decrease in carbon dioxide emissions between 2010 and 2011. Provisional DECC estimates suggest that emissions fell back by 39.5 million tonnes of carbon dioxide (MtCO2) (8.0 per cent) to 456 MtCO2 between 2010 and 2011. The main factor contributing to the fall though was decreased domestic gas use reflecting the warmer weather in 2011. More details of carbon dioxide emissions are available in a Statistical Release, published in March, which is available on the DECC website at: www.decc.gov.uk/assets/decc/11/stats/4856-2011-uk-greenhouse-gas-emissions-provisional-figur.pdf

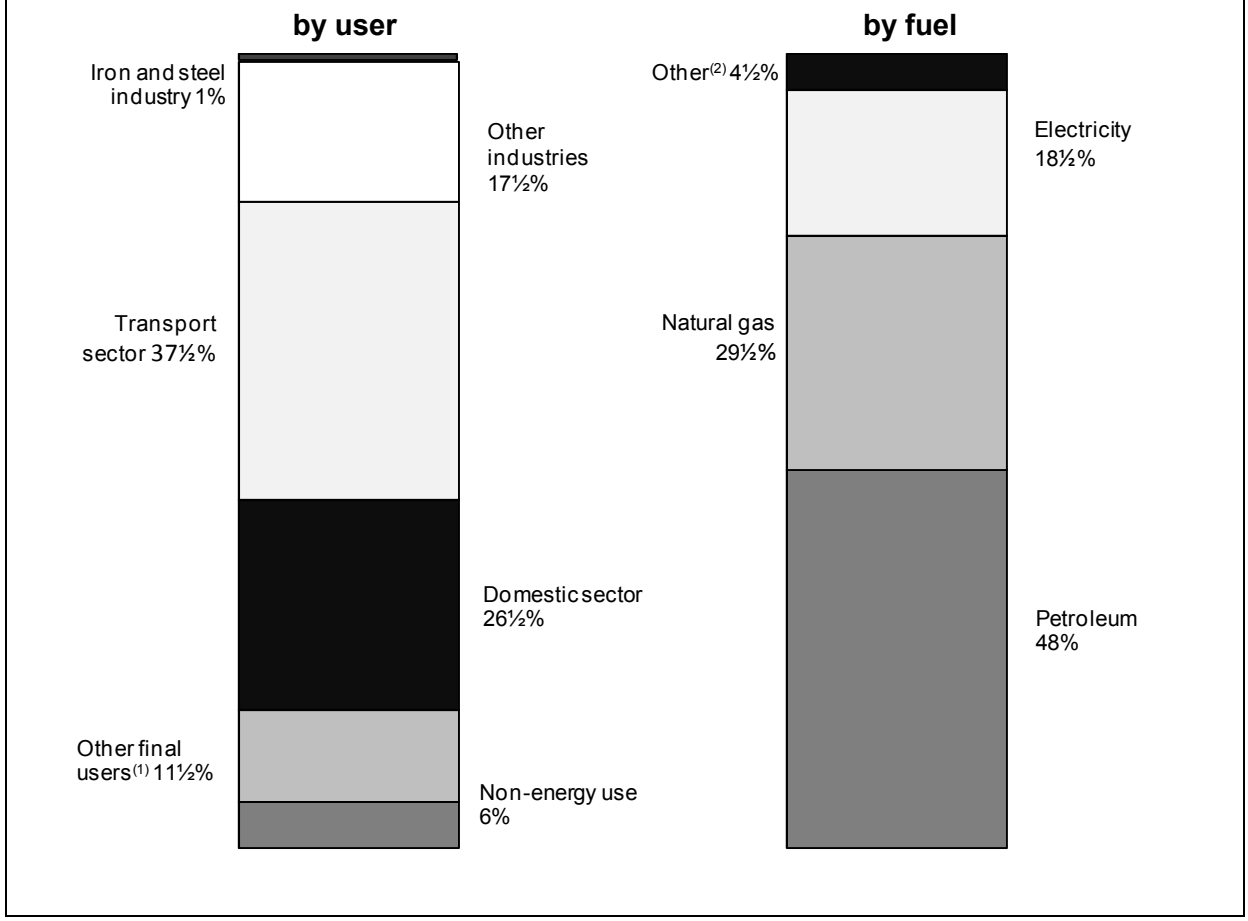
1.12 The energy industry use section of the table represents use of fuels by the energy industries themselves. This section also includes consumption by those parts of the iron and steel industry which behave like an energy industry i.e. they are involved in the transformation processes (see paragraph A.29 of Annex A). In 2011, energy industry use amounted to 13.3 million tonnes of oil equivalent of energy, continuing a general decline matching the fall in UK energy production.

1.13 Losses presented in the energy balance include distribution and transmission losses in the supply of manufactured gases, natural gas, and electricity. Recorded losses fell by 6.8 per cent between 2010 and 2011, reversing last year's increase; the fall was due to a decrease in gas losses, as demand for gas fell.

1.14 Total final consumption, which includes non-energy use of fuels, in 2011 was 147.0 million tonnes of oil equivalent; this is a 11.6 million tonnes of oil equivalent decrease, 7.3 per cent, on the consumption in 2010. The majority of this decrease was from the domestic sector, where consumption fell by 19.9 per cent. This sharp fall in consumption was due to the warmer weather in 2011, which contrasted sharply with the colder 2010. Temperatures were on average 1.8 degrees Celsius above those of 2010; 2011 was the second warmest year on record according to the Met Office, whilst 2010 was the coldest year since 1987. Final energy consumption in 2011 is accounted for by the transport sector (37.5 per cent), the domestic sector (26.4 per cent), the industrial sector (18.5 per cent), the services sector (11.7 per cent) and non-energy use (5.9 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 1.24 to 1.26.

1.15 The main fuels used by final consumers in 2011 were petroleum products (47.8 per cent), natural gas (29.3 per cent) and electricity (18.6 per cent). The amount of heat that was bought for final consumption accounted for 0.9 per cent of the total final energy consumption.

Chart 1.5: Final energy consumption 2011



1.16 Of the petroleum products consumed by final users 11.4 per cent was for non-energy purposes; for natural gas 1.6 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 2011 are shown in Table 1A. Further details of non-energy use are given in Chapter 3, paragraph 3.42 and Chapter 4, paragraph 4.34.

Table 1A: Non-energy use of fuels 2011

Thousand tonnes of oil equivalent

	Petroleum	Natural gas
Petrochemical feedstocks	4,535	693
Other	3,442	-
Total	**7,977**	**693**

1.17 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 2009 to 2011

Thousand tonnes of oil equivalent

	2009	2010	2011
Net imports	59,245	64,988	78,053
Primary energy supply + bunkers	222,472	229,263	214,124
Net import dependency	**26.6%**	**28.3%**	**36.5%**

1.18 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. The largest component of this series is currently nuclear; its share of energy supplied increased from 6.4 per cent to 7.7 per cent in 2011 due to greater availability of the nuclear fleet. There was also a rise in the shares from renewables, due to higher rainfall in the North of Scotland and higher wind speeds combined with increased capacity. 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" 3.8 per cent share of energy consumption in 2011 (the normalisation process takes out weather effects from this statistic see paragraph 6.28). 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 2009 to 2011

Per cent

	2009	2010	2011
Fossil fuel	89.1%	89.8%	87.5%
Low-carbon	10.5%	9.8%	12.0%
Other	0.4%	0.3%	0.6%

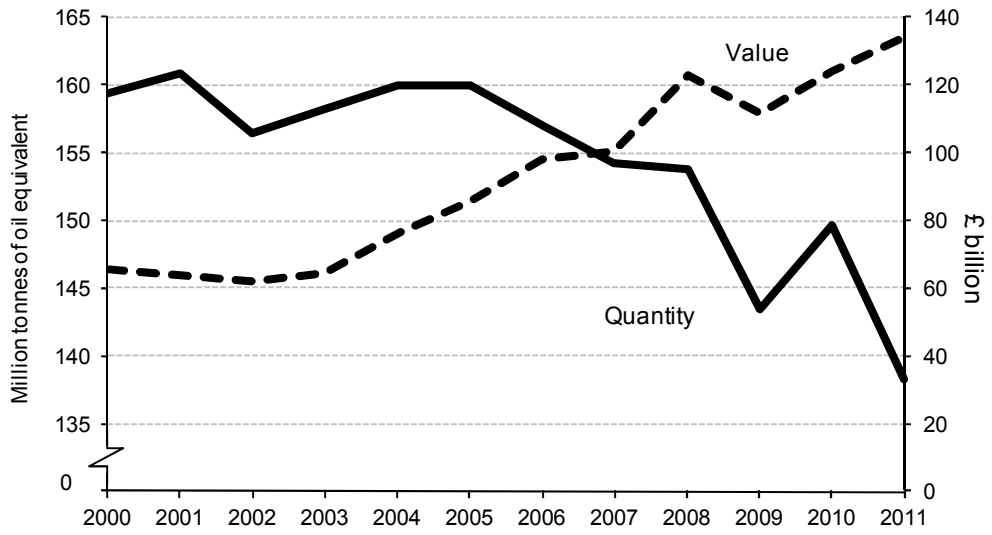
Value balance of traded energy (Tables 1.4, 1.5 and 1.6)

1.19 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 1.62. 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.

1.20 Total expenditure by final consumers in 2011 is estimated at £134,070 million, (£133,060 million shown as actual final consumption and £1,010 million of coal consumed by the iron and steel sector in producing coke for their own consumption). This is up by 8.0 per cent on 2010, reflecting a steady increase in energy prices. In 2011, crude oil prices averaged around $111 per barrel, 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



1.21 The value balance provides a guide on how the value chain works in the production and consumption of energy. For example, in 2011, £25,505 million of crude oil was indigenously produced, of which £17,590 million was exported, and £30,045 million of crude oil was imported. Allowing for stock changes, this provides a total value of UK inland crude oil supply of £38,240 million. This fuel was then completely consumed within the petroleum industry in the process of producing £48,770 million of petroleum products. Again some external trade and stock changes took place before arriving at a basic value of petroleum products of £43,670 million. In supplying the fuel to final consumers distribution costs were incurred and some profit was made amounting to £3,025 million, whilst duty and tax meant a further £38,880 million was added to the basic price to arrive at the final market value of £85,580 million. This was the value of petroleum products purchased, of which industry purchased £2,695 million, domestic consumers for heating purposes purchased £1,685 million, with the vast majority purchased within the transportation sector, £76,390 million.

1.22 Of the total final expenditure on energy in 2011 (£134,070 million), the biggest share, 59 per cent, fell to the transport sector. Industry purchased 10 per cent (£13,725 million), the domestic sector purchased 22 per cent (£29,135 million), with the remaining 9 per cent (£12,365 million) purchased by the service sector.

Sales of electricity and gas by sector (Table 1.7)

1.23 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 web site at: www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx

Energy consumption by main industrial groups (Table 1.8)

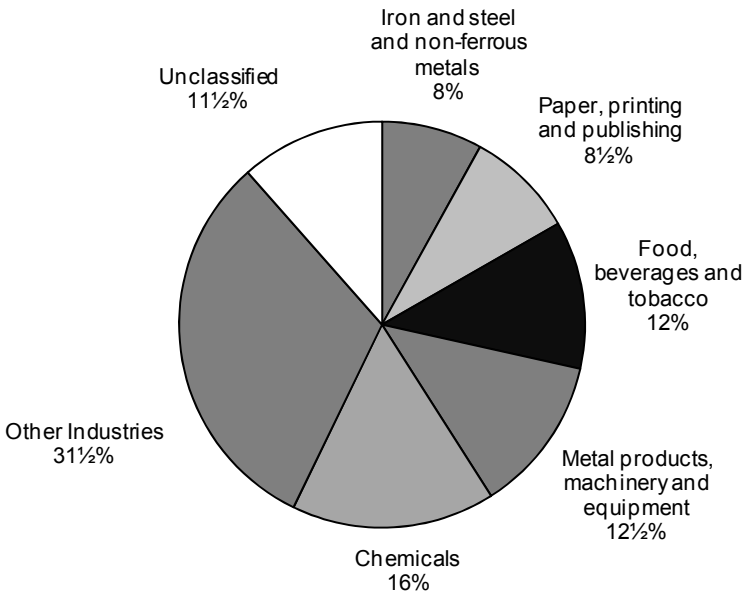
1.24 This table presents final energy consumption for the main industrial sub-sectors over the last five years.

1.25 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 2011, 27.1 million tonnes of oil equivalent were consumed by the main industrial groups. The largest consuming groups were chemicals (16.2 per cent), metal products, machinery and equipment (12.5 per cent), food, beverages and tobacco (11.8 per cent), iron and steel and non-ferrous metals (8.0 per cent), and paper, printing and publishing (8.7 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 2011



Total final energy consumption by industry
27.1 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.decc.gov.uk/en/content/cms/statistics/source/total/total.aspx) are compiled on an energy-supplied basis. Detailed data for individual fuels are converted from original units to tonnes of oil equivalent using gross calorific values and conversion factors appropriate to each category of fuel. The results are then aggregated according to the categories used in the tables. Gross calorific values represent the total energy content of the fuel, including the energy needed to evaporate the water present in the fuel (see also paragraph 1.52).

1.31 Estimated gross and net calorific values for 2011 are given on page 227. 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 228 and 229. This year, some revisions have been made to the net calorific values for certain waste and biofuels. To construct energy balances on an energy supplied basis calorific values are required for production, trade, and stocks, as follows:

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

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

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

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

Gases Although the original unit for gases is the cubic metre, figures for gases are generally presented in the fuel sections of this Digest in gigawatt hours (GWh), having been converted from cubic metres using gross calorific values provided by the industries concerned. Conversion factors between units of energy are given on the flap inside the back cover and on page 225.

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 225.

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 (38.0 per cent in 2011). (See Chapter 5, paragraphs 5.74 and 5.81).

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 3.44.

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 7.40 to 7.42. 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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx, shows the quantity of fuel by consuming sector used to produce heat that is subsequently sold.

II Energy balances (Tables 1.1, 1.2 and 1.3)

1.38 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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx). However, crude oil is treated differently, where the value is formed from price data taken from a census survey of refiners and volume data taken from Table 3.1. These values are considered to reflect the complete money chain more accurately than Tables G.1 to G.4. **Stock changes** are those for undistributed stocks except for coal where coke oven and generators stocks are included. A stock increase takes money out of the money chain and is therefore represented as a negative. **Distribution costs** are arrived at by removing an estimate of producers' value along with any taxes from the end user values shown. For most fuels, the estimate of producer value is derived from the consumption used for end use and the producer price taken from survey of producers. No sector breakdown is given for gas and electricity margins because it is not possible to accurately measure delivery costs for each sector. **Taxes** include VAT where not refundable and duties paid on downstream sales. Excluded are the gas and fossil fuel levies, petroleum revenue tax and production royalties and licence fees. The proceeds from the fossil fuel levy are redistributed across the electricity industry, whilst the rest are treated as part of the production costs.

Sales of electricity and gas by sector (Table 1.7)

1.45 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 2011 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 2011 – energy supplied basis

	Percentage of each fuel						Percentage of each sector					
	Industry	Transport	Domestic	Others	Total		Solid fuels	Petrol-eum	Gas	Secondary electricity	Bio-energy	Total
Solid fuels	69	0	30	1	100	Industry	7	17	41	33	2	100
Petroleum	7	86	4	2	100	Transport	0	97	-	1	2	100
Gas	25	-	59	15	100	Domestic	2	7	65	25	1	100
Electricity	32	1	35	31	100	Others	0	8	39	51	2	100
Bioenergy	21	44	22	13	100							
All fuels	**19**	**40**	**28**	**12**	**100**	**All users**	**2**	**45**	**31**	**20**	**2**	**100**

Table 1E: Total primary fuel consumption by final users in 2011 - primary input basis

	Percentage of each fuel						Percentage of each sector					
	Industry	Transport	Domestic	Others	Total		Coal	Petrol-eum	Gas	Primary electricity	Bio-energy	Total
Coal	35	1	35	30	100	Industry	24	11	48	12	4	100
Petroleum	8	85	5	3	100	Transport	1	96	1	-	2	100
Gas	29	-	49	22	100	Domestic	18	5	62	10	4	100
Primary electricity	32	1	35	31	100	Others	26	5	47	16	5	100
Bioenergy	28	16	31	25	100							
All fuels	**23**	**30**	**30**	**17**	**100**	**All users**	**16**	**34**	**38**	**9**	**4**	**100**

1.51 In 2011, every 1 toe of secondary electricity consumed by final users required, on average, 0.9 toe of coal, 0.9 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 2011

Percentage of each sector

	Solid fuels	Petroleum	Gas	Secondary electricity	Heat	Biofuels	Total
Industry	11	20	20	48	1	-	100
Transport	-	97	-	-	-	3	100
Domestic	1	6	42	50	-	-	100
Others	-	8	15	77	1	-	100
All users	**1**	**61**	**13**	**23**	**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 2.4, 2.5 and 2.6.

Coke and breeze – Coke, oven coke and hard coke breeze. Further details are given in Chapter 2, Tables 2.4, 2.5 and 2.6.

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

VI Classification of consumers

1.56 The Digest has been prepared, as far as is practicable, on the basis of the *Standard Industrial Classification (SIC)2007* (www.statistics.gov.uk/STATBASE/Product.asp?vlnk=14012). SIC(2007) replaced SIC(2003) on 1 January 2008, with energy statistics being compiled on the new basis from 2010. 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 Table 1G shows the categories of consumers together with their codes in SIC 2007. The coverage varies between tables (eg in some instances the 'other' category is split into major constituents, whereas elsewhere it may include transport). This is because the coverage is dictated by what data suppliers can provide. The table also shows the disaggregation available within industry. This disaggregation forms the basis of virtually all the tables that show a disaggregated industrial breakdown.

Table 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.

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.decc.gov.uk/en/content/cms/statistics/source/total/total.aspx. Quarterly figures are also published in DECC's quarterly statistical bulletin *Energy Trends* and *Quarterly Energy Prices*. See Annex C for more information about these bulletins.

VIII Statistical differences

1.62 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.

Contact: *Iain MacLeay*
Energy Statistics Team
iain.macleay@decc.gsi.gov.uk
0300 068 5048

Anwar Annut
Energy Statistics Team
anwar.annut@decc.gsi.gov.uk
0300 068 5060

1.1 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	-	45,288	5,751	17,468	-	-	136,990
Imports	21,399	35	62,917	24,942	50,251	1,890	-	747	-	162,180
Exports	-370	-357	-36,910	-30,300	-15,794	-184	-	-212	-	-84,127
Marine bunkers	-	-	-	-2,413	-	-	-	-	-	-2,413
Stock change(4)	+535	-385	667	+210	-1,945	-	-	-	-	-919
Primary supply	**33,144**	**-707**	**83,577**	**-7,562**	**77,799**	**7,457**	**17,468**	**535**	**-**	**211,711**
Statistical difference(5)	+25	-14	-326	-111	-145	-	-	-27	-	-598
Primary demand	**33,119**	**-693**	**83,903**	**-7,451**	**77,944**	**7,457**	**17,468**	**562**	**-**	**212,310**
Transfers	-	+5	-2,370	+2,356	-5	-	-1,843	+1,843	-	-14
Transformation	**-31,427**	**2,342**	**-81,533**	**80,525**	**-28,455**	**-4,906**	**-15,625**	**29,532**	**1,365**	**-48,182**
Electricity generation	-26,020	-640	-	-900	-26,420	-4,906	-15,625	29,532	-	-44,978
Major power producers	-25,221	-	-	-344	-23,697	-1,264	-15,625	26,839	-	-39,311
Autogenerators	-798	-640	-	-556	-2,723	-3,642	-	2,693	-	-5,667
Heat generation	-291	-51	-	-66	-2,035	-	-	-	1,365	-1,079
Petroleum refineries	-	-	-81,533	81,490	-	-	-	-	-	-42
Coke manufacture	-4,121	3,788	-	-	-	-	-	-	-	-333
Blast furnaces	-759	-980	-	-	-	-	-	-	-	-1,739
Patent fuel manufacture	-236	225	-	-	-	-	-	-	-	-10
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**660**	**-**	**5,189**	**5,161**	**-**	**-**	**2,171**	**94**	**13,277**
Electricity generation	-	-	-	-	-	-	-	1,415	-	1,415
Oil and gas extraction	-	-	-	571	4,571	-	-	50	-	5,192
Petroleum refineries	-	-	-	4,618	376	-	-	387	94	5,474
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**	**-**	**-**	**1,251**	**-**	**-**	**2,423**	**-**	**3,825**
Final consumption	**1,690**	**844**	**-**	**70,241**	**43,071**	**2,551**	**-**	**27,344**	**1,271**	**147,011**
Industry	**1,111**	**628**	**-**	**4,526**	**10,701**	**535**	**-**	**8,804**	**839**	**27,144**
Unclassified	-	184	-	2,404	2	535	-	-	-	3,125
Iron and steel	38	443	-	5	495	-	-	330	-	1,311
Non-ferrous metals	14	-	-	23	231	-	-	599	-	867
Mineral products	697	-	-	142	1,387	-	-	603	-	2,828
Chemicals	50	-	-	105	2,321	-	-	1,505	420	4,401
Mechanical engineering etc	8	-	-	67	571	-	-	634	-	1,279
Electrical engineering etc	3	-	-	32	298	-	-	550	-	883
Vehicles	37	-	-	78	666	-	-	446	-	1,227
Food, beverages etc	32	-	-	200	1,987	-	-	976	2	3,197
Textiles, leather etc	45	-	-	75	465	-	-	257	-	843
Paper, printing etc	71	-	-	36	1,312	-	-	938	1	2,358
Other industries	110	-	-	1,247	772	-	-	1,834	417	4,380
Construction	6	-	-	112	193	-	-	132	-	444
Transport *(6)*	**11**	**-**	**-**	**53,698**	**-**	**1,128**	**-**	**351**	**-**	**55,187**
Air	-	-	-	12,802	-	-	-	-	-	12,802
Rail	11	-	-	652	-	-	-	349	-	1,012
Road	-	-	-	38,646	-	1,128	-	2	-	39,775
National navigation	-	-	-	1,597	-	-	-	-	-	1,597
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**568**	**216**	**-**	**4,040**	**31,677**	**889**	**-**	**18,189**	**431**	**56,010**
Domestic	540	216	-	2,681	25,191	567	-	9,595	52	38,842
Public administration	18	-	-	366	2,680	112	-	1,591	376	5,144
Commercial	4	-	-	433	2,399	21	-	6,663	3	9,524
Agriculture	1	-	-	303	157	187	-	339	-	988
Miscellaneous	5	-	-	258	1,250	-	-	-	-	1,513
Non energy use	**-**	**-**	**-**	**7,977**	**693**	**-**	**-**	**-**	**-**	**8,669**

(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 5.11 regarding electricity use in transport and 6.24 regarding renewables use in transport.

1.2 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	5,135r	15,117r	-	-	157,892r
Imports	17,098r	88r	59,613	26,146r	50,688	1,925r	-	614	-	156,173r
Exports	-537	-370r	-46,153	-28,381	-15,168	-189r	-	-385	-	-91,184r
Marine bunkers	-	-	-	-2,251	-	-	-	-	-	-2,251
Stock change *(4)*	+4,608r	-152r	-41	+655	+1,313	-	-	-	-	+6,383r
Primary supply	**32,639r**	**-435r**	**82,402**	**-3,831r**	**94,020**	**6,871r**	**15,117r**	**229**	**-**	**227,012r**
Statistical difference *(5)*	-13r	-15	+10	+187r	-6r	-	-	-33r	-	+130r
Primary demand	**32,652r**	**-420r**	**82,393**	**-4,018r**	**94,026r**	**6,871r**	**15,117r**	**262r**	**-**	**226,882r**
Transfers	-	+23r	-2,484	+2,478	-23	-	-1,192r	+1,192r	-	-6r
Transformation	**-30,935r**	**2,180r**	**-79,909**	**78,447r**	**-34,161r**	**-4,360r**	**-13,925r**	**31,364r**	**1,361r**	**-49,939r**
Electricity generation	-25,556r	-673	-	-1,170r	-32,123r	-4,360r	-13,925r	31,364r	-	-46,443r
Major power producers	-24,774r	-	-	-628r	-29,420	-1,013	-13,925r	28,701r	-	-41,059r
Autogenerators	-782r	-673	-	-542r	-2,703r	-3,347	-	2,663r	-	-5,384r
Heat generation	-289r	-51	-	-66	-2,038r	-	-	-	1,361r	-1,085r
Petroleum refineries	-	-	-79,909	79,687	-	-	-	-	-	-222
Coke manufacture	-4,124	3,768r	-	-	-	-	-	-	-	-356r
Blast furnaces	-714	-1,110r	-	-4r	-	-	-	-	-	-1,828r
Patent fuel manufacture	-253	247	-	-	-	-	-	-	-	-5
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**680**	**-**	**5,257r**	**5,981r**	**-**	**-**	**2,222r**	**94r**	**14,238r**
Electricity generation	-	-	-	-	-	-	-	1,385r	-	1,385r
Oil and gas extraction	-	-	-	533r	5,256	-	-	48	-	5,837r
Petroleum refineries	-	-	-	4,724r	374r	-	-	433r	94r	5,626r
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	-	-	150r	-	438r
Losses	**-**	**168**	**-**	**-**	**1,611**	**-**	**-**	**2,325**	**-**	**4,104**
Final consumption	**1,713r**	**935r**	**-**	**71,649r**	**52,250r**	**2,511r**	**-**	**28,270r**	**1,266r**	**158,595r**
Industry	**1,136r**	**685r**	**-**	**5,098r**	**10,461r**	**482r**	**-**	**8,987r**	**822r**	**27,671r**
Unclassified	-	200	-	2,391r	2	482r	-	-	-	3,076r
Iron and steel	43	485r	-	5r	501	-	-	330r	-	1,364r
Non-ferrous metals	15	-	-	35	225	-	-	578r	-	853r
Mineral products	702	-	-	164	1,355r	-	-	625r	-	2,845r
Chemicals	51	-	-	130	2,226r	-	-	1,587r	415r	4,409r
Mechanical engineering etc	9	-	-	79	582r	-	-	658r	-	1,328r
Electrical engineering etc	3	-	-	37	292	-	-	572r	-	905r
Vehicles	36	-	-	92	648r	-	-	454r	-	1,230r
Food, beverages etc	29	-	-	234	1,927r	-	-	991r	1	3,182r
Textiles, leather etc	47	-	-	85	455	-	-	262r	-	849r
Paper, printing etc	71r	-	-	50r	1,288r	-	-	942r	1	2,352r
Other industries	127	-	-	1,668r	771r	-	-	1,848r	405r	4,819r
Construction	3	-	-	128	188	-	-	139r	-	459r
Transport *(6)*	**14**	**-**	**-**	**53,575r**	**-**	**1,214**	**-**	**350r**	**-**	**55,154r**
Air	-	-	-	12,288	-	-	-	-	-	12,288
Rail	14	-	-	659r	-	-	-	349r	-	1,021r
Road	-	-	-	39,159r	-	1,214	-	2	-	40,375r
National navigation	-	-	-	1,469	-	-	-	-	-	1,469
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**564r**	**250**	**-**	**4,678r**	**41,088r**	**814r**	**-**	**18,933r**	**444r**	**66,771r**
Domestic	536	250	-	3,427r	33,499	506r	-	10,217r	52	48,486r
Public administration	20r	-	-	312	3,295r	106r	-	1,642r	382r	5,757r
Commercial	2	-	-	379	2,733r	20r	-	6,727r	10r	9,871r
Agriculture	1	-	-	312	169	183r	-	346	-	1,012r
Miscellaneous	4	-	-	248r	1,392r	-	-	-	-	1,645r
Non energy use	**-**	**-**	**-**	**8,299r**	**701r**	**-**	**-**	**-**	**-**	**8,999r**

(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 5.11 regarding electricity use in transport and 6.24 regarding renewables use in transport.

1.3 Aggregate energy balance 2009
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	11,039	-	74,739	-	59,737	4,900r	16,481r	-	-	166,896r
Imports	24,688r	131r	59,395	24,183r	39,191	1,311r	-	568	-	149,468r
Exports	-489	-128r	-49,452	-27,998	-11,788	-46r	-	-322	-	-90,223r
Marine bunkers	-	-	-	-2,615	-	-	-	-	-	-2,615
Stock change(4)	-4,208	-r	+594	+365	-419	-	-	-	-	-3,669r
Primary supply	**31,029r**	**3r**	**85,276**	**-6,064r**	**86,720**	**6,166r**	**16,481r**	**246**	**-**	**219,857r**
Statistical difference(5)	-406r	-12	+73	-39r	+7	-	-	+13r	-	-365r
Primary demand	**31,435r**	**15r**	**85,204**	**-6,025r**	**86,713**	**6,166r**	**16,481r**	**233r**	**-**	**220,222r**
Transfers	-	+30r	-3,088	+3,089	-30	-	-1,252r	+1,252r	-	+2r
Transformation	**-29,699r**	**1,556r**	**-82,116**	**80,197r**	**-32,851**	**-3,947r**	**-15,229**	**30,828r**	**1,301**	**-49,961r**
Electricity generation	-24,646r	-772	-	-1,522r	-30,894	-3,947r	-15,229	30,828r	-	-46,183r
Major power producers	-23,775r	-	-	-1,023r	-28,224	-744	-15,229	28,159r	-	-40,835r
Autogenerators	-871r	-772	-	-499	-2,670	-3,204r	-	2,668r	-	-5,348r
Heat generation	-296r	-51	-	-65	-1,957	-	-	-	1,301	-1,068
Petroleum refineries	-	-	-82,116	81,851r	-	-	-	-	-	-265r
Coke manufacture	-3,847	3,444r	-	-	-	-	-	-	-	-402r
Blast furnaces	-664	-1,301r	-	-66r	-	-	-	-	-	-2,031r
Patent fuel manufacture	-247	236	-	-	-	-	-	-	-	-11
Other	-	-	-	-	-	-	-	-	-	-
Energy industry use	**3**	**699**	**-**	**5,112**	**5,938**	**-**	**-**	**2,236r**	**94**	**14,083r**
Electricity generation	-	-	-	-	-	-	-	1,425r	-	1,425r
Oil and gas extraction	-	-	-	486	5,255	-	-	51	-	5,792
Petroleum refineries	-	-	-	4,626	337	-	-	389	94	5,446
Coal extraction	3	-	-	-	8	-	-	80	-	91
Coke manufacture	-	378	-	-	-	-	-	8	-	385
Blast furnaces	-	321	-	-	39	-	-	40	-	400
Patent fuel manufacture	-	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	100	-	100
Other	-	-	-	-	301	-	-	144	-	445
Losses	**-**	**69**	**-**	**-**	**1,406**	**-**	**-**	**2,411r**	**-**	**3,886r**
Final consumption	**1,733**	**834r**	**-**	**72,149r**	**46,487**	**2,219r**	**-**	**27,665r**	**1,206**	**152,293r**
Industry	**1,152**	**617r**	**-**	**5,032r**	**10,009**	**446r**	**-**	**8,576r**	**763**	**26,594r**
Unclassified	-	207r	-	2,368	2	446r	-	-	-	3,024
Iron and steel	44	409r	-	54	433	-	-	311	-	1,251r
Non-ferrous metals	17	-	-	44	214	-	-	522r	-	797r
Mineral products	711	-	-	171	1,302	-	-	603	-	2,788
Chemicals	49	-	-	140	2,205	-	-	1,522r	347	4,263
Mechanical engineering etc	10	-	-	87	552	-	-	661	-	1,310
Electrical engineering etc	3	-	-	41	281	-	-	555	-	880
Vehicles	32	-	-	102	623	-	-	431	-	1,189
Food, beverages etc	33	-	-	241	1,805	-	-	924	1	3,004
Textiles, leather etc	49	-	-	91	446	-	-	259r	-	845r
Paper, printing etc	71	-	-	59	1,239	-	-	952r	-	2,320r
Other industries	130	-	-	1,496r	723	-	-	1,700r	415	4,464r
Construction	3	-	-	138	183	-	-	136	-	461
Transport *(6)*	**13**	**-**	**-**	**54,661r**	**-**	**1,038**	**-**	**347r**	**-**	**56,060r**
Air	-	-	-	12,751	-	-	-	-	-	12,751
Rail	13	-	-	650r	-	-	-	346r	-	1,009r
Road	-	-	-	39,635r	-	1,038	-	2	-	40,675r
National navigation	-	-	-	1,625	-	-	-	-	-	1,625
Pipelines	-	-	-	-	-	-	-	-	-	-
Other	**567r**	**217**	**-**	**4,254**	**35,790**	**734r**	**-**	**18,742**	**444**	**60,748r**
Domestic	514	217	-	3,012	28,590	466r	-	10,193	52	43,044r
Public administration	17	-	-	370	3,189	97	-	1,672	382	5,726r
Commercial	35	-	-	359	2,520	14r	-	6,551	9	9,487r
Agriculture	-	-	-	285	160	157r	-	327	-	928r
Miscellaneous	2	-	-	228	1,331	-	-	-	-	1,562
Non energy use	**-**	**-**	**-**	**8,202**	**688**	**-**	**-**	**-**	**-**	**8,890**

(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 5.11 regarding electricity use in transport and 6.24 regarding renewables use in transport.

1.4 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	1,195	290	25,505	48,770	7,960	13,110	295	325	97,450
Imports	3,050	10	30,045	16,130	9,050	440	-	655	59,375
Exports	-65	-100	-17,590	-20,155	-3,115	-140	-	-	-41,160
Marine bunkers	-	-	-	-1,175	-	-	-	-	-1,175
Stock change	55	-10	280	95	-385	-	-	-	35
Basic value of inland consumption	**4,240**	**190**	**38,240**	**43,670**	**13,505**	**13,410**	**295**	**975**	**114,530**
Tax and margins									
Distribution costs and margins	**955**	**30**	**-**	**3,025**	**9,255**	**16,725**	**-**	**110**	**30,095**
Electricity generation	505	-	-	40	-	-	-	-	545
Solid fuel manufacture	265	-	-	-	-	-	-	-	265
of which iron & steel sector	230	-	-	-	-	-	-	-	230
Iron & steel final use	45	15	-	-	-	-	-	-	60
Other industry	30	5	-	430	-	-	-	-	465
Air transport	-	-	-	260	-	-	-	-	260
Rail and national navigation	-	-	-	95	-	-	-	-	95
Road transport	-	-	-	1,505	-	-	-	110	1,615
Domestic	105	15	-	195	-	-	-	-	315
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	5	-	-	85	-	-	-	-	85
Non energy use	-	-	-	390	175	-	-	-	565
VAT and duties	**10**	**5**	**-**	**38,880**	**585**	**700**	**-**	**1,280**	**41,465**
Electricity generation	-	-	-	50	-	-	-	-	50
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	250	-	-	-	-	250
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	260	-	-	-	-	260
Road transport	-	-	-	38,070	-	-	-	1,275	39,345
Domestic	10	5	-	100	585	700	-	5	1,405
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	125	-	-	-	-	125
Climate Change Levy	**5**	**-**	**-**	**-**	**175**	**500**	**-**	**-**	**680**
Total tax and margins	**970**	**35**	**-**	**41,910**	**10,015**	**17,925**	**-**	**1,390**	**72,245**
Market value of inland consumption	**5,210**	**230**	**38,240**	**85,580**	**23,520**	**31,335**	**295**	**2,365**	**186,775**
Energy end use									
Total energy sector	**4,500**	**-**	**38,240**	**780**	**6,445**	**325**	**20**	**130**	**50,440**
Transformation	4,500	-	38,240	465	6,325	-	-	130	49,665
Electricity generation	3,315	-	-	435	5,870	-	-	130	9,750
of which from stocks	110	-	-	-	-	-	-	-	110
Heat Generation	40	-	-	35	455	-	-	-	525
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	**-**	**-**	**-**	**310**	**120**	**325**	**20**	**-**	**775**
Oil & gas extraction	-	-	-	310	-	45	-	-	355
Petroleum refineries	-	-	-	-	85	215	20	-	320
Coal extraction	-	-	-	-	-	65	-	-	65
Other energy sector	-	-	-	-	35	-	-	-	35
Total non energy sector use	**710**	**230**	**-**	**81,700**	**16,900**	**31,010**	**275**	**2,235**	**133,060**
Industry	**440**	**115**	**-**	**2,695**	**2,710**	**6,545**	**185**	**25**	**12,715**
Iron & steel final use	205	105	-	5	130	110	-	-	550
Other industry	240	10	-	2,695	2,580	6,435	185	25	12,165
Transport	**-**	**-**	**-**	**76,390**	**-**	**300**	**-**	**2,150**	**78,840**
Air	-	-	-	7,595	-	-	-	-	7,595
Rail and national navigation	-	-	-	1,440	-	300	-	-	1,740
Road	-	-	-	67,355	-	-	-	2,150	69,510
Other final users	**270**	**115**	**-**	**2,615**	**14,190**	**24,165**	**95**	**60**	**41,500**
Domestic	260	115	-	1,685	12,310	14,695	10	60	29,135
Agriculture	-	-	-	185	55	405	-	-	645
Commercial and other services	5	-	-	745	1,825	9,070	80	-	11,725
Total value of energy end use	**5,210**	**230**	**38,240**	**82,480**	**23,345**	**31,335**	**295**	**2,365**	**183,500**
Value of non energy end use	**-**	**-**	**-**	**3,100**	**175**	**-**	**-**	**-**	**3,275**
Market value of inland consumption	**5,210**	**230**	**38,240**	**85,580**	**23,520**	**31,335**	**295**	**2,365**	**186,775**

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

1.5 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	1,025r	330	22,825r	38,010r	7,675r	14,725r	295r	295r	85,185r
Imports	2,080r	20	21,115r	12,305r	6,850r	325	-	515r	43,210r
Exports	-85	-110	-16,265r	-14,960r	-2,190r	-205	-	-	-33,820r
Marine bunkers	-	-	-	-860	-	-	-	-	-860
Stock change	360	-15	65	300	200	-	-	-	905
Basic value of inland consumption	**3,380r**	**225**	**27,735r**	**34,795r**	**12,530r**	**14,850r**	**295r**	**810r**	**94,620r**
Tax and margins									
Distribution costs and margins	**750r**	**25**	**-**	**2,600r**	**11,115r**	**14,490r**	**-**	**100**	**29,085r**
Electricity generation	350	-	-	30	-	-	-	-	380
Solid fuel manufacture	200	-	-	-	-	-	-	-	200
of which iron & steel sector	175	-	-	-	-	-	-	-	175
Iron & steel final use	35	5	-	-r	-	-	-	-	45r
Other industry	25r	5	-	470r	-	-	-	-	500r
Air transport	-	-	-	180	-	-	-	-	180
Rail and national navigation	-	-	-	80	-	-	-	-	80
Road transport	-	-	-	1,220r	-	-	-	100	1,320r
Domestic	140	15	-	245r	-	-	-	-	400r
Agriculture	-	-	-	15	-	-	-	-	15
Commercial and other services	-	-	-	50	-	-	-	-	50
Non energy use	-	-	-	310r	145r	-	-	-	455r
VAT and duties	**10**	**5**	**-**	**37,225r**	**680**	**670r**	**-**	**1,260r**	**39,855r**
Electricity generation	-	-	-	65	-	-	-	-	65
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	310r	-	-	-	-	310r
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	240	-	-	-	-	240
Road transport	-	-	-	36,365r	-	-	-	1,255	37,620r
Domestic	10	5	-	105	680	670r	-	5	1,475
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	110	-	-	-	-	110
Climate Change Levy	**5**	**-**	-	-	**180**	**485**	-	-	**670**
Total tax and margins	**765r**	**30**	**-**	**39,830r**	**11,975r**	**15,650r**	**-**	**1,360r**	**69,605r**
Market value of inland consumption	**4,145r**	**255**	**27,735r**	**74,625r**	**24,505r**	**30,495**	**295r**	**2,170r**	**164,225r**
Energy end use									
Total energy sector	**3,470**	**-**	**27,735r**	**675**	**5,910r**	**330**	**20**	**100r**	**38,240r**
Transformation	3,470	-	27,735r	460r	5,795r	-	-	100r	37,565r
Electricity generation	2,570	-	-	435	5,450r	-	-	100r	8,555r
of which from stocks	85	-	-	-	-	-	-	-	85
Heat Generation	30	-	-	25	345r	-	-	-	405
Petroleum refineries	-	-	27,735r	-	-	-	-	-	27,735r
Solid fuel manufacture	875	-	-	-	-	-	-	-	875
of which iron & steel sector	765	-	-	-	-	-	-	-	765
Other energy sector use	**-**	**-**	**-**	**215r**	**115r**	**330**	**20**	**-**	**675r**
Oil & gas extraction	-	-	-	215r	-	40	-	-	255
Petroleum refineries	-	-	-	-	65r	220	20	-	305r
Coal extraction	-	-	-	-	-	70	-	-	70
Other energy sector	-	-	-	-	50	-	-	-	50
Total non energy sector use	**675r**	**255**	**-**	**71,535r**	**18,450r**	**30,165r**	**275r**	**2,070r**	**123,425r**
Industry	**420r**	**130**	**-**	**2,440r**	**2,185r**	**6,335r**	**180r**	**25**	**11,715r**
Iron & steel final use	150	115	-	5r	110r	100r	-	-	475r
Other industry	270r	15	-	2,435r	2,080r	6,235r	180r	25	11,240r
Transport	**-**	**-**	**-**	**66,690r**	**-**	**280**	**-**	**1,990r**	**68,960r**
Air	-	-	-	5,940	-	-	-	-	5,940
Rail and national navigation	-	-	-	1,110	-	280	-	-	1,390r
Road	-	-	-	59,645r	-	-	-	1,990r	61,635r
Other final users	**255**	**125**	**-**	**2,405r**	**16,265r**	**23,555r**	**95r**	**55**	**42,750**
Domestic	250	125	-	1,730	14,275r	14,085r	10	55	**30,525r**
Agriculture	-	-	-	150	55	405r	-	-	610r
Commercial and other services	5	-	-	530	1,935r	9,060r	85r	-	11,610r
Total value of energy end use	**4,145r**	**255**	**27,735r**	**72,210r**	**24,360r**	**30,495**	**295r**	**2,170r**	**161,665r**
Value of non energy end use	**-**	**-**	**-**	**2,415r**	**145r**	**-**	**-**	**-**	**2,560r**
Market value of inland consumption	**4,145r**	**255**	**27,735r**	**74,625r**	**24,505r**	**30,495**	**295r**	**2,170r**	**164,225r**

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

1.6 Value balance of traded energy in 2009[1]

£million

	Coal	Manufactured solid fuels	Crude oil	Petroleum products	Natural gas	Electricity	Heat sold	Other fuels	Total
Supply									
Indigenous production	710r	200	18,050r	28,565r	6,645r	14,165r	205	245r	68,790r
Imports	2,720r	35	17,060r	9,470	4,775	260	-	320	34,630r
Exports	-75r	-30	-13,180r	-11,375	-1,420	-160	-	-	-26,245r
Marine bunkers	-	-	-	-760	-	-	-	-	-760
Stock change	-295	10	115	90	-55r	-	-	-	-130
Basic value of inland consumption	**3,060r**	**215**	**22,040**	**25,990r**	**9,945r**	**14,260r**	**205**	**565r**	**76,285r**
Tax and margins									
Distribution costs and margins	**625r**	**30**	**-**	**3,195r**	**11,925r**	**16,235r**	**-**	**70**	**32,080r**
Electricity generation	250	-	-	30	-	-	-	-	280
Solid fuel manufacture	200	-	-	-	-	-	-	-	200
of which iron & steel sector	175	-	-	-	-	-	-	-	175
Iron & steel final use	30	5	-	20r	-	-	-	-	60r
Other industry	10r	10	-	450r	-	-	-	-	465r
Air transport	-	-	-	235	-	-	-	-	235
Rail and national navigation	-	-	-	85	-	-	-	-	85
Road transport	-	-	-	1,790r	-	-	-	70	1,860r
Domestic	135	10	-	225	-	-	-	-	370
Agriculture	-	-	-	15	-	-	-	-	15
Commercial and other services	-	-	-	50	-	-	-	-	50
Non energy use	-	-	-	300	155r	-	-	-	455r
VAT and duties	**10**	**5**	**-**	**33,580r**	**600**	**690**	**-**	**930**	**35,815r**
Electricity generation	-	-	-	80	-	-	-	-	80
Iron & steel final use	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	285r	-	-	-	-	285r
Air transport	-	-	-	10	-	-	-	-	10
Rail and national navigation	-	-	-	245	-	-	-	-	245
Road transport	-	-	-	32,755r	-	-	-	925	33,680r
Domestic	10	5	-	75	600	690	-	-	1,385
Agriculture	-	-	-	20	-	-	-	-	20
Commercial and other services	-	-	-	105	-	-	-	-	105
Climate Change Levy	**5**	**-**	**-**	**-**	**170**	**530**	**-**	**-**	**705**
Total tax and margins	**640r**	**35**	**-**	**36,775r**	**12,695r**	**17,455r**	**-**	**1,000**	**68,600r**
Market value of inland consumption	**3,700r**	**250**	**22,040**	**62,765r**	**22,640r**	**31,715r**	**205**	**1,565r**	**144,885r**
Energy end use									
Total energy sector	**3,030r**	**-**	**22,040**	**590**	**5,455**	**390**	**-**	**90r**	**31,600r**
Transformation	3,030r	-	22,040	445r	5,350	-	-	90r	30,955r
Electricity generation	2,125r	-	-	425	5,030	-	-	90r	7,675r
of which from stocks	45	-	-	-	-	-	-	-	45
Heat Generation	25	-	-	20	320	-	-	-	365
Petroleum refineries	-	-	22,040	-	-	-	-	-	22,040
Solid fuel manufacture	880	-	-	-	-	-	-	-	880
of which iron & steel sector	770	-	-	-	-	-	-	-	770
Other energy sector use	**-**	**-**	**-**	**150**	**105**	**390**	**-**	**-**	**640**
Oil & gas extraction	-	-	-	150	-	45	-	-	195
Petroleum refineries	-	-	-	-	55	275	-	-	330
Coal extraction	-	-	-	-	-	70	-	-	70
Other energy sector	-	-	-	-	50	-	-	-	50
Total non energy sector use	**670r**	**250**	**-**	**59,860r**	**17,030r**	**31,330r**	**205**	**1,475r**	**110,810r**
Industry	**425r**	**140**	**-**	**2,020r**	**2,290r**	**6,775r**	**130**	**20**	**11,800r**
Iron & steel final use	140	120	-	45r	100r	85r	-	-	490r
Other industry	280r	20	-	1,975r	2,190r	6,690r	130	20	11,310r
Transport	**-**	**-**	**-**	**56,030r**	**-**	**335r**	**-**	**1,405**	**57,770r**
Air	-	-	-	4,425	-	-	-	-	4,425
Rail and national navigation	-	-	-	975r	-	335r	-	-	1,305r
Road	-	-	-	50,630r	-	-	-	1,405	52,035r
Other final users	**245**	**105**	**-**	**1,810**	**14,735**	**24,220r**	**75**	**50**	**41,245r**
Domestic	245	105	-	1,245	12,605	14,535	10	50	28,795
Agriculture	-	-	-	120	55	395r	-	-	570r
Commercial and other services	5	-	-	445	2,075	9,290r	65	-	11,875r
Total value of energy end use	**3,700r**	**250**	**22,040**	**60,450r**	**22,485r**	**31,715r**	**205**	**1,565r**	**142,410r**
Value of non energy end use	**-**	**-**	**-**	**2,315**	**155r**	**-**	**-**	**-**	**2,475r**
Market value of inland consumption	**3,700r**	**250**	**22,040**	**62,765r**	**22,640r**	**31,715r**	**205**	**1,565r**	**144,885r**

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

1.7 Sales of electricity and gas by sector

United Kingdom

	2007	2008	2009	2010	2011
Total selling value (£ million)[1]					
Electricity generation - Gas	4,391	6,185	5,032	5,449r	5,870
Industrial - Gas	2,020	3,165	2,285r	2,177r	2,703
- Electricity	7,292	9,078r	7,163r	6,663r	6,867
of which:					
Fuel industries	323	359	389	329	323
Industrial sector	6,969	8,719r	6,774r	6,334r	6,545
Domestic sector - Gas	9,475	11,497	12,007	13,595r	11,724
- Electricity	11,943	13,569	13,843	13,413r	13,995
Other - Gas	2,145	2,472	2,305	2,151r	1,972
- Electricity	7,056	8,229	10,018r	9,750r	9,773
of which:					
Agricultural sector	369	416	396r	407r	403
Commercial sector	5,033	6,182	7,777r	7,776r	7,762
Transport sector	494	289r	335r	280r	301
Public lighting	151	177	173r	147r	151
Public admin. and other services	1,009	1,165	1,337r	1,139r	1,155
Total, all consumers	**44,321**	**54,195r**	**52,654r**	**53,198r**	**52,905**
of which gas	**18,030**	**23,320**	**21,629r**	**23,372r**	**22,270**
of which electricity	**26,290**	**30,875r**	**31,025r**	**29,825r**	**30,635**
Average net selling value per kWh sold (pence)[1]					
Electricity generation - Gas	1.236	1.644	1.403	1.461	1.914
Industrial - Gas	1.515	2.283	1.963r	1.790r	2.172
- Electricity	6.895	8.454	7.540r	6.733r	7.149
of which:					
Fuel industries	6.778	7.564	8.570	7.259	7.556
Industrial sector	6.901	8.495	7.488r	6.707r	7.130
Domestic sector - Gas	2.685	3.198	3.611	3.490r	4.002
- Electricity	9.729	11.326	11.678	11.289r	12.554
Other - Gas	2.262	2.585	2.753	2.437	2.615
- Electricity	6.856	7.861	9.995r	9.545r	9.726
of which:					
Agricultural sector	8.944	10.232	10.410r	10.110r	10.220
Commercial sector	6.891	7.883	10.410r	10.110r	10.220
Transport sector	6.567	7.329	8.290r	6.880r	7.390
Public lighting	6.797	7.775	8.540r	7.510r	7.910
Public admin. and other services	6.373	7.291	8.540r	7.510r	7.910
Average, all consumers	**3.497**	**4.163r**	**4.369r**	**4.116r**	**4.777**
of which gas	**1.926**	**2.404**	**2.427**	**2.403r**	**2.785**
of which electricity	**7.937**	**9.303**	**9.887r**	**9.323r**	**9.945**

(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

	2007	2008	2009	2010	2011
Iron and steel and non-ferrous metals					
Coal	76	69	60	58	51
Manufactured solid fuels *(2)*	451	378	332r	301r	281
Blast furnace gas	48	40	29	87	97
Coke oven gas	101	92	49	97	65
Natural gas	876	852	647	726	726
Petroleum	115	109	98	39r	28
Electricity	1,060	1,036r	833r	909r	930
Total iron and steel and non-ferrous metals	**2,727**	**2,575r**	**2,048r**	**2,217r**	**2,179**
Chemicals					
Coal	76	65	49	51	50
Natural gas	2,592	2,681	2,205	2,226r	2,321
Petroleum	192	175	140	130	105
Electricity	1,737	1,744r	1,522r	1,587r	1,505
Heat purchased from other sectors *(3)*	480	592	347	415r	420
Total chemicals	**5,075**	**5,258**	**4,263**	**4,409r**	**4,401**
Metal products, machinery and equipment					
Coal	45	48	45	48	48
Natural gas	1,714	1,738	1,457	1,522r	1,535
Petroleum	264	259	230	208	176
Electricity	1,846	1,876	1,647	1,685	1,630
Heat purchased from other sectors *(3)*	3	4	-	-	-
Total metal products, machinery and equipment	**3,873**	**3,926**	**3,379r**	**3,463r**	**3,389**
Food, beverages and tobacco					
Coal	25	28	33	29	32
Natural gas	1,975	2,095	1,805	1,927r	1,987
Petroleum	282	292	241	234	200
Electricity	1,039	1,054	924	991r	976
Heat purchased from other sectors *(3)*	2	10	1	1	2
Total food, beverages and tobacco	**3,322**	**3,478**	**3,004**	**3,182r**	**3,197**

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

	2007	2008	2009	2010	2011
Paper, printing and publishing					
Coal	101	105	71	71r	71
Natural gas	1,334	1,428	1,239	1,288r	1,312
Petroleum	66r	65	59	50r	36
Electricity	1,096	1,106	952r	942r	938
Heat purchased from other sectors *(3)*	1	1	-	1	1
Total paper, printing and publishing	**2,597r**	**2,704**	**2,320r**	**2,352r**	**2,358**
Other industries					
Coal	945	981	893	879	859
Natural gas	2,972	3,129	2,655	2,769r	2,817
Petroleum	2,512r	2,270r	1,896r	2,045r	1,576
Electricity	2,922r	2,998r	2,698r	2,875r	2,826
Heat purchased from other sectors *(3)*	411	413	415	405r	417
Total other industries	**9,762r**	**9,791r**	**8,557r**	**8,972r**	**8,494**
Unclassified					
Manufactured solid fuels *(2)*	239	239	207r	200	184
Coke oven gas	-	-	-	-	-
Natural gas	3	3	2	2	2
Petroleum	2,647	2,383	2,368	2,391r	2,404
Bioenergy & waste	276	449	446r	482r	535
Total unclassified	**3,166**	**3,074**	**3,024**	**3,076r**	**3,125**
Total					
Coal	1,268	1,296	1,152	1,136r	1,111
Manufactured solid fuels *(2)*	690	617	539r	502r	466
Blast furnace gas	48	40	29	87	97
Coke oven gas	101	92	49	97	65
Natural gas	11,466	11,925	10,009	10,461r	10,701
Petroleum	6,077r	5,552r	5,032r	5,098r	4,526
Bioenergy & waste	276	449	446r	482r	535
Electricity	9,699r	9,815r	8,576r	8,987r	8,804
Heat purchased from other sectors *(3)*	896	1,021	763	822r	839
Total	**30,522r**	**30,807r**	**26,594r**	**27,671r**	**27,144**

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

Thousand tonnes of oil equivalent
(except where shown otherwise)

	2007	2008	2009	2010	2011
Iron and steel and non-ferrous metals					
Coal	767	801	706	633	651
Blast furnace gas	767	664	546	453	421
Coke oven gas	169	168	200	196	190
Natural gas	37	57	43	40	34
Petroleum	28	44	54	9	6
Other (including renewables) *(2)*	56	54	55	51	60
Total fuel input *(3)*	**1,824**	**1,789**	**1,605**	**1,381**	**1,363**
Electricity generated by iron & steel and non-ferrous	**476**	**485**	**459**	**425**	**428**
metals *(4)* *(in GWh)*	5,536	5,637	5,337	4,946	4,976
Electricity consumed by iron and steel and non-ferrous	**399**	**388**	**326**	**335**	**350**
metals from own generation *(5)* *(in GWh)*	4,639	4,509	3,795	3,895	4,065
Chemicals					
Coal	110	110	109	110	110
Natural gas	759	719	684	731r	766
Petroleum	8	7	6	11	6
Other (including renewables) *(2)*	103	89	94	83r	83
Total fuel input *(3)*	**979**	**925**	**892**	**935r**	**964**
Electricity generated by chemicals *(4)*	**426**	**402**	**376**	**407r**	**415**
(in GWh)	4,957	4,669	4,372	4,729r	4,830
Electricity consumed by chemicals from own generation *(5)*	**273**	**243**	**170**	**224r**	**228**
(in GWh)	3,179	2,821	1,979	2,610r	2,650
Metal products, machinery and equipment					
Coal	-	-	-	-	-
Natural gas	77	81	72	58r	57
Petroleum	6	6	6	6	6
Other (including renewables) *(2)*	-	-	-	-	-
Total fuel input *(3)*	**83**	**87**	**78**	**63r**	**63**
Electricity generated by metal products, machinery	**44**	**49**	**46**	**37r**	**36**
and equipment *(4)* *(in GWh)*	514	573	530	435r	419
Electricity consumed by metal products, machinery	**37**	**47**	**38**	**32r**	**31**
and equipment from own generation *(5)* *(in GWh)*	433	550	443	376r	361
Food, beverages and tobacco					
Coal	5	3	4	4	4
Natural gas	371	350	374	375r	384
Petroleum	5	3	5	6r	4
Other (including renewables) *(2)*	-	-	-	-	0
Total fuel input *(3)*	**380**	**356**	**383**	**384r**	**392**
Electricity generated by food, beverages and tobacco *(4)*	**184**	**172**	**186**	**184r**	**189**
(in GWh)	2,141	2,006	2,162	2,139r	2,201
Electricity consumed by food, beverages and tobacco	**117**	**113**	**83**	**109r**	**113**
from own generation *(5)* *(in GWh)*	1,364	1,316	959	1,264r	1,309

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

	2007	2008	2009	2010	2011
Paper, printing and publishing					
Coal	41	52	48	32	30
Natural gas	827	561	503	382r	386
Petroleum	2	1	1	1	0
Other (including renewables) *(2)*	7	5	5	6	6
Total fuel input *(3)*	**877**	**619**	**556**	**420r**	**421**
Electricity generated by paper, printing and publishing *(4)*	**386**	**286**	**249**	**200r**	**198**
(in GWh)	4,492	3,320	2,899	2,326r	2,297
Electricity consumed by paper, printing and publishing from own generation *(5)*	**281**	**186**	**163**	**111r**	**127**
(in GWh)	3,266	2,168	1,894	1,292r	1,476
Other industries					
Coal	-	-	-		-
Coke oven gas	24	26	25	25	28
Natural gas	147	159	122	103r	76
Petroleum	4	5	4	4r	3
Other (including renewables) *(2)*	1,698	1,740	1,820	1,873r	1,881
Total fuel input *(3)*	**1,874**	**1,929**	**1,972**	**2,004r**	**1,988**
Electricity generated by other industries *(4)*	**134**	**138**	**121**	**118r**	**117**
(in GWh)	1,555	1,610	1,412	1,371r	1,358
Electricity consumed by other industries from own generation *(5)*	**90**	**71**	**77**	**101r**	**104**
(in GWh)	1,047	827	899	1,180r	1,208
Total					
Coal	922	966	867	778	795
Blast furnace gas	767	664	546	453	421
Coke oven gas	194	195	226	221	218
Natural gas	2,217	1,927	1,798	1,687r	1,703
Petroleum	52	66	75	35r	25
Other (including renewables) *(2)*	1,864	1,888	1,939	2,013r	2,030
Total fuel input *(3)*	**6,015**	**5,705**	**5,485**	**5,187r**	**5,192**
Electricity generated *(4)*	**1,651**	**1,532**	**1,437**	**1,371r**	**1,383**
(in GWh)	19,196	17,815	16,710	15,947r	16,081
Electricity consumed from own generation *(5)*	**1,198**	**1,048**	**857**	**913r**	**952**
(in GWh)	13,926	12,191	9,969	10,616r	11,069

(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	**2007**	**2008**	**2009**	**2010**	**2011**
All industry	6,015	5,705	5,485	5,187r	5,192
Fuel industries	1,574	1,253	1,083	1,294r	1,436
Transport, Commerce and Administration	244	237	298	267r	275
Services	986	1,150	1,566	1,625r	1,719
Total fuel input	**8,819**	**8,345**	**8,432**	**8,374r**	**8,622**
Electricity generated	**3,041**	**2,869**	**2,946**	**2,934r**	**3,061**
Electricity consumed	**1,824**	**1,569**	**1,398**	**1,473r**	**1,482**
					GWh
Electricity generated	**35,370**	**33,369**	**34,257**	**34,123r**	**35,604**
Electricity consumed	**21,216**	**18,243**	**16,255**	**17,128r**	**17,232**

Chapter 2
Solid fuels and derived gases

Key points

- In 2011 UK coal production increased by 1.1 per cent on 2010, with an increase in surface mine production (including an estimate for slurry) of 2.6 per cent, counteracting a decline in deep mined production of 1.1 per cent (Table 2.7).
- Coal imports have exceeded UK coal production since 2003. In 2011 UK imports were 33 million tonnes, an increase of 23 per cent on 2010 (27 million tonnes) but a decrease of 36 per cent on the 2006 record of 51 million tonnes (Table 2.7).
- Since 2005, nearly half of the UK's coal imports (mainly steam coal) have come from Russia, with Australia, Colombia, the USA and the Republic of South Africa being the other main suppliers (Table 2B).
- Demand for coal in 2011 was 52 million tonnes, showing little change on 2010 (Table 2.7).
- During the last ten years, over 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 2.7).
- Coal stocks decreased by 5 per cent in 2011 compared to levels at the end of 2010. (Table 2.7).

Introduction

2.1 This chapter presents statistics on supply and demand for coal during the period 2009 to 2011 by grade of coal (steam coal, anthracite and coking coal). These are shown as commodity balances in Tables 2.1 to 2.3. Table 2.7 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 but for the latest five years.

2.2 UK production and employment categorised by type of mine and devolved administration during 2008 to 2011 (Table 2A).

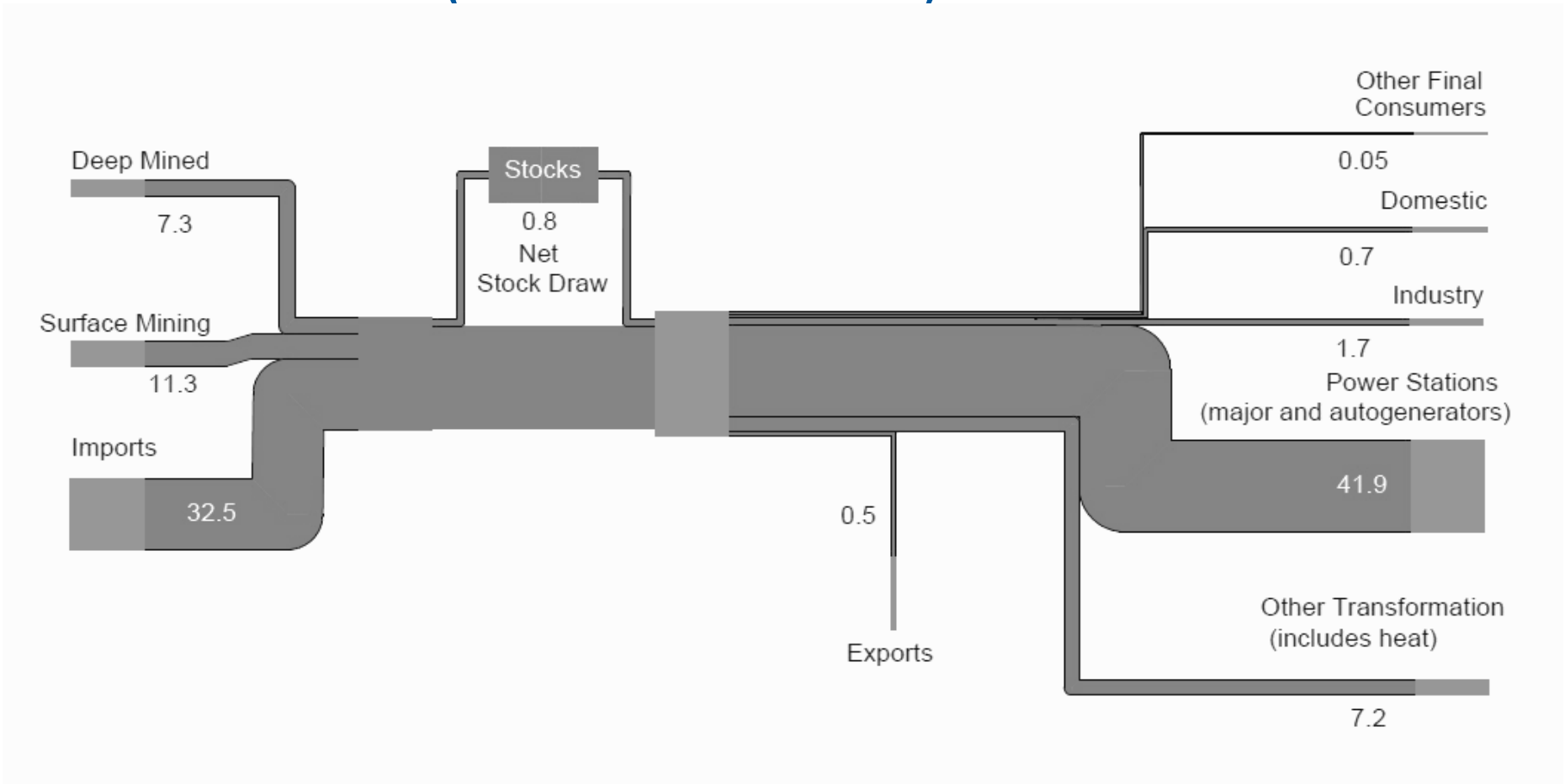
2.3 Imports of coal in 2011 split by grade of coal and country of origin (Table 2B).

2.4 Map 2A presents all UK coal production sites and ports of entry for international trade.

2.5 Energy flow chart for 2011 (page 42), showing the flows of coal from production and imports through to consumption. This is a way of simplifying the figures that can be found in the commodity balance for coal in Table 2.7. 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).

2.6 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 commodity balances in Tables 2.4 to 2.6 and Tables 2.8 to 2.9 shows for the latest five years.

Coal flow chart 2011 (million tonnes of coal)



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

2.7 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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

2.8 Detailed statistics on imports and exports of solid fuels are in Annex G (Table G5), available on the DECC energy statistics web site at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Coal (Tables 2.1, 2.2, 2.3 and 2.7)

Coal Production and Trade

2.9 UK coal production has seen a general decline since 1952, where levels peaked at 228 million tonnes. Production levels also plummeted in 1984 as a result of the miners' strike before recovering fairly quickly to levels recorded pre-1984, and then fell again in the early 1990s. Figures for 2011 show that coal production (including an estimate for slurry) increased by a small amount on 2010 (1.1 per cent) to 19 million tonnes (Chart 2.1).

2.10 **Deep mined** production, which contributed 14 per cent to UK coal supply in 2011, fell by 1.1 per cent on 2010. In contrast, **surface mine** production (including an estimate for **slurry**) increased by 2.6 per cent and contributed 22 per cent to UK coal supply.

2.11 **Steam coal**, mainly used by coal-fired power stations, accounted for 91 per cent of total production in 2011, with 6.7 per cent **anthracite** production and the remainder **coking coal**.

2.12 Table 2A shows how production of coal is divided between England, Wales and Scotland. In 2011, 57 per cent of coal output was in England, 31 per cent in Scotland and 12 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		
		2009	2010	2011	2009	2010	2011
Deep mined	England	7.4	7.3	7.2	3,436	3,158	3,184
	Wales	0.1	0.1	0.1	311	388	511
	Total	7.5	7.4	7.3	3,747	3,546	3,695
Surface mining	England	2.1	2.7	2.9	575	775	580
	Scotland	6.0	6.0	5.5	1,125	1,149	1,103
	Wales	1.6	1.7	2.1	465	544	594
	Total	9.8	10.4	10.6	2,165	2,468	2,277
Total	England	9.5	10.0	10.2	4,011	3,933	3,764
	Scotland	6.0	6.0	5.5	1,125	1,149	1,103
	Wales	1.7	1.7	2.2	776	932	1,105
	Total	17.3	17.8	17.9	5,912	6,014	5,972

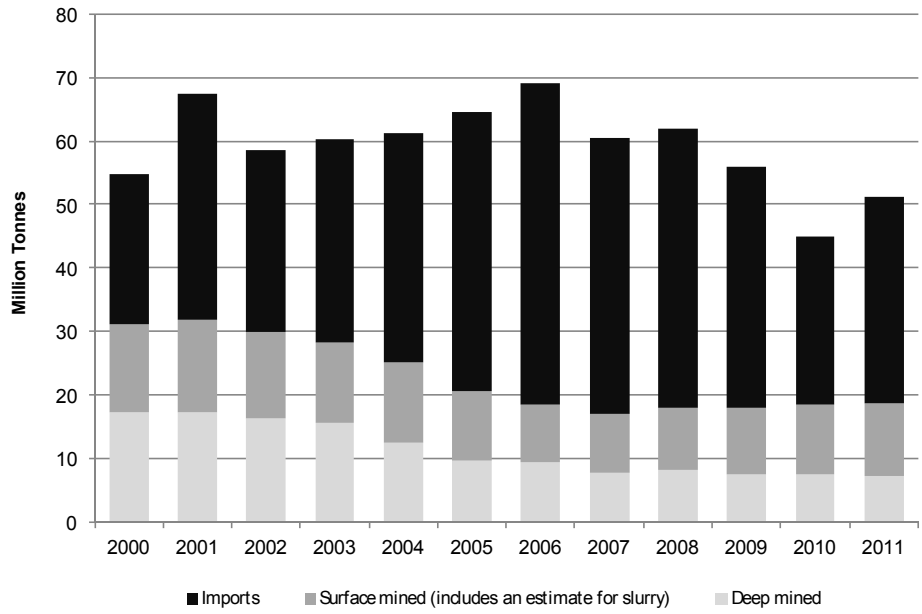
Source: The Coal Authority

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.*

2.13 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 2011 total employment, including contractors, was 0.7 per cent lower than in 2010. At 31 December 2011, 63 per cent of the 5,972 people employed in UK coal mining worked in England, while 18 per cent were employed in Scotland and 19 per cent in Wales.

2.14 Based on statistics for 2010[1], the UK was the second largest EU hard coal producer (out of nine EU producing countries) for the second year running, accounting for 14 per cent of total EU production (127 million tonnes). Poland had the highest production, contributing 60 per cent (76 million tonnes) to the EU total. Other EU countries such as Germany have higher lignite and brown coal production.

Chart 2.1: Coal production and imports 2000 to 2011



2.15 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 imports reached a new record of 51 million tonnes in 2006. Since then, imports have generally declined. However, in 2011 UK imports were 33 million tonnes, an increase of 23 per cent on 2010 (27 million tonnes) but 36 per cent lower than the 2006 record.

Table 2B: Imports of coal in 2011[1]

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Russia	12,093	239	-	12,332
Colombia	8,010	-	-	8,010
United States of America	4,461	1,873	-	6,334
Australia	-	3,380	-	3,380
European Union[2]	1,056	3	96	1,155
Republic of South Africa	647	-	-	647
Canada	-	363	-	363
Other countries	205	50	-	254
People's Republic of China	-	-	51	51
Total all countries	**26,472**	**5,908**	**148**	**32,527**

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 2011 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).*

2.16 Table 2B shows that, in 2011, 38 per cent (12 million tonnes) of the United Kingdom's coal imports came from Russia and another 54 per cent (18 million tonnes) from Colombia, the USA and Australia combined.

2.17 Steam coal accounted for 81 per cent of the total imports, 18 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 26 per cent in 2011 (from 10 million tonnes to 12 million tonnes). In 2011, Russia accounted for 46 per cent (12 million tonnes) of total steam coal imports. A further 53 per cent (14 million tonnes) came from a combination of Colombia, the USA and the EU. The United Kingdom imported 57 per cent (3.4 million tonnes) of coking coal from Australia with a further 32 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 (65 per cent) and China (35 per cent).

2.18 The UK and Germany have consistently been the top two coal importing countries in the EU. In 2010, these two countries accounted for 13 and 23 per cent respectively of total EU imports (199 million tonnes). Italy followed with an 11 per cent (22 million tonnes) share of the total[2].

2.19 Since 1983 the volume of coal exported from the UK is significantly less than the levels imported and in 2011, 0.5 million tonnes of coal was exported, 31 per cent lower than in 2010.

[2] *EU statistics for 2011 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).*

Map 2A: UK coal production sites and ports

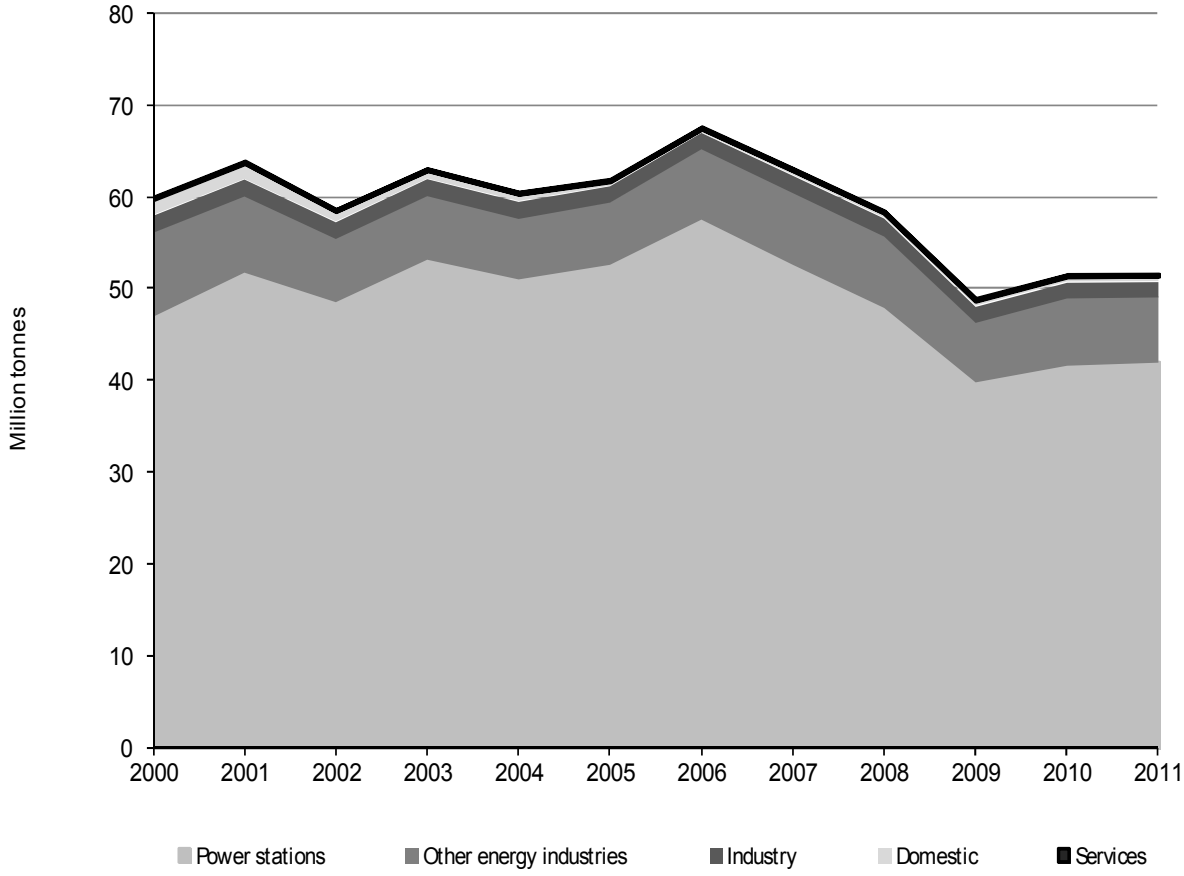
Coal Consumption

2.20 As with coal production, coal consumption in the UK has also seen a general decline over the last 30 years as the UK's energy mix has become more diverse. Also, environmental regulations and high coal prices have generally made natural gas more attractive to purchase for generation use. The overall demand for coal showed little change between 2010 and 2011 (Chart 2.2). Eighty-five per cent (44 million tonnes) of this demand was for steam coal, 12 per cent (6.4 million tonnes) was for coking coal and 2.3 per cent (1.2 million tonnes) was for anthracite.

2.21 In 2010, the UK continued to be the third largest consumer of coal of EU countries for the tenth year running, accounting for 17 per cent (310 million tonnes) of total coal consumption in the EU. The top two consumers were Poland and Germany, accounting for 27 per cent (85 million tonnes) and 19 per cent (59 million tonnes) of total EU consumption, respectively[3].

[3] *EU statistics for 2011 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).*

Chart 2.2: Coal consumption, 2000 to 2011



2.22 The transformation sector represented 95 per cent (49 million tonnes) of overall demand for coal in 2011 (52 million tonnes), similar to the level seen in 2010. Electricity generation accounted for 94 per cent of demand for steam coal and 40 per cent of demand for anthracite. Coking coal was used in coke ovens (84 per cent) and blast furnaces (16 per cent) in the UK iron and steel industry. These splits remained similar to 2010. In 2011, 54 per cent (22 million tonnes) of coal consumed by major power producers was from imports (steam coal).

2.23 Coal consumption by final consumers accounted for 4.8 per cent (2.5 million tonnes) of total demand in 2011, where it was used for steam raising, space or hot water heating, or heat for processing, a decrease of 1.6 per cent from 2010. Steam coal accounted for 85 per cent of this final consumption (unchanged from 2010).

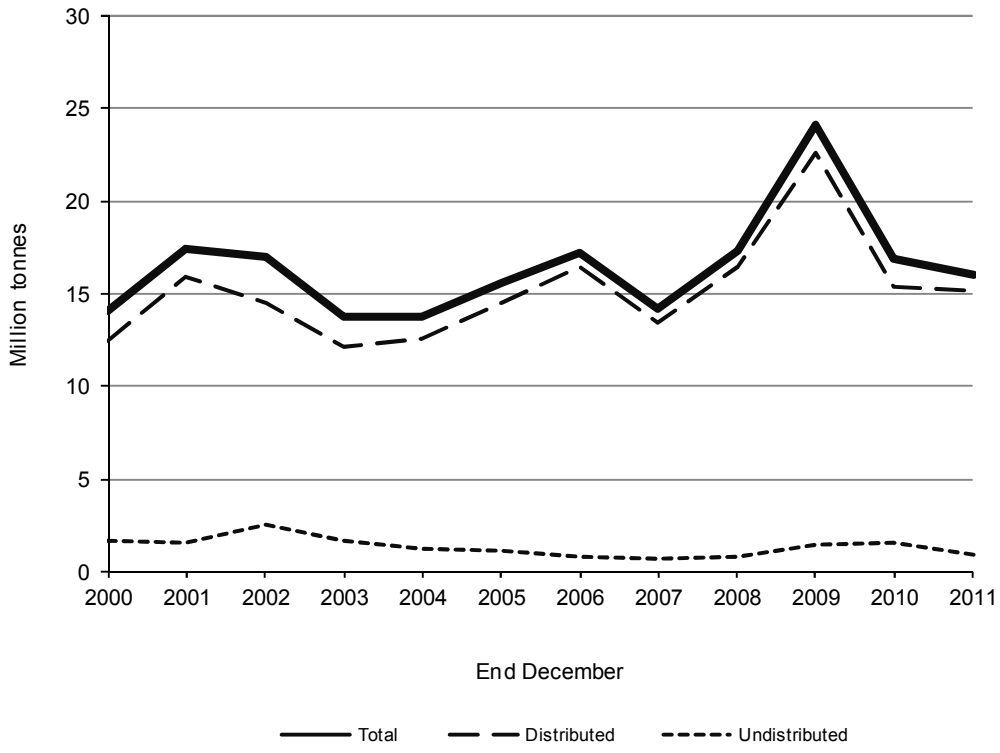
2.24 The industrial sector is the largest final consumer (accounting for 69 per cent of total final consumption in 2011), despite consumption in 2011 falling by 2.0 per cent from 2010. Ninety-two per cent of coal use in the industrial sector was for steam coal, with mineral products (e.g. cement, glass and brick production) being the largest users.

2.25 The domestic sector accounted for 29 per cent of the final consumption of coal, with 70 per cent of this demand being for steam coal and the remainder for anthracite. Coal use in the commercial and public sector decreased by 2.0 per cent from 32 thousand tonnes in 2010 to 31 thousand tonnes in 2011.

Coal Stocks

2.26 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 stocks at the end of 2011 (16 million tonnes) were 0.8 million tonnes less than total stocks held at the end of 2010 but represented nearly a third of the year's coal consumption. Stocks held at collieries and surface mine sites at the end of 2011 were 0.6 million tonnes lower than a year earlier and stocks at major power stations and coke ovens, as a whole, increased by 0.1 million tonnes and accounted for 93 per cent of total stocks in 2011.

Chart 2.3: Coal stocks in the UK 2000 to 2011

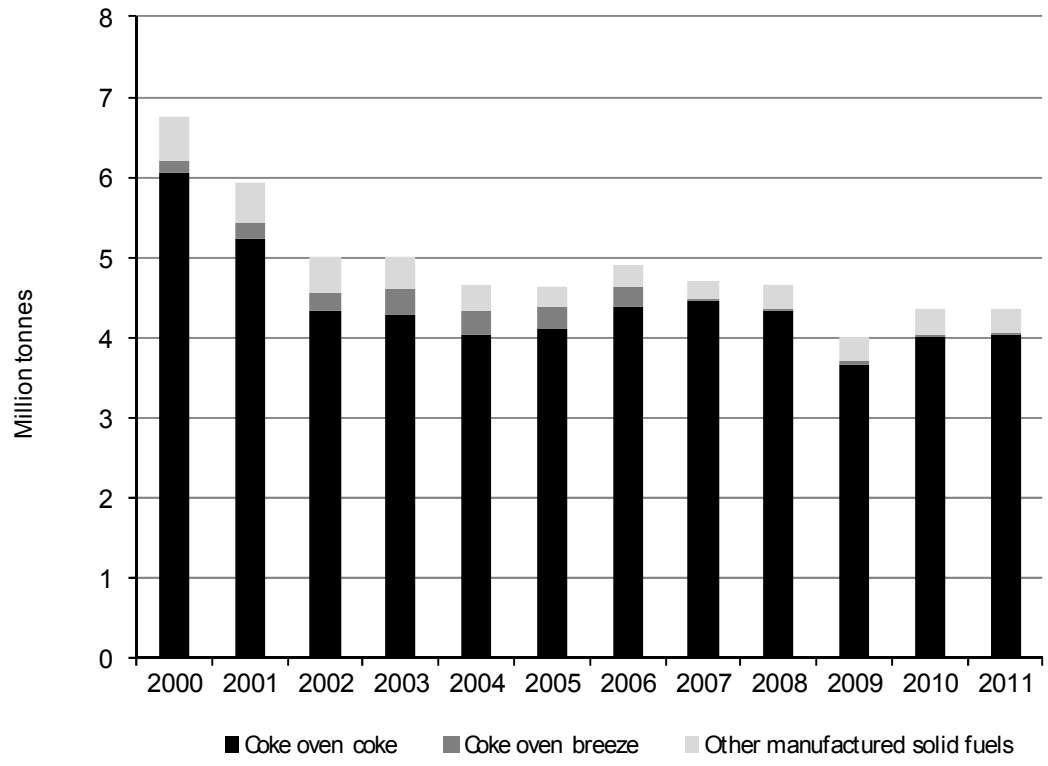


Manufactured Solid Fuels (Tables 2.4, 2.5, 2.6, 2.8 and 2.9)

Production, Trade and Consumption

2.27 In 2011, 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 2011 all of the UK's supply of coke oven coke was home produced. There was very little change in home produced coke oven coke between 2010 and 2011, remaining at 4.0 million tonnes. Export levels also remained unchanged at 0.4 million tonnes when compared to 2010.

Chart 2.4: Total manufactured solid fuels production in the UK 2000 to 2011



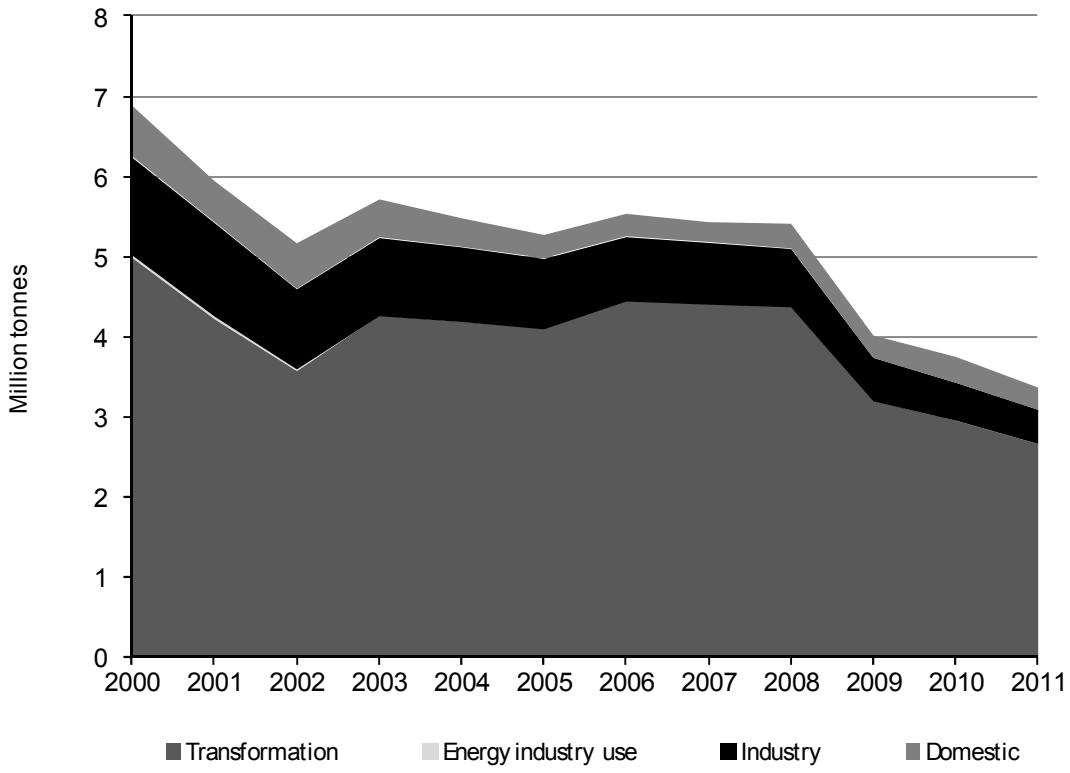
2.28 The main purpose of coke oven coke is for use in blast furnaces in the UK iron and steel industry. In 2011, this represented 98 per cent of total demand (2.3 million tonnes), and was 10.4 per cent lower than the demand for coke oven coke in 2010 (2.6 million tonnes) with the rest of production added to stocks.

2.29 Most of the supply of **coke breeze** is from re-screened coke oven coke, with direct production accounting for only 4.2 per cent of total supply in 2011. In 2011, 48 per cent was used in blast furnaces (0.4 million tonnes) for transformation and 52 per cent used for final consumption (Chart 2.5). DECC will be reviewing the calorific value for coke breeze. However, for this edition of the Digest the calorific value for coke breeze, for the latest three years, have 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.

2.30 Other manufactured solid fuels (patent fuels) are manufactured smokeless fuels, produced mainly for the domestic market. A small amount of these fuels (only 7.9 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.

2.31 The carbonisation and gasification of solid fuels in coke ovens produces coke oven gas as a by-product. In 2011, production of coke oven gas showed little change on 2010, remaining at 8.8 TWh. Some of this (43 per cent) was used to fuel the coke ovens themselves and, of the rest, 28 per cent was used for electricity generation, 11 per cent for iron and steel and other industrial processes (including heat production), 5.2 per cent in blast furnaces and 8.4 per cent was lost.

Chart 2.5: Total manufactured solid fuels consumption in the UK 2000 to 2011



2.32 **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 2011 used 46 per cent of total blast furnace gas and BOS gas, while 32 per cent was used in coke ovens and blast furnaces themselves, 1.7 per cent used in general heat production, 9.4 per cent was lost or burned as waste and a further 11 per cent was used in the iron and steel industry. Demand for **benzole and tars** remained unchanged from 2010 (1.7 TWh).

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

Technical notes and definitions

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

Coal production

2.35 **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.

2.36 **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.

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

Steam coal, coking coal and anthracite

2.38 **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.

2.39 **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.

2.40 **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

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

Coal consumption

2.42 Figures for actual consumption of coal are available for all fuel and power producers and for final use by the iron and steel industry. The remaining final users consumption figures are based on information on disposals to consumers by producers and on imports.

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

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

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

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

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

Stocks of coal

2.44 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

2.45 The statistics cover coke produced at coke ovens owned by Corus plc, Coal Products Ltd and other producers. Low temperature carbonisation plants are not included (see paragraph 2.47, below). Breeze (as defined in paragraph 2.42) is excluded from the figures for coke oven coke.

2.46 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.

2.47 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.

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

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

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

2.51 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.

2.52 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

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

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

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

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

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

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

Contact: Mita Kerai
Energy Statistics Team
mita.kerai@decc.gsi.gov.uk
0300 068 5044

Ruhi Babbar
Energy Statistics Team

2.1 Commodity balances 2011

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	16,335	383	1,174	17,892
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	**43,950**	**6,270**	**1,280**	**51,500**
Statistical difference *(2)*	-8	-7	+0	-14
Total demand	**43,958**	**6,277**	**1,280**	**51,514**
Transformation	**41,857**	**6,277**	**924**	**49,057**
Electricity generation	41,351	-	506	41,857
Major power producers	40,060	-	506	40,566
Autogenerators	1,291	-	-	1,291
Heat generation	477	-	-	477
Petroleum refineries	-	-	-	-
Coke manufacture	-	5,282	116	5,398
Blast furnaces	-	995	-	995
Patent fuel manufacture and low temperature carbonisation	29	-	302	331
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	**2,097**	**-**	**356**	**2,453**
Industry	**1,541**	**-**	**141**	**1,681**
Unclassified	-	-	-	-
Iron and steel	2	-	51	53
Non-ferrous metals	23	-	-	23
Mineral products	1,056	-	0	1,056
Chemicals	78	-	-	78
Mechanical engineering etc	11	-	-	11
Electrical engineering etc	5	-	-	5
Vehicles	53	-	-	53
Food, beverages etc	26	-	20	45
Textiles, leather, etc	64	-	-	64
Paper, printing etc	122	-	-	122
Other industries	94	-	70	164
Construction	7	-	-	7
Transport	**15**	**-**	**-**	**15**
Air	-	-	-	-
Rail *(3)*	15	-	-	15
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**541**	**-**	**215**	**756**
Domestic	501	-	215	717
Public administration	26	-	-	26
Commercial	5	-	-	5
Agriculture	1	-	-	1
Miscellaneous	7	-	-	7
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 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	19,751r	6,634r	155	26,541r
Exports	-624	-1	-90	-715
Marine bunkers	-	-	-	-
Stock change *(1)*	+7,817	-531	-79r	+7,206r
Transfers	-	-	-	-
Total supply	**43,871r**	**6,372r**	**1,206r**	**51,448r**
Statistical difference *(2)*	-0r	-6r	+0r	-6r
Total demand	**43,871r**	**6,378**	**1,206r**	**51,455r**
Transformation	**41,737r**	**6,378**	**843r**	**48,958r**
Electricity generation	41,225r	-	272r	41,498r
Major power producers	39,958r	-	272r	40,230r
Autogenerators	1,268r	-	-	1,268r
Heat generation	477r	-	-	477r
Petroleum refineries	-	-	-	-
Coke manufacture	-	5,399	254r	5,654r
Blast furnaces	-	978	-	978
Patent fuel manufacture and low temperature carbonisation	34r	-	317	351r
Energy industry use	**5r**	**-**	**-**	**5r**
Electricity generation	-	-	-	-
Oil and gas extraction	-	-	-	-
Petroleum refineries	-	-	-	-
Coal extraction	5r	-	-	5r
Coke manufacture	-	-	-	-
Blast furnaces	-	-	-	-
Patent fuel manufacture	-	-	-	-
Pumped storage	-	-	-	-
Other	-	-	-	-
Losses	**-**	**-**	**-**	**-**
Final consumption	**2,129r**	**-**	**363r**	**2,492r**
Industry	**1,567r**	**-**	**149r**	**1,716r**
Unclassified	-	-	-	-
Iron and steel	2r	-	58	60r
Non-ferrous metals	24	-	-	24
Mineral products	1,063r	-	0	1,063r
Chemicals	79r	-	-	79r
Mechanical engineering etc	13	-	-	13
Electrical engineering etc	5	-	-	5
Vehicles	51r	-	-	51r
Food, beverages etc	24r	-	18	42r
Textiles, leather, etc	67	-	-	67
Paper, printing etc	123r	-	-	123r
Other industries	112r	-	73r	186r
Construction	4	-	-	4
Transport	**19r**	**-**	**-**	**19r**
Air	-	-	-	-
Rail *(3)*	19r	-	-	19r
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**544r**	**-**	**214r**	**757r**
Domestic	504r	-	214r	718r
Public administration	28r	-	-	28r
Commercial	4r	-	-	4r
Agriculture	1r	-	-	1r
Miscellaneous	6r	-	-	6r
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 2009

Coal

Thousand tonnes

	Steam coal	Coking coal	Anthracite	Total
Supply				
Production	15,862	246	1,266	17,374
Other sources	430	-	70	500
Imports	32,794r	5,264r	109	38,167r
Exports	-526r	-6r	-115	-646
Marine bunkers	-	-	-	-
Stock change *(1)*	-6,797	+259	-70	-6,608
Transfers	-	-	-	-
Total supply	**41,763r**	**5,763r**	**1,260**	**48,786r**
Statistical difference *(2)*	+15r	-24r	-26	-35r
Total demand	**41,748r**	**5,787**	**1,285**	**48,821r**
Transformation	**39,574r**	**5,787**	**930**	**46,290r**
Electricity generation	39,081r	-	600	39,681r
Major power producers	37,662r	-	600	38,262r
Autogenerators	1,419r	-	-	1,419r
Heat generation	482r	-	-	482r
Petroleum refineries	-	-	-	-
Coke manufacture	-	4,936	-	4,936
Blast furnaces	-	852	-	852
Patent fuel manufacture and low temperature carbonisation	11	-	330	341
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	**2,170r**	**-**	**356**	**2,525r**
Industry	**1,600r**	**-**	**142**	**1,742r**
Unclassified	-	-	-	-
Iron and steel	2	-	58	60
Non-ferrous metals	28	-	-	28
Mineral products	1,076	-	1	1,077
Chemicals	77r	-	-	77r
Mechanical engineering etc	14	-	-	14
Electrical engineering etc	5	-	-	5
Vehicles	46	-	-	46
Food, beverages etc	37	-	11	48
Textiles, leather, etc	69	-	-	69
Paper, printing etc	124	-	-	124
Other industries	119	-	72	191
Construction	4	-	-	4
Transport	**19**	**-**	**-**	**19**
Air	-	-	-	-
Rail *(3)*	19	-	-	19
Road	-	-	-	-
National navigation	-	-	-	-
Pipelines	-	-	-	-
Other	**551r**	**-**	**214**	**765r**
Domestic	475r	-	214	689r
Public administration	24r	-	-	24r
Commercial	49	-	-	49
Agriculture	-	-	-	-
Miscellaneous	3	-	-	3
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 Commodity balances 2011

Manufactured fuels

	Thousand tonnes				GWh		
	Coke oven coke	Coke breeze	Other manuf. solid fuel	Total manuf. solid fuel	Benzole and tars *(5)*	Coke oven gas	Blast furnace gas
Supply							
Production *(1)*	4,021	31	289	4,342	1,657	8,847	10,503
Other sources	-	-	-	-	-	-	-
Imports	-	26	21	47	-	-	-
Exports	-427	-40	-32	-499	-	-	-
Marine bunkers	-	-	-	-	-	-	-
Stock change *(2)*	-515	-12	-13	-540	-	-	-
Transfers *(3)*	-744	+744	-	-	-	+62	-2
Total supply	**2,335**	**749**	**265**	**3,350**	**1,657**	**8,909**	**10,501**
Statistical difference *(4)*	+5	-4	-4	-4	-	-62	-70
Total demand	**2,331**	**753**	**270**	**3,354**	**1,657**	**8,971**	**10,571**
Transformation	**2,287**	**358**	-	**2,645**	-	**2,958**	**5,081**
Electricity generation	-	-	-	-	-	2,539	4,901
Major power producers	-	-	-	-	-	-	-
Autogenerators	-	-	-	-	-	2,539	4,901
Heat generation	-	-	-	-	-	418	179
Petroleum refineries	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-
Blast furnaces	2,287	358	-	2,645	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-
Low temperature carbonisation	-	-	-	-	-	-	-
Energy industry use	-	-	**-**	**-**	-	**4,300**	**3,370**
Electricity generation	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	3,832	657
Blast furnaces	-	-	-	-	-	469	2,713
Patent fuel manufacture	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Losses	-	-	-	-	-	**758**	**993**
Final consumption	**44**	**395**	**270**	**709**	**1,657**	**955**	**1,127**
Industry	**35**	**395**	**-**	**430**	**1,657**	**955**	**1,127**
Unclassified	28	7	-	35	1,657	200	-
Iron and steel	7	388	-	395	-	755	1,127
Non-ferrous metals	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Other	**9**	**-**	**270**	**278**	-	-	-
Domestic	9	-	270	278	-	-	-
Public administration	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-
Non energy use	-	-	-	-	-	-	-

(1) See paragraph 2.45- 2.53

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

(3) Coke oven gas and blast furnace gas transfers are for synthetic coke oven gas, see paragraph 2.53.

(4) Total supply minus total demand.

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

2.5 Commodity balances 2010

Manufactured fuels

	Thousand tonnes				GWh		
	Coke oven coke	Coke breeze	Other manuf. solid fuel	Total manuf. solid fuel	Benzole and tars *(5)*	Coke oven gas	Blast furnace gas
Supply							
Production *(1)*	3,990	32	318	4,340	1,696	8,822	11,404
Other sources	-	-	-	-	-	-	-
Imports	44	69	10	123	-	-	-
Exports	-437	-46	-35	-518	-	-	-
Marine bunkers	-	-	-	-	-	-	-
Stock change *(2)*	-145	-83	+13	-215	-	-	-
Transfers *(3)*	-833	+833	-	-	-	+274	-11
Total supply	**2,620**	**805**	**306**	**3,731**	**1,696**	**9,096**	**11,393**
Statistical difference *(4)*	+1	-0	-5	-5	-	-62	-71
Total demand	**2,619**	**805**	**311**	**3,735**	**1,696**	**9,158**	**11,464**
Transformation	**2,554**	**384**	-	**2,938**	-	**2,984r**	**5,444r**
Electricity generation	-	-	-	-	-	2,566r	5,265r
Major power producers	-	-	-	-	-	-	-
Autogenerators	-	-	-	-	-	2,566r	5,265r
Heat generation	-	-	-	-	-	418	179
Petroleum refineries	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-
Blast furnaces	2,554	384	-	2,938	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-
Low temperature carbonisation	-	-	-	-	-	-	-
Energy industry use	-	-	**-**	**-**	-	**4,235**	**3,674**
Electricity generation	-	-	**-**	**-**	-	-	-
Oil and gas extraction	-	-	**-**	**-**	-	-	-
Petroleum refineries	-	-	**-**	**-**	-	-	-
Coal extraction	-	-	**-**	**-**	-	-	-
Coke manufacture	-	-	**-**	**-**	-	3,861	732
Blast furnaces	-	-	**-**	**-**	-	374	2,943
Patent fuel manufacture	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Losses	-	-	-	-	-	**617**	**1,335**
Final consumption	**66**	**421**	**311**	**797**	**1,696**	**1,321r**	**1,010r**
Industry	**55**	**421**	**-**	**476**	**1,696**	**1,321r**	**1,010r**
Unclassified	48	4	-	53	1,696	198	-
Iron and steel	7	416	-	423	-	1,123r	1,010r
Non-ferrous metals	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Other	**10**	**-**	**311**	**321**	-	-	-
Domestic	10	-	311	321	-	-	-
Public administration	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-
Non energy use	-	-	-	-	-	-	-

(1) See paragraph 2.45- 2.53

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

(3) Coke oven gas and blast furnace gas transfers are for synthetic coke oven gas, see paragraph 2.53.

(4) Total supply minus total demand.

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

2.6 Commodity balances 2009

Manufactured fuels

	Thousand tonnes				GWh		
	Coke oven coke	Coke breeze	Other manuf. solid fuel	Total manuf. solid fuel	Benzole and tars (5)	Coke oven gas	Blast furnace gas
Supply							
Production (1)	3,663	29	303	3,996	1,536	7,956	11,199
Other sources	-	-	-	-	-	-	-
Imports	140	38	6	184	-	-	-
Exports	-97	-49	-31	-177	-	-	-
Marine bunkers	-	-	-	-	-	-	-
Stock change (2)	-79	+89	-10	1	-	-	-
Transfers (3)	-784	+784	-	-	-	+366	-15
Total supply	**2,843**	**892**	**268**	**4,003**	**1,536**	**8,322**	**11,184**
Statistical difference (4)	+0	+0	-1	-1	-	-62r	-66
Total demand	**2,843**	**892**	**269**	**4,004**	**1,536**	**8,383**	**11,250**
Transformation	**2,755**	**426**	-	**3,180**	-	**3,044**	**6,531**
Electricity generation	-	-	-	-	-	2,626	6,352
Major power producers	-	-	-	-	-		
Autogenerators	-	-	-	-	-	2,626	6,352
Heat generation	-	-	-	-	-	418	179
Petroleum refineries	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-
Blast furnaces	2,755	426	-	3,180	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-
Low temperature carbonisation	-	-	-	-	-	-	-
Energy industry use	-	-	**-**	**-**	-	**4,471**	**3,657**
Electricity generation	-	-	**-**	**-**	-	-	-
Oil and gas extraction	-	-	**-**	**-**	-	-	-
Petroleum refineries	-	-	**-**	**-**	-	-	-
Coal extraction	-	-	**-**	**-**	-	-	-
Coke manufacture	-	-	**-**	**-**	-	3,888	506
Blast furnaces	-	-	**-**	**-**	-	583	3,151
Patent fuel manufacture	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Losses	-	-	-	-	-	**75**	**724**
Final consumption	**88**	**466**	**269**	**824**	**1,536**	**794**	**337**
Industry	**78**	**466**	**-**	**544**	**1,536**	**794**	**337**
Unclassified	71	7	-	78	1,536	230	
Iron and steel	7	460	-	466	-	564	337
Non-ferrous metals	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Other	**10**	**-**	**269**	**280**	-	-	-
Domestic	10	-	269	280	-	-	-
Public administration	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-
Non energy use	-	-	-	-	-	-	-

(1) See paragraph 2.45- 2.53

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

(3) Coke oven gas and blast furnace gas transfers are for synthetic coke oven gas, see paragraph 2.53.

(4) Total supply minus total demand.

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

2.7 Supply and consumption of coal

Thousand tonnes

	2007	2008	2009	2010	2011
Supply					
Production	16,540	17,604	17,374	17,817	17,892
Deep-mined	7,674	8,096	7,520	7,390	7,312
Surface mining *(1)*	8,866	9,509	9,854	10,426	10,580
Other sources *(2)*	467	449	500	600	735
Imports	43,364	43,875	38,167r	26,541r	32,527
Exports	-544	-599	-646	-715	-491
Stock change *(3)*	3,076	-3,110	-6,608	7,206r	836
Total supply	**62,903**	**58,219**	**48,786r**	**51,448r**	**51,500**
Statistical difference *(4)*	-125	-166	-35r	-6r	-14
Total demand	**63,029**	**58,385**	**48,821r**	**51,455r**	**51,514**
Transformation	**60,434**	**55,707**	**46,290r**	**48,958r**	**49,057**
Electricity generation	52,511	47,808	39,681r	41,498r	41,857
Major power producers	51,031	46,252	38,262r	40,230r	40,566
Autogenerators	1,480	1,555	1,419r	1,268r	1,291
Heat generation	485	503	482r	477r	477
Coke manufacture	5,932	5,875	4,936	5,654r	5,398
Blast furnaces	1,242	1,170	852	978	995
Patent fuel manufacture and low temperature carbonisation	265	352	341	351r	331
Energy industry use	**5**	**5**	**5**	**5r**	**4**
Coal extraction	5	5	5	5r	4
Final consumption	**2,590**	**2,672**	**2,525r**	**2,492r**	**2,453**
Industry	**1,896**	**1,940**	**1,742r**	**1,716r**	**1,681**
Unclassified	**-**	**-**	**-**	**-**	**-**
Iron and steel	75	69	60	60r	53
Non-ferrous metals	36	33	28	24	23
Mineral products	1,150	1,150	1,077	1,063r	1,056
Chemicals	119	102	77r	79r	78
Mechanical engineering etc	10	14	14	13	11
Electrical engineering etc	6	6	5	5	5
Vehicles	49	49	46	51r	53
Food, beverages etc	34	39	48	42r	45
Textiles, clothing, leather, etc	74	76	69	67	64
Pulp, paper, printing etc	144	149	124	123r	122
Other industries	200	212	191	186r	164
Construction	**-**	43	4	4	7
Transport ***(5)***	**19**	**19**	**19**	**19r**	**15**
Other	**675**	**713**	**765r**	**757r**	**756**
Domestic	648	683	689r	718r	717
Public administration	14	13	24r	28r	26
Commercial	6	10	49	4r	5
Agriculture	4	5	0	1r	1
Miscellaneous	2	1	3	6r	7
Non energy use	-	-	-	-	-
Stocks at end of year *(6)*					
Distributed stocks	13,420	16,392	22,640r	15,366	15,113
Of which:					
Major power producers	11,179	14,863	21,770	13,370	13,496
Coke ovens	1,479	1,065	806	1,338	1,355
Undistributed stocks	734	854	1,450	1,517	926
Total stocks *(7)*	**14,155**	**17,246**	**24,090r**	**16,883**	**16,039**

(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

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

Thousand tonnes

	2007	2008	2009	2010	2011
Coke oven coke					
Supply					
Production	4,451	4,324	3,663	3,990	4,021
Imports	745	503	140	44	-
Exports	-105	-111	-97	-437	-427
Stock change *(1)*	+34	+287	-79	-145	-515
Transfers	-1,115	-1,104	-784	-833	-744
Total supply	**4,010**	**3,899**	**2,843**	**2,620**	**2,335**
Statistical difference *(2)*	-14	-0r	+0	+1	+5
Total demand	**4,024**	**3,900**	**2,843**	**2,619**	**2,331**
Transformation	**3,910**	**3,796**	**2,755**	**2,554**	**2,287**
Blast furnaces	3,910	3,796	2,755	2,554	2,287
Energy industry use	**-**	**-**	**-**	**-**	**-**
Final consumption	**114**	**104**	**88**	**66**	**44**
Industry	**99**	**91**	**78**	**55**	**35**
Unclassified	76	78	71	48	28
Iron and steel	23	13	7	7	7
Non-ferrous metals	**-**	**-**	**-**	**-**	**-**
Other	**15**	**12**	**10**	**10**	**9**
Domestic	15	12	10	10	9
Stocks at end of year *(3)*	**616**	**326**	**319**	**453**	**666**
Coke breeze					
Supply					
Production *(4)*	25	35	29	32	31
Imports	325	219	38	69	26
Exports	-152	-74	-49	-46	-40
Stock change *(1)*	-80	-79	+89	-83	-12
Transfers	1,115	1,104	784	833	744
Total supply	**1,233**	**1,205**	**892**	**805**	**749**
Statistical difference *(2)*	+3	+0	+0	-0	-4
Total demand	**1,229**	**1,204**	**892**	**805**	**753**
Transformation	**483**	**567**	**426**	**384**	**358**
Coke manufacture	**-**	**-**	**-**	**-**	**-**
Blast furnaces	483	567	426	384	358
Energy industry use	**-**	**-**	**-**	**-**	**-**
Final consumption	**747**	**638**	**466**	**421**	**395**
Industry	**747**	**638**	**466**	**421**	**395**
Unclassified	13	16	7	4	7
Iron and steel	734	621	460	416	388
Stocks at end of year *(3)*	**473**	**553**	**246**	**248**	**174**
Other manufactured solid fuels					
Supply					
Production	227	302	303	318	289
Imports	13	16	6	10	21
Exports	-7	-25	-31	-35	-32
Stock change *(1)*	+2	+6	-10	+13	-13
Total supply	**235**	**299**	**268**	**306**	**265**
Statistical difference *(2)*	+0	+4	-1	-5	-4
Total demand	**235**	**294**	**269**	**311**	**270**
Transformation	**-**	**-**	**-**	**-**	**-**
Energy industry use	**-**	**-**	**-**	**-**	**-**
Patent fuel manufacture	**-**	**-**	**-**	**-**	**-**
Final consumption	**235**	**294**	**269**	**311**	**270**
Industry	**-**	**-**	**-**	**-**	**-**
Unclassified	**-**	**-**	**-**	**-**	**-**
Other	**235**	**294**	**269**	**311**	**270**
Domestic	235	294	269	311	270
Stocks at end of year *(3)*	**27**	**24**	**33**	**18**	**32**

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

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

GWh

	2007	2008	2009	2010	2011
Coke oven gas					
Supply					
Production	9,651	9,410	7,956	8,822	8,847
Imports	-	-	-	-	-
Exports	-	-	-	-	-
Transfers *(1)*	+81	+71	+366	+274	+62
Total supply	**9,732**	**9,481**	**8,322**	**9,096**	**8,909**
Statistical difference *(2)*	+47	-8	-62	-62r	-62
Total demand	**9,685**	**9,489**	**8,383**	**9,158**	**8,971**
Transformation	**2,671**	**2,681**	**3,044**	**2,984r**	**2,958**
Electricity generation	2,253	2,263	2,626	2,566r	2,539
Heat generation	418	418	418	418	418
Other	-	-	-	-	-
Energy industry use	**5,170**	**5,117**	**4,471**	**4,235**	**4,300**
Coke manufacture	4,228	4,349	3,888	3,861	3,832
Blast furnaces	942	768	583	374	469
Other	-	-	-	-	-
Losses	**445**	**413**	**75**	**617**	**758**
Final consumption	**1,399**	**1,278**	**794**	**1,321r**	**955**
Industry	**1,399**	**1,278**	**794**	**1,321r**	**955**
Unclassified	221	207	230	198	200
Iron and steel	1,178	1,071	564	1,123r	755
Blast furnace gas					
Supply					
Production	16,701	15,345	11,199	11,404	10,503
Imports	-	-	-	-	-
Exports	-	-	-	-	-
Transfers *(1)*	-3	-3	-15	-11	-2
Total supply	**16,698**	**15,342**	**11,184**	**11,393**	**10,501**
Statistical difference *(2)*	-113	-110	-66	-71r	-70
Total demand	**16,811**	**15,452**	**11,250**	**11,464**	**10,571**
Transformation	**9,102**	**7,900**	**6,531**	**5,444r**	**5,081**
Electricity generation	8,922	7,721	6,352	5,265r	4,901
Heat generation	179	179	179	179	179
Other	-	-	-	-	-
Energy industry use	**5,082**	**4,759**	**3,657**	**3,674**	**3,370**
Coke manufacture	703	639	506	732	657
Blast furnaces	4,379	4,121	3,151	2,943	2,713
Other	-	-	-	-	-
Losses	**2,071**	**2,332**	**724**	**1,335**	**993**
Final consumption	**557**	**461**	**337**	**1,010r**	**1,127**
Industry	**557**	**461**	**337**	**1,010r**	**1,127**
Unclassified	-	-	-	-	-
Iron and steel	557	461	337	1,010r	1,127
Benzole and tars *(3)*					
Supply					
Production	1,838	1,816	1,536	1,696	1,657
Final consumption *(4)*	**1,838**	**1,816**	**1,536**	**1,696**	**1,657**
Unclassified	1,838	1,816	1,536	1,696	1,657
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.

2.10 Deep mines in production at 31 December 2011[(1)]

Licensee	Site	Location
Ayle Colliery Company Ltd	Ayle Colliery	Northumberland
Eckington Colliery Partnerships	Eckington Colliery	Derbyshire
Energybuild Mining Ltd	Aberpergwm Colliery	Neath Port Talbot
J Flack Ltd	Hay Royds Colliery	Kirklees
Maltby Colliery Ltd	Maltby Colliery	Rotherham
Hatfield Colliery Ltd	Hatfield Colliery	Doncaster
Ray Ashly, Richard Daniels and Neil Jones	Monument Colliery	Gloucestershire
Riche UK Mining Ltd	Johnson Mine	Torfaen
UK Coal Mining Ltd	Daw Mill Colliery	Warwickshire
	Kellingley Colliery	North Yorkshire
	Thoresby Colliery	Nottinghamshire
Unity Mine Ltd	Unity Mine	Neath Port Talbot

(1) In addition, at 31 December 2011, there were:

4 mines developing -
Buckholt Colliery, owned by Richard Pegler & Richard Ashly, in Gloucestershire
Dan-y-Graig No.4 Colliery, owned by Three D's Mining Ltd, in Neath Port Talbot
Haywood Drift, owned by S Harding & R Harding, in Gloucestershire
Hill Top Colliery, owned by Grimebridge Colliery Company Ltd, in Lancashire

Source: The Coal Authority

2.11 Opencast sites in production at 31 December 2011[1]

Licensee	Site Name	Location
Aardvark TMC Ltd	Glenmuckloch	Dumfries & Galloway
(trading as ATH Resources)	Glenmuckloch Samsiston Area	Dumfries & Galloway
	Muir Dean	Fife
	Netherton	East Ayrshire
Benhar Developments Ltd	Mossband Farm Quarry	North Lanarkshire
Bryn Bach Coal Ltd	Cwm Yr Onen Colliery Reclamation	Neath Port Talbot
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	Northumberland
	Shotton	Northumberland
Hall Construction Services Ltd	Wilsontown	South Lanarkshire
Horizon Mining Ltd	Bwlch Ffos	Neath Port Talbot
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
Shires Developments (Engine) Ltd	Engine Extension Area	Derbyshire
	Engine Reclamation Scheme	Derbyshire
The Scottish Coal Company Ltd	Broken Cross	South Lanarkshire
	Blair House	Fife
	Dalfad	East Ayrshire
	Dunstonhill	East Ayrshire
	House of Water	East Ayrshire
	Mainshill	South Lanarkshire
	Spireslack Complex (Airdsgreen)	East Ayrshire
	St Ninians	Fife
UK Coal Mining Ltd	Huntington Lane	Telford & Wrekin
	Lodge House	Derbyshire
	Park Wall North	Durham
	Potland Burn	Northumberland

(1) In addition, at 31 December 2011, there were:

7 mines developing -
Laigh Glenmuir Site, owned by Aardvark TMC Ltd (t/a ATH Resources), in East Ayrshire
Rusha Site, owned by HJ Banks & Company Ltd, in West Lothian
Airdsgreen (Ponesk Remainder), owned by The Scottish Coal Company Ltd, in East Ayrshire
Butterwell Disposal Point, owned by UK Coal Mining Ltd, in Northumberland
Caughley Quarry, owned by Parkhill Estates Ltd, in Shropshire
Earlseat, owned by Hall Construction Services Ltd, in Fife
Glenmuckloch Eastern Extension, owned by Aardvark TMC Ltd (t/a ATH Resources), in Dumfries & Galloway

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 nearly a fifth. This is largest decrease since large scale oil extraction began (table 3.1, chart 3.1);
- Net imports of crude oil and Natural Gas Liquids rose to meet demand. Crude oil exports decreased by 23 per cent and for the first time imports of primary oils marginally exceeded production (table 3.1, chart 3.1);
- The UK's eight refineries produced over 74 million tonnes of petroleum products, 2 per cent more than the previous year. UK production is around 14 per cent lower than 2000 (table 3.2, chart 3.4);
- The UK is a net exporter of petroleum products, and exports in 2011 were 34 per cent higher than they were in 2000. In 2011, product exports increased almost 7 per cent on 2010 (table 3.2, chart 3.4). Imports decreased by over 5 per cent on last year, but were up around 60 per cent on 2000;
- The UK's high level of trade is partially a result of indigenous refinery production not meeting demand. The UK's demand is increasing for diesel and aviation fuel and decreasing for motor spirit, but the UK's refinery production is in deficit for diesel and aviation fuel (chart 3.5, para 3.21);

Introduction

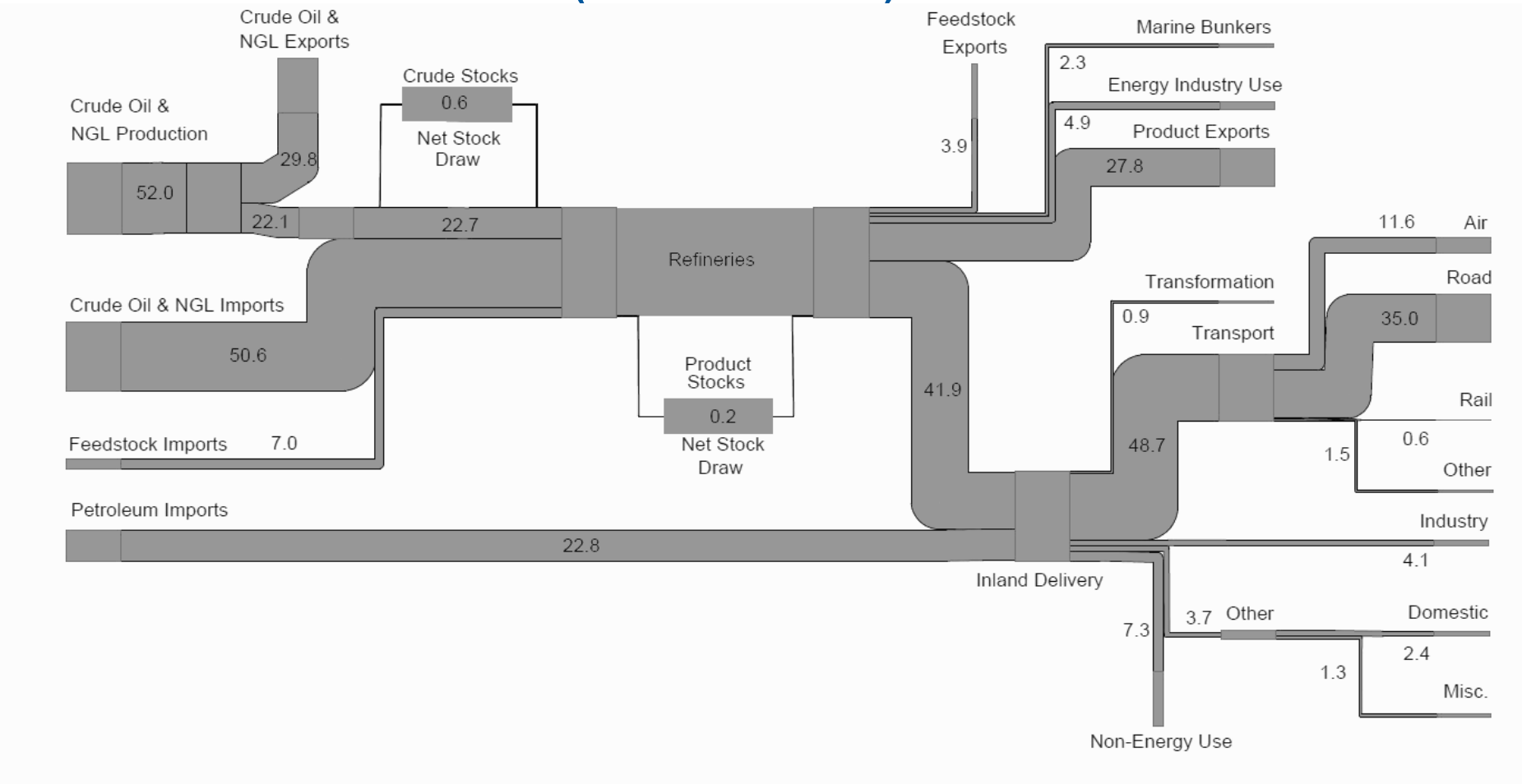
3.1 This chapter covers the supply and demand of primary oils and petroleum products. The first part of the chapter covers the supply and demand of primary oils, crude oils and Natural Gas Liquids (NGLs), and feedstocks. The second part of the chapter covers the supply and demand of petroleum products.

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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx.

3.4 A flow chart of the movement of crude oil, other refinery feedstocks and petroleum products for 2011 is provided, showing the flow from indigenous production and imports to eventual uses. The flows are measured in million tonnes and the width of the bands are approximately proportional to the size of the flow they represent.

Petroleum Flow Chart 2011 (million tonnes)



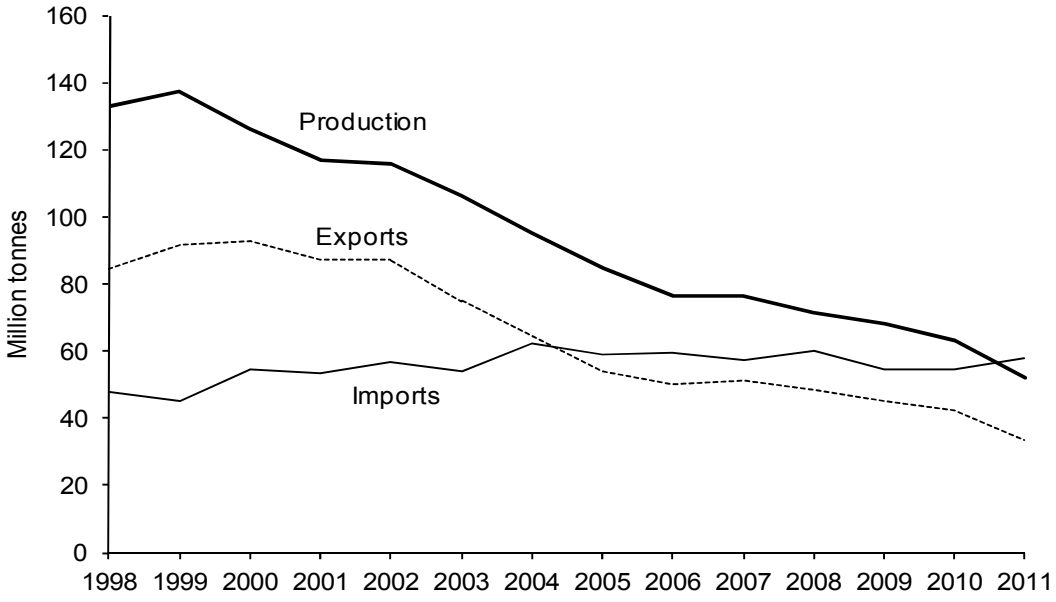
Note:
This flow chart is based on the data that appear in Tables 3.1 and 3.2.
The numbers on either side of the flow chart will not match due to losses in transformation.
Biofuels are not included.

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 natural gas liquids (NGLs), and feedstocks in 2009, 2010 and 2011. 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 2011



3.7 The decreases in production over the last 10 years show a sharp rate of decrease between 2002 and 2006, with a shallower profile in later years, until 2011. A principal driver of this flattening effect from the middle of the decade was the development of the Buzzard field which compensated for the sharper falls seen in the existing fields. On average, year-on-year primary oil production has been decreasing by almost 7 per cent a year since production peaked in 1999. In 2011 a number of unexpected slowdowns saw a reduction of 17 per cent.

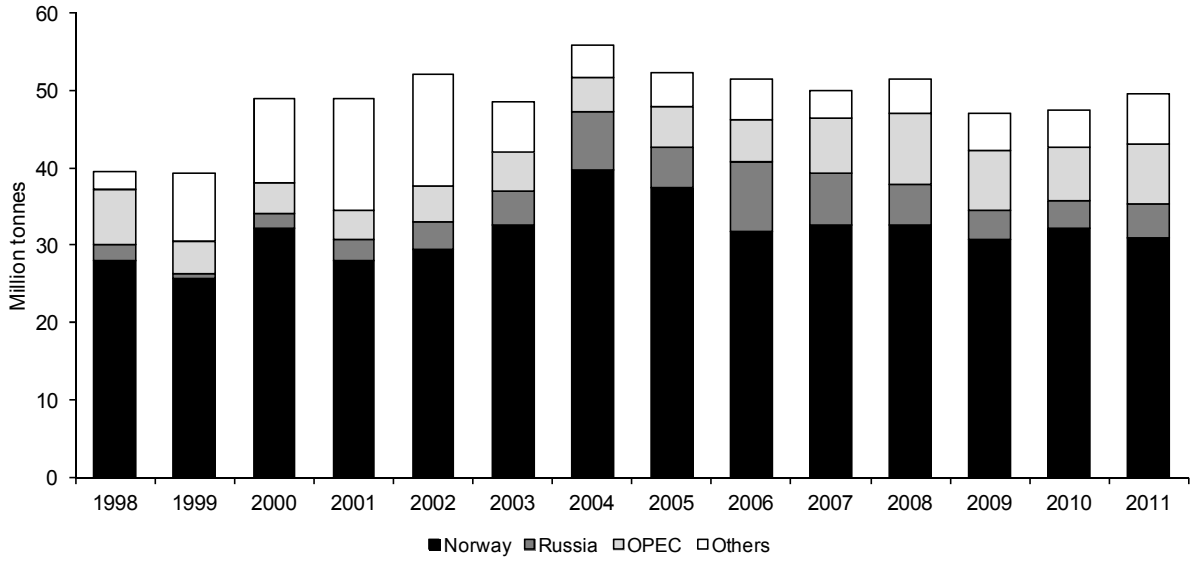
3.8 DECC's Energy Development Unit publishes data on field-by-field production. These are available three months in arrears owing to the need to protect commercially sensitive data. These data can be accessed at http://og.decc.gov.uk/en/olgs/cms/data_maps/field_data/uk_production/uk_production.aspx

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. It is within the top 20 of oil producers worldwide.

3.10 Whilst the UK's production would be sufficient to meet over two thirds of its inland demand, there is an active trade in oil. The UK imports crude oil for various commercial reasons, a principal element of which is the oil's sulphur content. North Sea type crude contains a high proportion of the lighter hydrocarbon fuels resulting in higher yields of products such as motor spirit and other transport fuels. Whilst 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 - primary oil will continue to make a significant contribution to the UK economy.

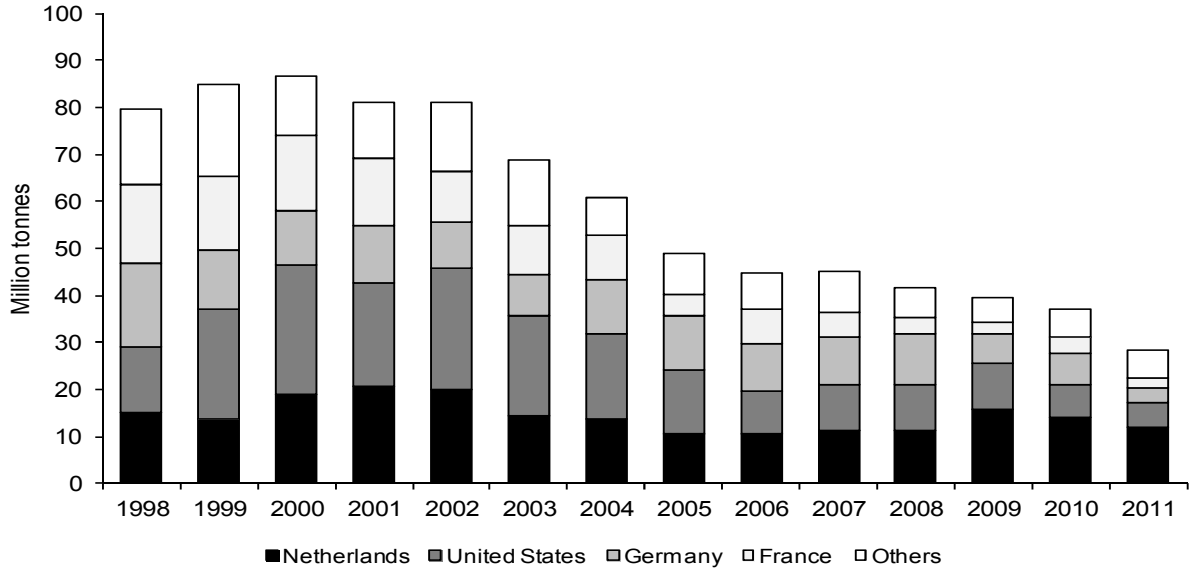
3.11 The sources of crude oil from other countries is shown in Chart 3.2. The principal source of the UK's imports is consistently Norway, given not only its proximity to the UK, but also the similarity in its crude types. These trade data are provisional and subject to revision.

Chart 3.2: Source of UK oil imports 1998 to 2011



3.12 Chart 3.3 shows the decrease in crude oil exports from its peak in 2000, and indicates two quite distinct phases, with a sharp reduction between 2002 and 2005, and a relatively steady level since then, until 2011. Crude oils and NGLs are principally exported to the Netherlands, Germany and the US with exports to France decreasing in recent years.

Chart 3.3: Destination of UK oil exports 1998 to 2011



UK refineries

3.13 A significant proportion of the UK's primary oil was processed into petroleum products by the UK's eight refineries. Data for refinery capacity as at the end of 2011 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 2011 was similar to 2010, and distillation capacity has been broadly constant over the last ten years with the one closure in the last ten years (the suspension of refinery operations at North Tees) offset by small increases in other refineries

Map 3A: Distribution of UK refineries active as at end 2011

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

Table 3A: UK refinery processing capacity as at end 2011

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	5.2
❸	Coryton – Petroplus International Ltd	8.8	1.8	3.4
❹	Grangemouth – Ineos Refining Ltd	9.8	2	3.3
❺	Lindsey Oil Refinery Ltd – Total (UK)	11.8	1.5	4.1
❻	Pembroke – Valero Energy Ltd	10.1	1.5	6.1
❼	Killingholme – ConocoPhillips UK	11.1	2.1	9.5
❽	Milford Haven - Murco Pet. Ltd	6.6	0.9	2.1
①	Harwich – Petrochem Carless Ltd	0.4	-	-
②	Eastham – Eastham Refinery Ltd	1.1	-	-
③	Dundee (Camperdown) – Nynas UK AB	0.7	-	-
Total all refineries		**89.0**	**14.3**	**37.6**

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

3.15 These tables show details of the production, supply and disposals of petroleum products into the UK market in 2009, 2010 and 2011.

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.

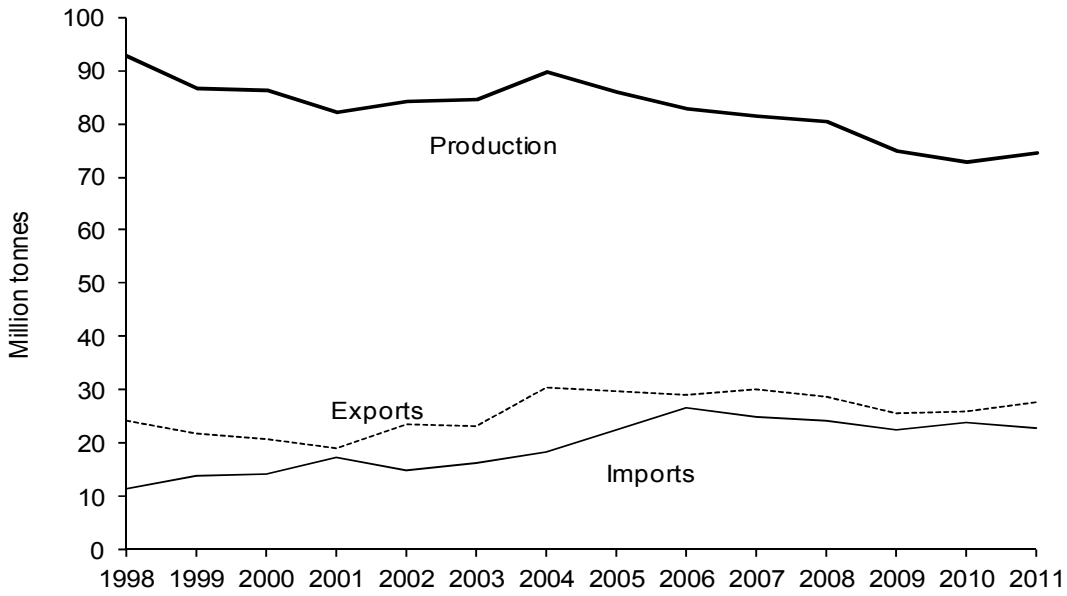
3.17 The lower half of the table reports the demand side and covers the uses made of the different products, including the uses made within refineries of fuels in the refining process, and details of the amounts reported by oil companies within the UK as delivered for final consumption.

Supply of petroleum products

3.18 Chart 3.4 below shows the production output of petroleum products since 1998. In 2011, the UK's refineries produced over 74 million tonnes, up 2 per cent on last year but down 14 per cent on 2000. The UK's refinery capacity remains substantial, ranking 3rd within the EU, behind Germany and Italy, and with slightly more capacity than France.

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 2011, exports of petroleum products increased by 7 per cent, following a smaller increase in 2010.

Chart 3.4: Production, imports and exports of petroleum products 1998 to 2011

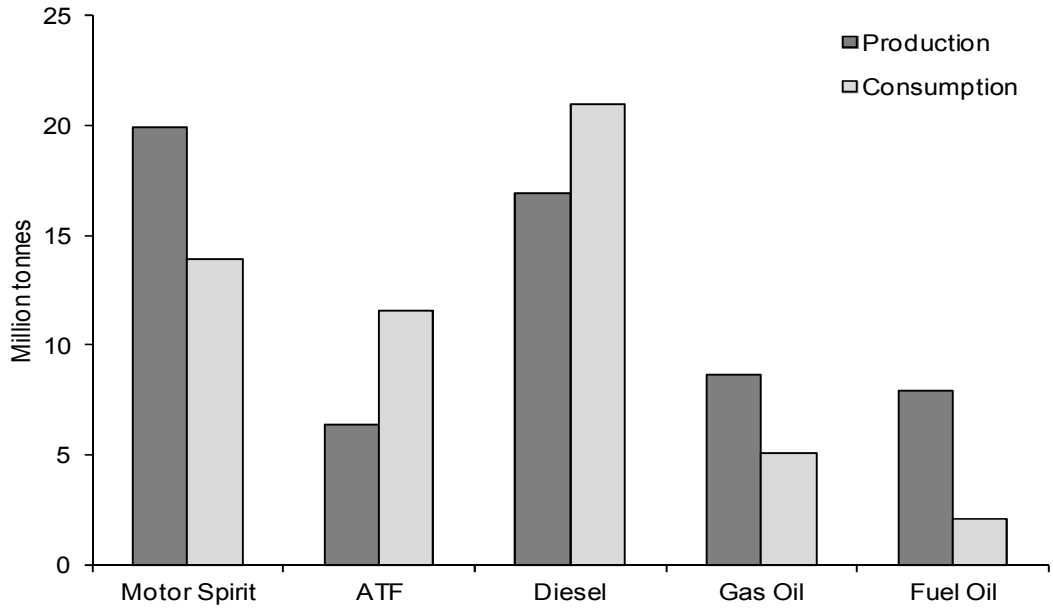


3.20 Whilst UK refinery output outstrips domestic demand, the overall picture of demand and supply is not matched on a product by product basis. The UK's refineries - in common with many other European countries – are geared to produce motor spirit for domestic cars and fuel oil for electricity generation. 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.

3.21 Accordingly, in an international context, the UK is one of the world's largest importers of Aviation Turbine Fuel (ATF) within the OECD, but is also one of the OECD's largest exporters of motor spirit.

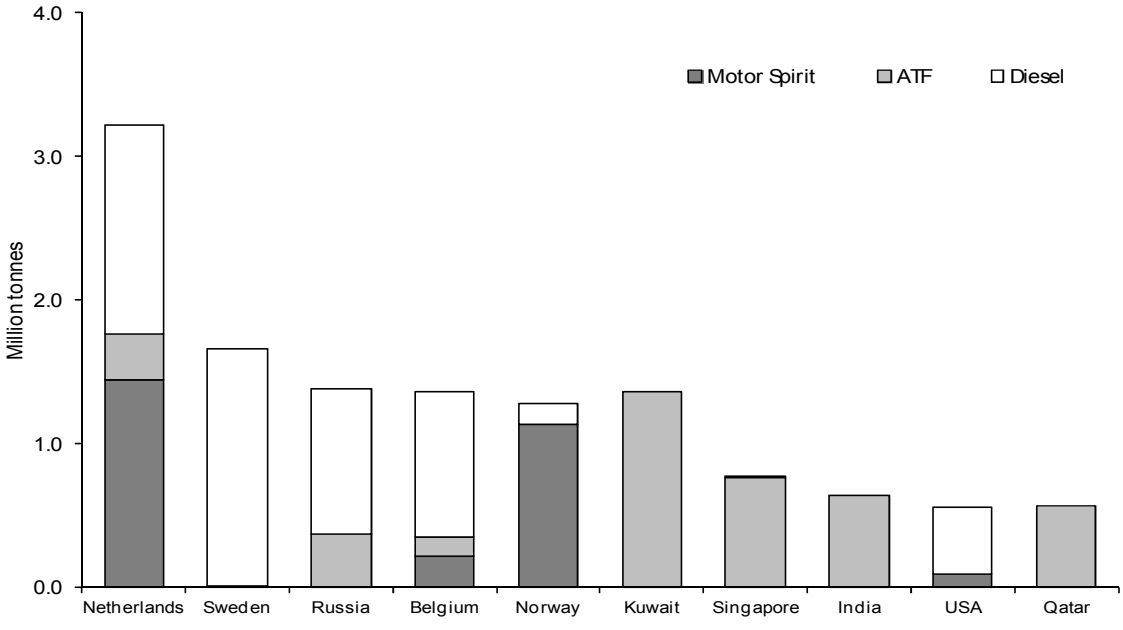
3.22 Chart 3.5 shows the production and consumption figures for the key petroleum products, and illustrates the deficit for ATF and diesel road fuel (DERV), and the surpluses for motor spirit, gas oil, and fuel oil.

Chart 3.5: Production and consumption of key petroleum products 2011



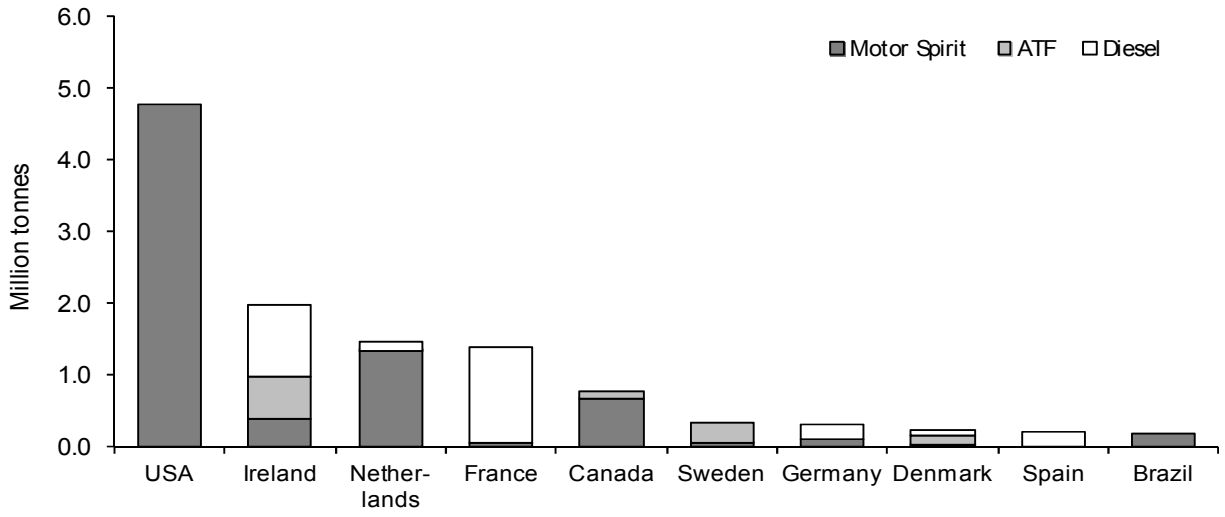
3.23 Chart 3.6 shows the source of transport fuels imported by the UK in 2011. The ten countries shown account for 70 per cent of the total volume of imports. The bulk of the products (around 18 per cent) come via the Netherlands, which acts as a major trading hub: although the fuel might have originated from elsewhere in Europe or beyond. The diversity of supply is spreading compared to 2010. 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 2011



3.24 Similarly, the chart overleaf shows the exports by country of despatch for the principal transport fuels in 2011. The ten countries shown cover85 per cent of these exports. A considerable portion of all of the 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.

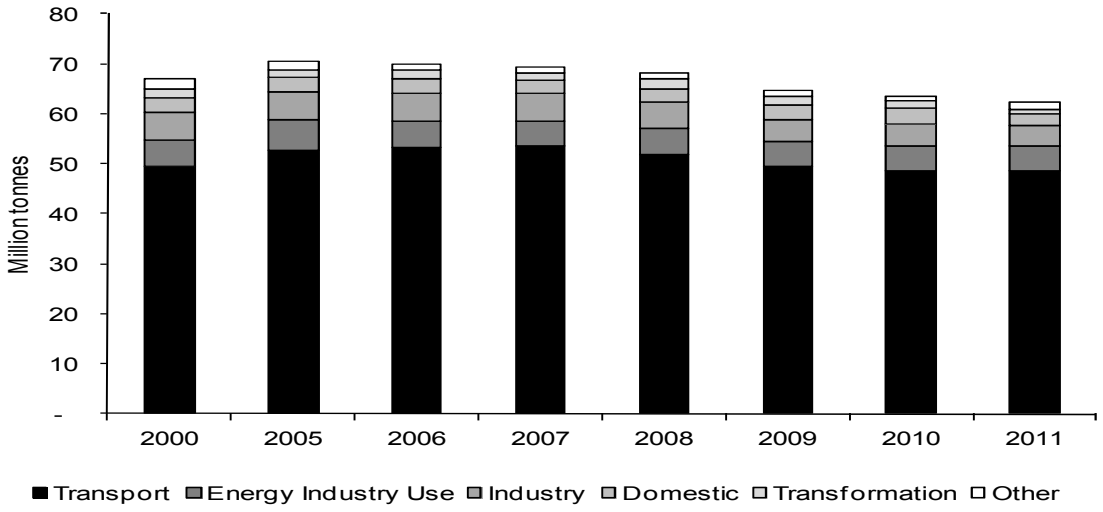
Chart 3.7: Destination of transport fuel exports 2011



Consumption of petroleum products

3.25 Tables 3.2 to 3.4 show the consumption of oil products during the period 2009 to 2011, 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 2011. Energy use of petroleum products decreased every year between 2005 and 2009 with a total decrease of over ten per cent, but it has remained broadly constant since.

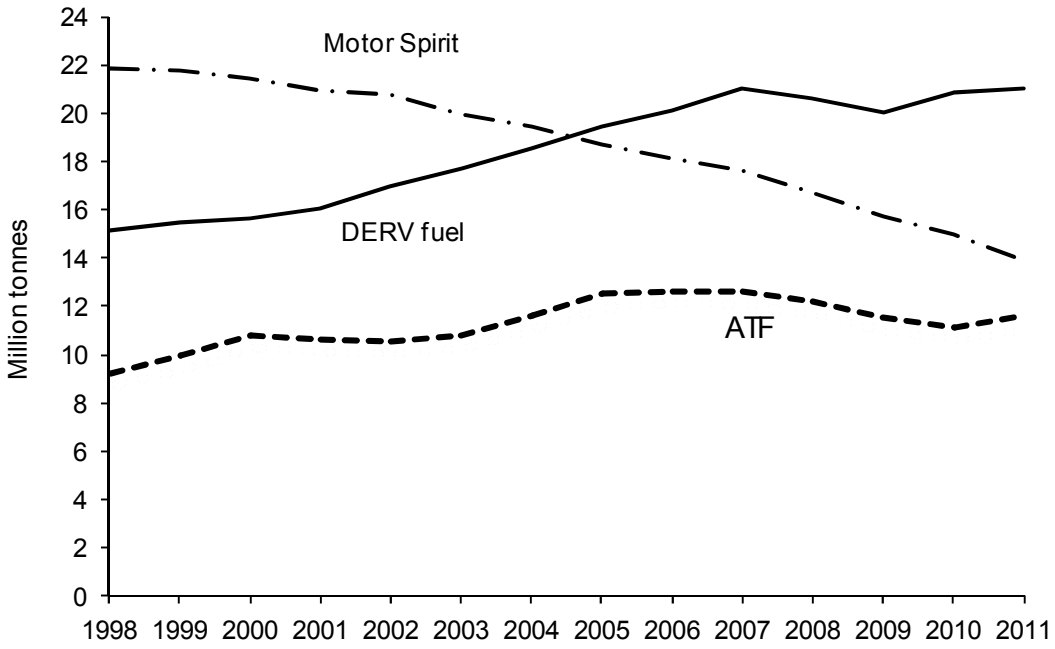
Chart 3.8: Petroleum products used for energy (share by main sector)



3.26 The three main transport fuels - aviation turbine fuel, motor spirit and diesel road fuel – account for two-thirds of the UK's total demand of petroleum products. Once the energy industry's own use has been discounted, these transport fuels account for almost 75 per cent of the UK's final energy consumption of petroleum products.

3.27 Whilst the proportion of petroleum consumed by 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 2011



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 almost doubled between 1995 and 2010.

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

	1995	2000	2005	2009	2010
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	19%	25%	31%	37%	35%
Light goods vehicles	15%	21%	23%	22%	22%
Heavy goods vehicles	58%	46%	39%	33%	35%
Buses and coaches	8%	8%	8%	8%	7%

Source: AEA Energy and Environment

3.29 ATF deliveries were in decline between 2007 and 2010 as a result of the weak economic climate and the eruption of Eyjafjallajokull volcano in April 2010. However this trend was reversed in 2011 as ATF deliveries increased by 4 per cent.

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 2007 to 2011. 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 sold by super/hypermarkets are in line with last year's figures whilst their DERV deliveries increased by 11 per cent. Sales by super/hypermarkets have taken a slightly larger share of retail deliveries (i.e. deliveries to final consumers) of motor spirit and DERV fuel since 2006, and accounted for 43 per cent and 39 per cent respectively in 2011.

Table 3C: Super/hypermarkets share of retail deliveries, 2006 to 2011

per cent

	Motor spirit		DERV fuel	
	Share of retail	Share of total	Share of retail	Share of total
2006	41	39	34	19
2007	41	39	34	20
2008	44	42	34	22
2009	41	40	35	22
2010	41	39	36	23
2011	43	41	39	25

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 not included in the Tables of this chapter, but are included in overall energy balances in Chapter 1, and are covered in the renewables 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 3.5 per cent of total road fuels.

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

Unit: Million litres

Year	Bio-diesel	All diesel including biodiesel	Biodiesel as % Diesel share	Bio-ethanol	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%

Source: HM Revenue and Customs

Stocks of oil (Table 3.7)

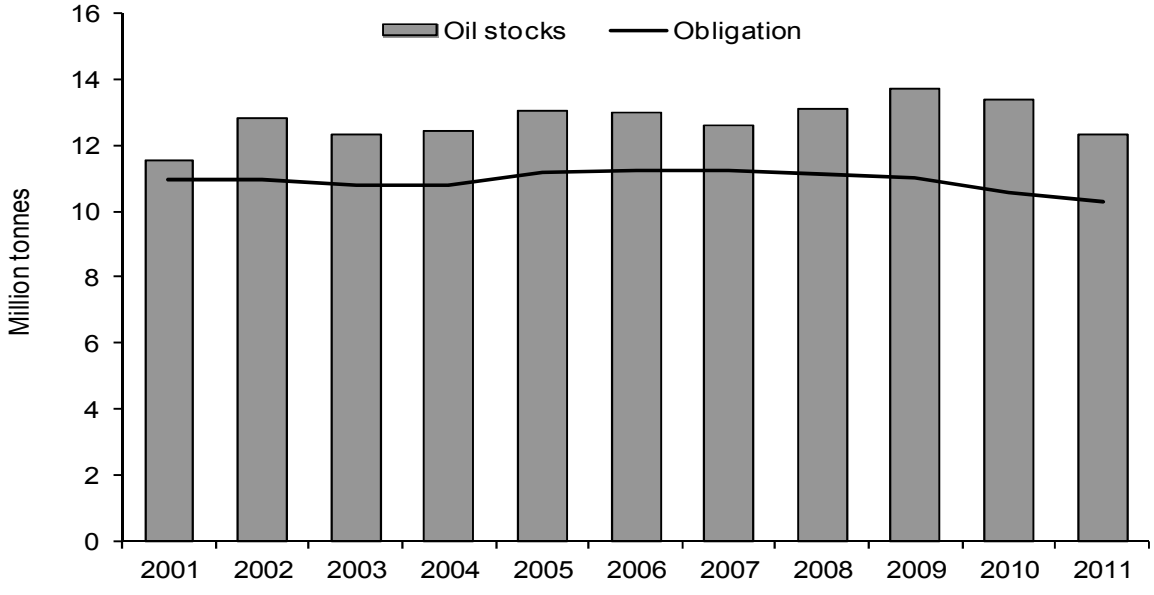
3.34 The UK holds stocks of oil to help reduce the adverse impact on the UK of any disruptions of supplies of oil arising from domestic or international incidents. The UK is required to hold these stocks under EU and IEA qualifying arrangements.

3.35 The EU's requirements are for all member states to hold stocks equivalent to 90 days of 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 oil products into the UK market (production plus net imports) to maintain emergency stocks of oil products as fuels.

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. The stock figures in this year's DUKES have been revised downwards post 2005 to reflect better information on the stock levels of some products, particularly Naphtha, Petroleum Coke and Fuel oils.

Chart 3.10: UK Oil stocks and obligation 2001 to 2011



3.38 The UK held just over 12 million tonnes of petroleum products (equivalent to about 79 days of consumption) towards its EU obligation at the end of 2011, about 1 million tonnes less than the previous year.

3.39 In particular, stocks of motor spirit products held physically in the UK decreased by 26 per cent respectively compared to December the previous year. Petroleum companies reduced their stocks during the last quarter of the year as the markets moved into a slight backwardation, when the future price of a product is less than its current price. The (net) amount of stocks held overseas on behalf of the UK decreased by 18 per cent between 2010 and 2011.

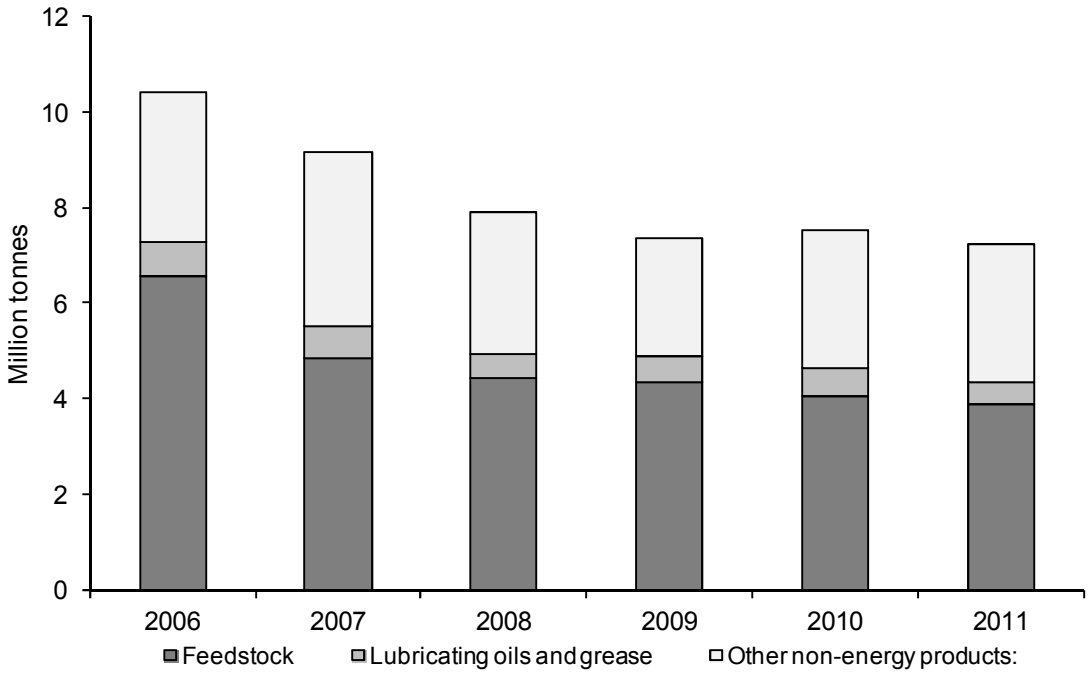
3.40 Crude oil and feedstock stocks also decreased by 10 per cent during 2011. Crude oil yields can also be used against the national obligation.

3.41 The low stock levels observed in 2011 were, in part, a result from the international stock release coordinated by the IEA as a result of the disruption to Libyan oil production. The UK government lowered stock holding obligations by almost 400,000 tonnes for a period of 6 months.

Inland deliveries for non-energy uses (table 3.8)

3.42 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 2011



3.43 Overall, the volume of non-energy use of petroleum products declined between 2006 and 2008 and have been broadly stable since.

3.44 The principal product for non-energy use are gases used as feedstocks in petrochemical plants, accounting for over a third of total non-energy use in 2011. Deliveries of Naphtha are also a significant component of inland deliveries for non-energy use, accounting for 14 per cent of total non energy deliveries in 2011.

3.45 Bitumen remains a significant component of non-energy use, accounting for 22 per cent of consumption in 2011. This represents a 4 percentage point increase on 2010.

Technical notes and definitions

3.46 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

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

Deliveries

3.48 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

3.49 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).

Statistical differences

3.50 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.

3.51 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.

3.52 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.

3.53 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.

3.54 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.

3.55 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.

3.56 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.

3.57 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.

3.58 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.).

3.59 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

3.60 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.

3.61 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.

3.62 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.

3.63 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

3.64 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.

3.65 We will be undertaking a review of trade data in 2012 which could result in changes to these data.

Marine bunkers

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

3.67 In 2009, 20 per cent of UK production of fuel oil and 9 per cent of gas oil production went into international marine bunkers, totalling 2.3 million tonnes of products; 3 per cent of the total UK refinery production in the year. These are fuel sales destined for consumption on ocean going vessels and therefore cannot be classified as being consumed within the UK. Correspondingly, these quantities are treated in a similar way to exports in the commodity balances. It should be noted that these quantities do not include deliveries of fuels for use in UK coastal waters, which are counted as UK consumption and are given in the figures of the transport section of the commodity balances.

Crude and process oils

3.68 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

3.69 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)

3.70 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). From this edition of DUKES onwards, gasoil used for oil and gas extraction is included, following the acquisition of new data. The back-series of these data cover 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)

3.71 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

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

Electricity generators - Petroleum products delivered for use by major power producers and other companies for electricity generation including those deliveries to the other industries listed below which are used for autogeneration of electricity (Tables 3.2 to 3.4). This includes petroleum products used to generate electricity at oil refineries and is recorded in the Transformation sector, as opposed to other uses of refinery fuels that are recorded in the Energy Industry Use sector. From 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

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

Contact: *Warren Evans*
Energy Statistics Team
warren.evans@decc.gsi.gov.uk
0300 068 5059

Clive Evans
Energy Statistics Team
clive.evans@decc.gsi.gov.uk
0300 068 5040

3.1 Commodity balances 2009 - 2011[1]

Primary oil

Thousand tonnes

	Crude oil	Ethane	Propane	Butane	Condensate	Total NGL	Feedstock	Total primary oil
2009								
Supply								
Production	62,820	999	1,692	1,284	1,403	5,378	-	68,199
Imports	47,104	155	198	113	94	561	6,723	54,387
Exports	-39,446	-9	-1,015	-589	-743	-2,356	-3,399	-45,202
Stock change (2)	+393	..	..	..	..	-30	+182	+545
Transfers	-	-1,139	-798	-363	-318	-2,618	+16	-2,601
Total supply	**70,870**	..	..	..	..	**935**	**3,522**	**75,327**
Statistical difference (3)(4)	+155	..	..	..	..	+7	-59	+102
Total demand (4)	**70,716**	..	..	..	..	**928**	**3,582**	**75,225**
Transformation (Petroleum refineries) (4)	70,716	..	..	..	..	928	3,582	75,225
Energy industry use	-	-	-	-	-	-	-	-
2010								
Supply								
Production	58,047	866	1,479	1,159	1,412	4,915	-	62,962
Imports	47,497	159	203	123	99	584	6,505	54,587
Exports	-36,986	-9	-950	-439	-855	-2,253	-2,957	-42,196
Stock change (2)	+166	..	..	..	..	+56	-261	-39
Transfers	-	-1,005	-716	-336	-250	-2,306	+232	-2,074
Total supply	**68,724**	..	..	..	..	**996**	**3,519**	**73,239**
Statistical difference (3)(4)	+12	..	..	..	..	+0	+26	+39
Total demand (4)	**68,711**	..	..	..	..	**996**	**3,493**	**73,200**
Transformation (Petroleum refineries) (4)	68,711	..	..	..	..	996	3,493	73,200
Energy industry use	-	-	-	-	-	-	-	-
2011								
Supply								
Production	48,571	599	1,047	768	987	3,401	-	51,972
Imports	49,649	243	338	214	139	934	7,003	57,586
Exports	-28,286	-7	-634	-348	-561	-1,550	-3,908	-33,745
Stock change (2)	+533	..	..	..	..	+10	+67	+611
Transfers	-	-834	-747	-268	-292	-2,141	+155	-1,986
Total supply	**70,467**	..	..	..	..	**654**	**3,317**	**74,438**
Statistical difference (3)(4)	-224	..	..	..	..	-19	-27	-271
Total demand (4)	**70,691**	..	..	..	..	**673**	**3,345**	**74,709**
Transformation (Petroleum refineries) (4)	70,691	..	..	..	..	673	3,345	74,709
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 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	2,806	1,493	0	19,856	65	6,411
Other sources	834	747	268	-	292	-	-	-	-
Imports	-	164	31	-	459	20	3,398	97	6,881
Exports	-	-545	-276	-	-1,102	-	-9,363	-20	-1,210
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	-4	-7	-0	30	1	39	1	-28
Transfers	-	-6	27	24	-125	-0	-39	-1	-518
Total supply	**834**	**2,001**	**997**	**2,830**	**1,046**	**21**	**13,891**	**143**	**11,535**
Statistical difference *(3)*	**-**	**5**	**2**	**0**	**-0**	**0**	**-4**	**-0**	**-39**
Total demand	**834**	**1,995**	**994**	**2,830**	**1,046**	**21**	**13,895**	**143**	**11,574**
Transformation	**-**	**5**	**-**	**353**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	353	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	353	-	-	-	-	-
Heat generation	-	5	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,309**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,309	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**834**	**1,990**	**994**	**169**	**1,046**	**21**	**13,895**	**143**	**11,574**
Industry	**-**	**430**	**375**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	430	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	0	-	-	-	-	-	-
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 3.45.

3.2 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	74,496	Production
-	-	-	-	-	-	-	-	2,141	Other sources
618	7,806	1,242	808	508	178	496	100	22,804	Imports
-173	-3,127	-4,667	-5,140	-487	-151	-652	-887	-27,800	Exports
-	-	-753	-1,543	-	-	-	-	-2,296	Marine bunkers
-2	83	43	-15	48	4	-16	12	188	Stock change *(2)*
455	-510	441	49	2	96	-	-52	-155	Transfers
3,274	**21,053**	**4,988**	**2,068**	**502**	**1,602**	**2,009**	**585**	**69,378**	**Total supply**
-13	**62**	**-103**	**-3**	**10**	**-18**	**0**	**-6**	**-109**	**Statistical difference *(3)***
3,288	**20,991**	**5,091**	**2,071**	**491**	**1,621**	**2,009**	**592**	**69,487**	**Total demand**
-	**-**	**63**	**426**	**-**	**-**	**48**	**-**	**895**	**Transformation**
-	-	58	374	-	-	48	-	832	Electricity generation
-	-	41	255	-	-	48	-	345	Major power producers
-	-	16	119	-	-	-	-	488	Autogenerators
-	-	5	52	-	-	-	-	63	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**527**	**660**	**-**	**-**	**1,423**	**-**	**4,918**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	527	-	-	-	-	-	527	Oil & gas extraction
-	-	-	660	-	-	1,423	-	4,391	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,288	**20,991**	**4,502**	**985**	**491**	**1,621**	**538**	**592**	**63,674**	**Final Consumption**
1,314	**-**	**1,837**	**125**	**-**	**-**	**-**	**-**	**4,081**	**Industry**
1,314	-	-	-	-	-	-	-	2,118	Unclassified
-	-	-	4	-	-	-	-	4	Iron & steel
-	-	15	7	-	-	-	-	22	Non-ferrous metals
-	-	122	9	-	-	-	-	131	Mineral products
-	-	80	18	-	-	-	-	98	Chemicals
-	-	56	6	-	-	-	-	62	Mechanical engineering etc
-	-	27	3	-	-	-	-	30	Electrical engineering etc
-	-	66	5	-	-	-	-	72	Vehicles
-	-	168	17	-	-	-	-	185	Food, beverages etc
-	-	67	3	-	-	-	-	70	Textiles, leather, etc
-	-	24	10	-	-	-	-	34	Paper, printing etc
-	-	1,114	37	-	-	-	-	1,152	Other industries
-	-	98	5	-	-	-	-	104	Construction
-	**20,991**	**1,411**	**695**	**-**	**-**	**-**	**-**	**48,685**	**Transport**
-	-	-	-	-	-	-	-	11,594	Air
-	-	601	-	-	-	-	-	601	Rail
-	20,991	-	-	-	-	-	-	34,984	Road
-	-	810	695	-	-	-	-	1,505	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
1,973	**-**	**1,128**	**165**	**-**	**-**	**-**	**-**	**3,653**	**Other**
1,973	-	142	-	-	-	-	-	2,401	Domestic
-	-	273	68	-	-	-	-	341	Public administration
-	-	341	61	-	-	-	-	402	Commercial
-	-	153	16	-	-	-	-	271	Agriculture
-	-	218	21	-	-	-	-	239	Miscellaneous
-	**-**	**125**	**-**	**491**	**1,621**	**538**	**592**	**7,255**	**Non energy use *(4)***

3.3 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	2,980	1,596	0	19,918	66	5,781
Other sources	1,005	716	336	-	250	-	-	-	-
Imports	-	162	199	-	672	17	3,137r	181	7,353
Exports	-	-529	-203	-	-1,369	-	-8,619	-25	-1,487
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	-46	30	-	-2	2	299	1	116
Transfers	-	-	-	-	-110	6	-30	-1	-649
Total supply	**1,005**	**1,911**	**1,002**	**2,980**	**1,036**	**25**	**14,705r**	**223**	**11,114**
Statistical difference *(3)*	**-**	**14**	**-33**	**-1**	**-25**	**4**	**103r**	**-1**	**-2**
Total demand	**1,005**	**1,897**	**1,035**	**2,981**	**1,061**	**21**	**14,602r**	**224**	**11,116**
Transformation	**-**	**5**	**-**	**325r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	325r	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	325r	-	-	-	-	-
Heat generation	-	5	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,462r**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,462r	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**1,005**	**1,892**	**1,035**	**194**	**1,061**	**21**	**14,602r**	**224**	**11,116**
Industry	**-**	**277**	**362**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	277	362	-	-	-	-	-	-
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	**-**	**106**	**-**	**-**	**-**	**21**	**14,602r**	**-**	**11,116**
Air	-	-	-	-	-	21	-	-	11,116
Rail	-	-	-	-	-	-	-	-	-
Road	-	106	-	-	-	-	14,602r	-	-
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 3.45.

3.3 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	72,871	Production
-	-	-	-	-	-	-	-	2,306	Other sources
972	7,709r	705	1,020	607r	370	755	119	23,979r	Imports
-191	-2,121	-4,358	-4,895	-421	-187	-686	-975	-26,065	Exports
-	-	-807	-1,332	-	-	-	-	-2,139	Marine bunkers
-5	61	95	115	-19	-88	51	-8	603	Stock change *(2)*
655	-180	81	-15	-1	18	-	-6	-232	Transfers
4,000	**20,802r**	**5,220**	**2,419**	**578r**	**1,389**	**2,227**	**687**	**71,323r**	**Total supply**
-12	**62r**	**-7r**	**15r**	**-2**	**19**	**1**	**16**	**150r**	**Statistical difference *(3)***
4,012	**20,740r**	**5,227r**	**2,404r**	**580**	**1,370**	**2,226**	**671**	**71,173**	**Total demand**
-	**-**	**73r**	**598r**	**-**	**-**	**210**	**-**	**1,211r**	**Transformation**
-	-	67r	541r	-	-	210	-	1,143r	Electricity generation
-	-	45	410	-	-	210	-	665	Major power producers
-	-	22r	131r	-	-	-	-	478r	Autogenerators
-	-	5	52	-	-	-	-	63	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	4r	-	-	-	-	4r	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**493r**	**611r**	**-**	**-**	**1,401**	**-**	**4,967**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	493r	-	-	-	-	-	493r	Oil & gas extraction
-	-	-	611r	-	-	1,401	-	4,474r	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
4,012	**20,740r**	**4,662r**	**1,195r**	**580r**	**1,370**	**615**	**671**	**64,996r**	**Final Consumption**
1,489	**-**	**2,056r**	**468r**	**-**	**-**	**-**	**-**	**4,651r**	**Industry**
1,489	-	-	-	-	-	-	-	2,128	Unclassified
-	-	-	5r	-	-	-	-	5r	Iron & steel
-	-	16	17	-	-	-	-	33	Non-ferrous metals
-	-	133	19	-	-	-	-	152	Mineral products
-	-	82	40	-	-	-	-	122	Chemicals
-	-	60	13	-	-	-	-	74	Mechanical engineering etc
-	-	29	5	-	-	-	-	35	Electrical engineering etc
-	-	72	13	-	-	-	-	85	Vehicles
-	-	181r	38	-	-	-	-	218	Food, beverages etc
-	-	72	7	-	-	-	-	79	Textiles, leather, etc
-	-	26	21	-	-	-	-	47	Paper, printing etc
-	-	1,278r	277r	-	-	-	-	1,555r	Other industries
-	-	107	12	-	-	-	-	119	Construction
-	**20,740r**	**1,384r**	**611**	**-**	**-**	**-**	**-**	**48,580r**	**Transport**
-	-	-	-	-	-	-	-	11,137	Air
-	-	609r	-	-	-	-	-	609r	Rail
-	20,740r	-	-	-	-	-	-	35,448r	Road
-	-	774	611	-	-	-	-	1,385	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
2,523	**-**	**1,081r**	**116**	**-**	**-**	**-**	**-**	**4,235r**	**Other**
2,523	-	165	-	-	-	-	-	3,083	Domestic
-	-	255	35	-	-	-	-	290	Public administration
-	-	301	52	-	-	-	-	353	Commercial
-	-	147	11	-	-	-	-	278	Agriculture
-	-	213r	18	-	-	-	-	230r	Miscellaneous
-	**-**	**142**	**-**	**580r**	**1,370**	**615**	**671**	**7,530r**	**Non energy use *(4)***

3.4 Commodity balances 2009

Petroleum products

Thousand tonnes

	Ethane	Propane	Butane	Other gases	Naphtha	Aviation spirit	Motor spirit	White Spirit & SBP	Aviation turbine fuel
Supply									
Production	-	1,544	569	2,758	1,529	0	20,404	61	6,022
Other sources	1,139	798	363	-	318	-	-	-	-
Imports	-	230	283	-	1,034	26	2,774r	127	7,532
Exports	-	-530	-129	-	-1,812	-1	-7,811	-10	-1,451
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(2)*	-	1	13	-0	83	-2	30	-5	-7
Transfers	-	-	-	-	-179	-0	198	-0	-485
Total supply	**1,139**	**2,044**	**1,098**	**2,758**	**973**	**23**	**15,595r**	**174**	**11,612**
Statistical difference *(3)*	**-**	**10**	**44**	**2**	**-38**	**1**	**-17r**	**-0**	**79**
Total demand	**1,139**	**2,034**	**1,054**	**2,757**	**1,011**	**22**	**15,613r**	**174**	**11,533**
Transformation	**-**	**5**	**-**	**296**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	296	-	-	-	-	-
Major power producers	-	-	-	-	-	-	-	-	-
Autogenerators	-	-	-	296	-	-	-	-	-
Heat generation	-	5	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**2,313**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil & gas extraction	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	2,313	-	-	-	-	-
Coal extraction	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**1,139**	**2,029**	**1,054**	**148**	**1,011**	**22**	**15,613r**	**174**	**11,533**
Industry	**-**	**350**	**294**	**-**	**-**	**-**	**-**	**-**	**-**
Unclassified	-	350	294	-	-	-	-	-	-
Iron & steel	-	-	-	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-	-	-	-
Paper, printing etc	-	-	-	-	-	-	-	-	-
Other industries	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-
Transport	**-**	**107**	**-**	**-**	**-**	**22**	**15,613r**	**-**	**11,533**
Air	-	-	-	-	-	22	-	-	11,533
Rail	-	-	-	-	-	-	-	-	-
Road	-	107	-	-	-	-	15,613r	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**-**	**376**	**33**	**-**	**-**	**-**	**-**	**-**	**-**
Domestic	-	278	33	-	-	-	-	-	-
Public administration	-	-	-	-	-	-	-	-	-
Commercial	-	-	-	-	-	-	-	-	-
Agriculture	-	98	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	-	-	-	-
Non energy use *(4)*	**1,139**	**1,195**	**728**	**148**	**1,011**	**-**	**-**	**174**	**-**

(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 3.45.

3.4 Commodity balances 2009 (continued)

Petroleum products

Thousand tonnes

Burning oil	DERV	Gas Oil [1]	Fuel oils	Lubri -cants	Bitu -men	Petroleum coke	Misc. products	Total Products	
									Supply
2,830	15,908r	9,487	8,641	530	1,338	2,070	1,204	74,895r	Production
-	-	-	-	-	-	-	-	2,618	Other sources
668	5,823r	751	1,243	533	239	813	97	22,172r	Imports
-241	-1,850	-4,183	-5,547	-590	-324	-548	-707	-25,733	Exports
-	-	-716	-1,774	-	-	-	-	-2,490	Marine bunkers
4	173	-15	82	10	-11	-60	24	320	Stock change *(2)*
487	-4	39	-74	-29	20	-	10	-16	Transfers
3,749	**20,049r**	**5,362**	**2,570**	**455**	**1,262**	**2,274**	**627**	**71,766r**	**Total supply**
17	**-63r**	**10**	**-26**	**-55**	**-119**	**-0**	**54**	**-102r**	**Statistical difference *(3)***
3,732	**20,112r**	**5,353**	**2,596**	**510**	**1,381**	**2,274**	**573**	**71,868r**	**Total demand**
-	**-**	**67**	**824r**	**-**	**-**	**502**	**-**	**1,694r**	**Transformation**
-	-	62	708r	-	-	502	-	1,568r	Electricity generation
-	-	42	584r	-	-	502	-	1,127r	Major power producers
-	-	20	125	-	-	-	-	441	Autogenerators
-	-	5	52	-	-	-	-	62	Heat generation
-	-	-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	64r	-	-	-	-	64r	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Other
-	**-**	**450**	**677**	**-**	**-**	**1,410**	**-**	**4,849**	**Energy industry use**
-	-	-	-	-	-	-	-	-	Electricity generation
-	-	450	-	-	-	-	-	450	Oil & gas extraction
-	-	-	677	-	-	1,410	-	4,399	Petroleum refineries
-	-	-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	-	-	Other
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**Losses**
3,732	**20,112r**	**4,835**	**1,095r**	**510**	**1,381**	**363**	**573**	**65,325r**	**Final Consumption**
1,462	**-**	**2,089r**	**393r**	**-**	**-**	**-**	**-**	**4,586r**	**Industry**
1,462	-	-	-	-	-	-	-	2,105	Unclassified
-	-	-	52	-	-	-	-	52	Iron & steel
-	-	16	25	-	-	-	-	41	Non-ferrous metals
-	-	136	23	-	-	-	-	159	Mineral products
-	-	83	48	-	-	-	-	131	Chemicals
-	-	62	19	-	-	-	-	81	Mechanical engineering etc
-	-	30	8	-	-	-	-	38	Electrical engineering etc
-	-	74	21	-	-	-	-	95	Vehicles
-	-	187	37	-	-	-	-	225	Food, beverages etc
-	-	74	10	-	-	-	-	85	Textiles, leather, etc
-	-	26	30	-	-	-	-	55	Paper, printing etc
-	-	1,289r	100r	-	-	-	-	1,389r	Other industries
-	-	110	18	-	-	-	-	129	Construction
-	**20,112r**	**1,540**	**588**	**-**	**-**	**-**	**-**	**49,515r**	**Transport**
-	-	-	-	-	-	-	-	11,555	Air
-	-	601r	-	-	-	-	-	601r	Rail
-	20,112r	-	-	-	-	-	-	35,832r	Road
-	-	939	588	-	-	-	-	1,527	National navigation
-	-	-	-	-	-	-	-	-	Pipelines
2,270	**-**	**1,064**	**114**	**-**	**-**	**-**	**-**	**3,858**	**Other**
2,270	-	131	-	-	-	-	-	2,713	Domestic
-	-	298	47	-	-	-	-	345	Public administration
-	-	283	51	-	-	-	-	334	Commercial
-	-	148	8	-	-	-	-	255	Agriculture
-	-	204	8	-	-	-	-	211	Miscellaneous
-	**-**	**143**	**-**	**510**	**1,381**	**363**	**573**	**7,365**	**Non energy use *(4)***

3.5 Supply and disposal of petroleum[1]

Thousand tonnes

	2007	2008	2009	2010	2011
Primary oils (Crude oil, NGLs and feedstocks)					
Indigenous production *(2)*	76,575	71,665	68,199	62,962	51,972
Imports	57,357	60,041	54,387	54,587	57,586
Exports *(3)*	-50,999	-48,401	-45,202	-42,196	-33,745
Transfers - Transfers to products *(4)*	-2,754	-2,800	-2,618	-2,306	-2,141
Product rebrands (5)	+547	+208	+16	+232	+155
Stock change *(6)*	+784	+234	+545	-39	+611
Use during production *(7)*	-	-	-	-	-
Calculated refinery throughput *(8)*	81,509	80,947	75,327	73,239	74,438
Overall statistical difference *(9)*	32	208	102	39	-271
Actual refinery throughput	**81,477**	**80,740**	**75,225**	**73,200**	**74,709**
Petroleum products					
Losses in refining process *(10)*	293r	315	330r	329	213
Refinery gross production *(11)*	81,184r	80,425	74,895r	72,871	74,496
Transfers - Transfers to products *(4)*	2,754	2,800	2,618	2,306	2,141
Product rebrands *(5)*	-547	-208	-16	-232	-155
Imports	25,110r	24,186	22,172r	23,979r	22,804
Exports *(12)*	-29,983r	-28,791	-25,733	-26,065	-27,800
Marine bunkers	-2,371	-2,594	-2,490	-2,139	-2,296
Stock changes *(6)* - Refineries	1,067	-3r	421	577	46
Power generators	+5	+127	-101	+26	+142
Calculated total supply	77,220r	75,942r	71,766r	71,323r	69,378
Statistical difference *(9)*	-204r	72r	-102r	150r	-109
Total demand *(4)*	**77,424r**	**75,870r**	**75,870r**	**71,173r**	**69,487**
Of which:					
Energy use	69,456r	67,838r	64,502r	63,644r	62,232
Of which, for electricity generation *(13)*	1,126	1,575r	1,568r	1,143r	832
total refinery fuels *(13)*	4,676r	4,752	4,399	4,474r	4,391
Non-energy use	7,967	8,032r	7,365	7,530r	7,255

(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

	2007	2008	2009	2010	2011
Motor spirit					
Retail deliveries (4)					
Hypermarkets (5)					
Lead Replacement Petrol/Super premium unleaded (6)	252r	196	188	168	163
Premium unleaded	6,628r	6,818	6,036	5,542	5,586
Total hypermarkets	6,879	7,014	6,223	5,710	5,749
Refiners/other traders					
Lead Replacement Petrol/Super premium unleaded (6)	535r	559r	558r	478r	397
Premium unleaded	9,559r	8,359r	8,264r	7,894r	7,284
Total Refiners/other traders	10,095r	8,918r	8,822r	8,372r	7,681
Total retail deliveries					
Lead Replacement Petrol/Super premium unleaded (6)	787r	755r	745r	647r	560
Premium unleaded	16,187r	15,176r	14,300r	13,435r	12,870
Total retail deliveries	16,974r	15,932r	15,045r	14,082r	13,430
Commercial consumers (7)					
Lead Replacement Petrol/Super premium unleaded (6)	16r	19r	12r	11r	11
Premium unleaded	624r	591r	555r	509r	454
Total commercial consumers	641r	610r	567r	520r	465
Total motor spirit (10)	**17,615r**	**16,542r**	**15,613r**	**14,602r**	**13,895**
Gas oil/diesel oil					
DERV fuel:					
Retail deliveries (4):					
Hypermarkets (5)	4,165r	4,418	4,447	4,781	5,300
Refiners/other traders	8,142r	8,359r	8,223r	8,376r	8,248
Total retail deliveries	12,308r	12,777r	12,669r	13,157r	13,549
Commercial consumers (7)	8,730r	7,724r	7,443	7,583r	7,442
Total DERV fuel	21,038r	20,501r	20,112r	20,740r	20,991
Other gas oil (8)	6,117r	5,967r	5,353	5,227r	5,092
Total gas oil/diesel oil	**27,155r**	**26,468r**	**25,465r**	**25,967r**	**26,083**
Fuel oils (9)					
Light	568r	611r	374	685r	713
Medium	274r	313r	186	119	124
Heavy	1,368r	1,531r	1,359	989r	575
Total fuel oils	**2,209**	**2,455**	**1,919**	**1,793r**	**1,411**

(1) Aggregate monthly data for inland deliveries of oil products are available - see paragraph 3.70 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

	2007	2008	2009	2010	2011
Crude and process oils					
Refineries *(2)*	4,664	4,616	3,848	4,110	3,889
Terminals *(3)*	1,131	1,092	1,136	1,049	694
Offshore *(4)*	638	664	682	520	540
Total crude and process oils *(5)*	**6,834**	**6,787**	**6,033**	**5,889**	**5,274**
Petroleum products					
Ethane	-r	-r	-r	-r	-
Propane	25r	25r	30r	18r	23
Butane	107r	38r	39r	31r	38
Other petroleum gases	-	-	-	-	-
Naphtha	242r	248r	209r	229r	199
Aviation spirit	5	4	6	4	3
Motor spirit	865	1,085	1,150	1,140	846
White spirit & SBP	9r	5r	9r	9r	7
Aviation turbine fuel	833	1,116	1,429	1,188	1,216
Burning oil	213r	208r	204r	209r	238
Gas/Diesel oil *(6)*	3,357	4,339	4,623	4,018	3,776
of which, DERV	691	790	633	641	545
Fuel oils	829r	709r	797r	687r	645
Lubricating oils	127r	160r	149r	180r	132
Bitumen	116r	123r	134r	101r	95
Petroleum wax	10	11	8	8	6
Petroleum coke	220r	227r	288r	236r	252
Miscellaneous products	143r	117r	96r	104r	92
Total all products	**7,103r**	**8,414r**	**9,173r**	**8,164r**	**7,569**
Of which : net bilateral stocks *(7)*	886	2,104	2,728	2,563	2,100

(1) Aggregate monthly data on the level of stocks of crude oil and oil products are available - see paragraph 3.34 to 3.41
(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

	2007	2008	2009	2010	2011
Feedstock for petroleum chemical plants:					
Propane	811	1,121	1,195	1,039	1,102
Butane	691	825	728	628	593
Other gases	1,514	1,458	1,286	1,199	1,003
Total gases	3,016	3,404	3,209	2,865	2,699
Naphtha (LDF)	1,608	818	1,011	1,061	1,046
Middle Distillate Feedstock (MDF)	238	201	143	142	125
Other products	-	-	-	-	-
Total feedstock	4,861	4,423	4,363	4,069	3,870
Lubricating oils and grease:					
Aviation	5	4	3	4	4
Industrial	370	287	296	337r	276
Marine	22	15	17	19	17
Other motors, Gear oils & Transmissions	271	204	191	216	191
Agricultural	5	3	3	4	3
Fuel oil sold as lubricant	-	-	-	-	-
Total lubricating oils and grease	672	514	510	580r	491
Other non-energy products:					
Industrial spirit/white spirit	167	148	174	224	143
Bitumen	1,563	1,741	1,381	1,370	1,621
Petroleum coke	366	610r	363	615	538
Miscellaneous products	338	596	573	671	592
Total other non-energy products	2,434	3,095r	2,492	2,880	2,894
Total non-energy use	**7,967**	**8,032r**	**7,365**	**7,530r**	**7,255**

Chapter 4
Natural gas

Key points

- UK natural gas production has been decreasing since 2000 and in 2011 was down over a fifth on 2010. This is the largest year-on-year decrease recorded 2000, and some three times the average post 2000 decrease. It is a result of a number of unexpected slowdowns and maintenance issues on the UK Continental Shelf (Chart 4.1, paragraph 4.6).

- Imports of natural gas in 2011 remain historically high, similar to 2010 which was a record year. For the first time since large scale gas extraction began imports exceeded production (Table 4.1).

- Imports of Liquefied Natural Gas (LNG) have grown substantially over the last few years. In 2011 these imports accounted for almost half of the UK's total commercial imports of gas, up from around a third in 2010 (Chart 4.3).

- Despite the record fall in production, increased imports coupled with lower domestic demand contributed to record levels of exports. The total volume of traded gas in 2011 is at its highest ever level (Table 4.1).

- Total gas demand decreased by just under a fifth in 2011 to under 1,000 TWh for the first time this millennium. The lower demand was a reflection of the warm weather – a contrast with a particularly cold 2010 - and lower demand from electricity generators (Table 4.1).

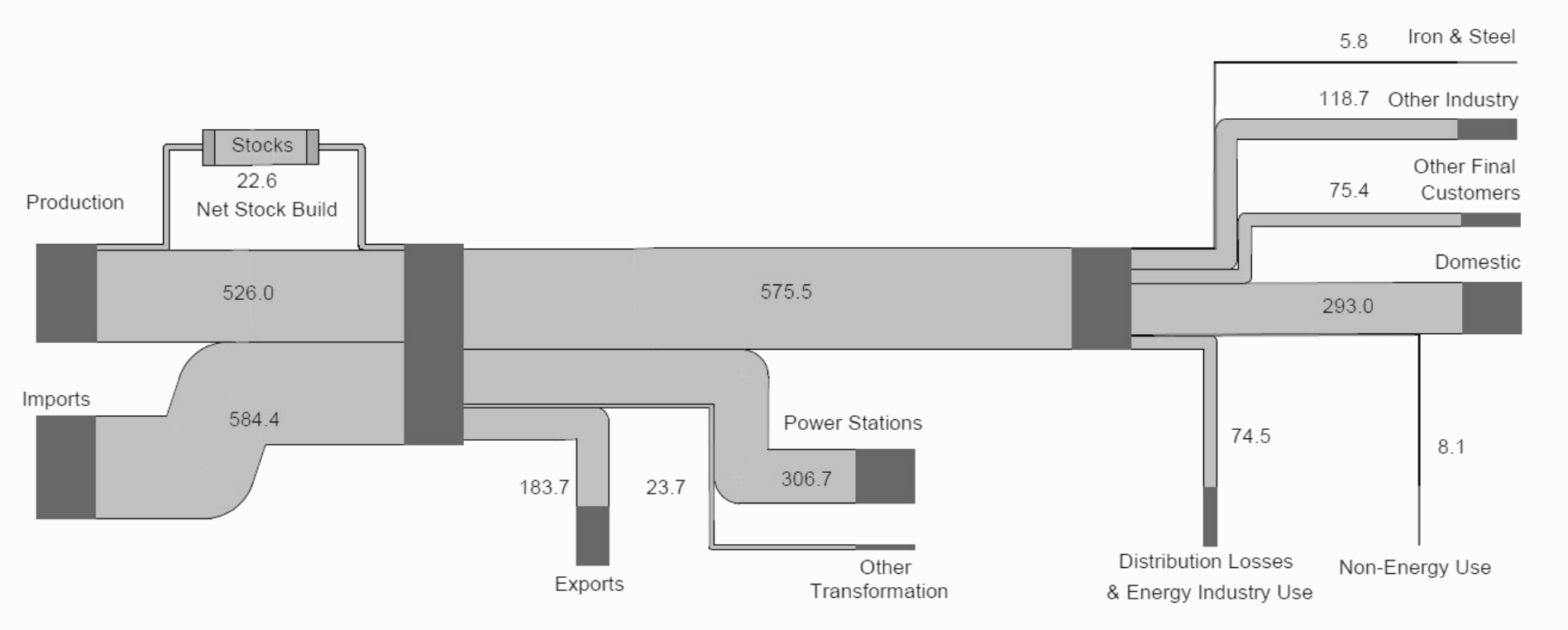
Introduction

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 103 & 104).

4.2 An energy flow chart for 2011, showing the flows of natural gas from production and imports through to consumption, is included overleaf, as a way of simplifying the figures that can be found in the commodity balance tables. It illustrates the flow of gas from the point at which it becomes available from home production or imports (on the left) to the eventual final use of gas (on the right) as well as the gas transformed into other forms of energy or exported.

4.3 Table 4.1 shows the commodity balances for natural gas and colliery methane, both separately and in aggregate. In Table 4.2, the two gases are aggregated and presented as a five year time-series, showing supply, transmission and consumption. The natural gas statistics include bio-methane gas which is being currently being produced by a small number of companies to feed into the national grid. However, 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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Natural gas flow chart 2011 (TWh)



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

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.

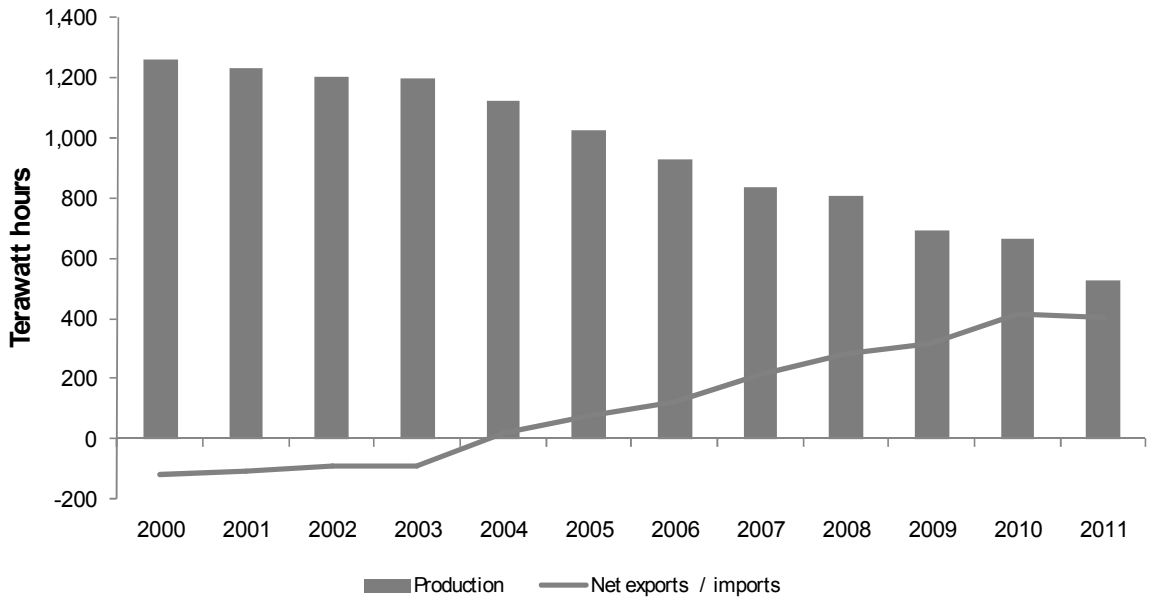
Commodity balances for gas (Tables 4.1 and 4.2)

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

4.6 UK Continental Shelf (UKCS) production of natural gas has been in decline since the turn of the decade and in 2011 (at 526 TWh) it was well under half the level produced in 2000 (1,260 TWh). Since 2000, gas production has fallen off at a rate of around 7 per cent per year. However, the rate of decline varies each year, and in 2011 production was almost 21 per cent lower than in 2010. This is the largest fall in production since production peaked in 2000 and reflects a number of unexpected problems on the UKCS. The UK is still one of the largest gas producers in the EU, second only to the Netherlands, and remains within the top 20 producers globally, accounting for around 1.5 per cent of total global production.

4.7 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 2011 accounting for over 40 per cent of demand. The UK imported 584 TWh in 2011 and this is the first time that gas imports have exceeded gas production since large scale gas extraction began on the UKCS. In 2009 two new LNG terminals at Milford Haven (Dragon and South Hook) began commissioning gas and contributed to the 29.3 per increase in natural gas imports between 2009 and 2010. Gas exports increased significantly in 2011 (see 4.21). The pattern of production and trade can be seen in Chart 4.1.

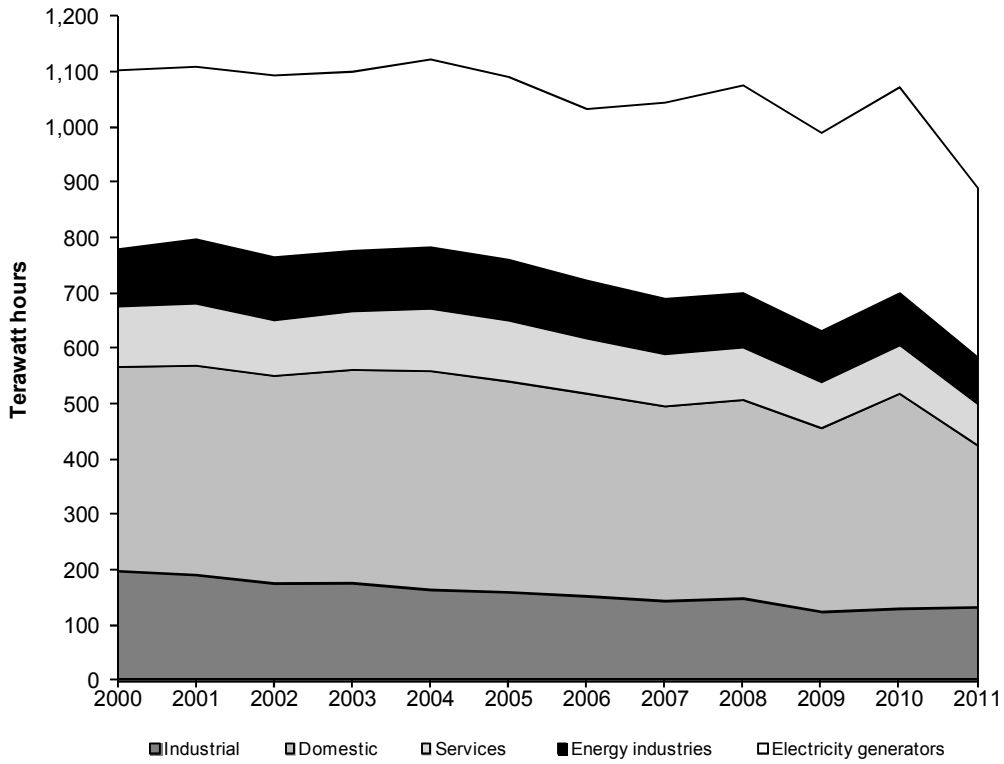
Chart 4.1: Natural gas production and net exports/imports 2000 to 2011



4.8 After an increase of almost 10 per cent in 2010, total gas demand decreased by almost a fifth in 2011, dropping from 1,093 TWh to 906 TWh, the first time since 1997 that demand was less than 1,000 TWh. Part of the reason for the low demand in 2011 was the mild weather which contrasted markedly with the extremely cold weather at the beginning and end of the 2010. The other reasons was a substantial reduction of the use of gas for power generation.

4.9 Chart 4.2 shows the volume of gas used in the UK. Gas consumption is split roughly in thirds between electricity generation and domestic use with the remaining third going to a combination of industry/services and energy industries. With the exception of a modest rise in industrial use of gas, demand for gas saw substantial falls in all sectors.

Chart 4.2: Consumption of natural gas 2000 to 2011



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. The footnotes to the table give more information about each row. This table departs from the standard balance methodology and definitions in order to maintain the link with past data and with monthly data given on DECC's energy statistics web site (see paragraph 4.41). 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 2011 as follows:

			GWh
Total UK consumption (Table 4.3)			836,252
plus Producers' own use			53,163
plus Operators' own use			1,791
equals			
"Consumption of natural gas"			891,206
plus Other losses and metering differences (upstream)			-
plus Downstream losses	- leakage assessment	4,389)	6,517
	- own use gas	355)	
	- theft	1,773)	
plus Metering differences (transmission)			8,037
equals			
Total demand for natural gas (Table 4.1)			905,759

4.11 The box below shows how, in 2011, the wastage, losses and metering differences figures in Table 4.3 are related to the losses row in the balance Table 4.1.

Table 4.3		GWh
	Upstream gas industry:	
	Other losses and metering differences	-
Downstream gas industry:		
	Transmission system metering differences	8,037
	Leakage assessment	4,389
	Own use gas	355
	Theft	1,773
Table 4.1		
	Losses	14,554

4.12 The statistical difference row in Table 4.1 is made up of the following components in 2011:

Table 4.3		GWh
	Statistical difference between gas available from upstream and gas input to downstream	-662
plus	Downstream gas industry:	
	Distribution losses and metering differences	-1,025
Table 4.1		
	Statistical difference	-1,687

4.13 For a discussion of the various statistical difference terms, losses and metering differences in this table, see paragraphs 4.42 to 4.46 in the technical notes and definitions section below.

4.14 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's weekly brief, and storage data from its 2011 Ten Year Statement.

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

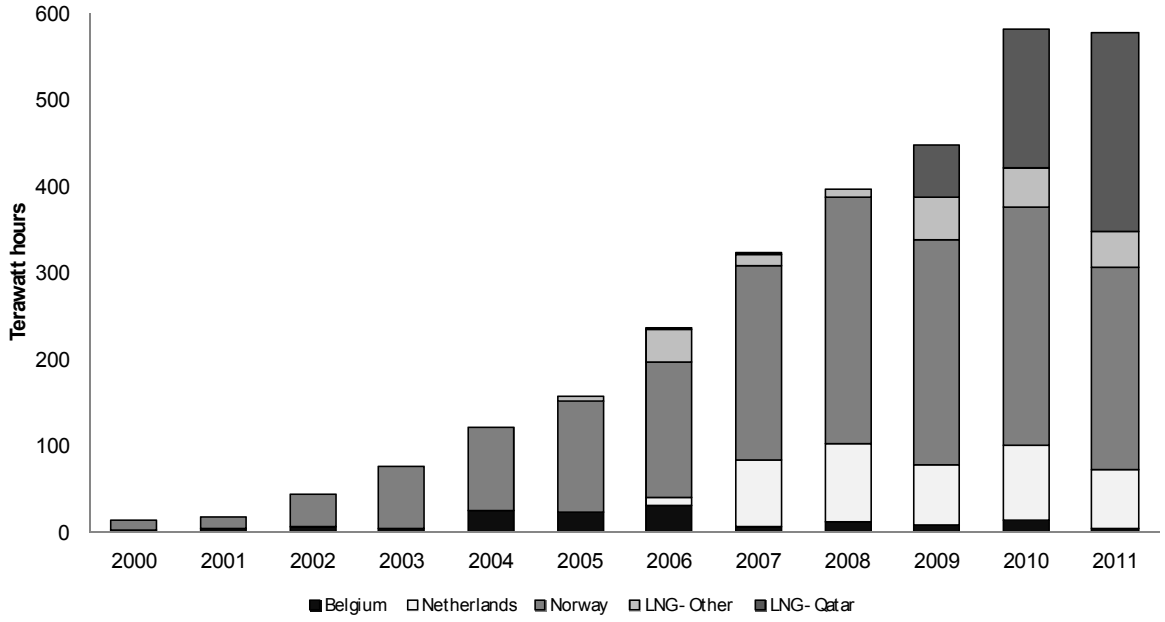
4.15 This table details current gas storage facilities in the UK as at 31 May 2012 and also the two operational pipelines that bring gas to the UK from continental Europe. Significant increases in storage capacity/deliverability are being planned or contemplated at existing or new sites, both onshore 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)

4.16 These tables show how much gas was imported to, and exported from, the UK, via the interconnector pipelines and via ships to the UK's LNG terminals. Norwegian gross gas imports were 41 per cent of total gas imports compared to 48 per cent in 2010 and the lowest proportion in the last 10 years. This decrease largely reflects a number of infrastructure issues at Norwegian terminals in 2011. In 2011, as in 2010, two thirds of gas exports were to continental Europe, with the remaining third to the Republic of Ireland.

4.17 Chart 4.3 shows the shares of natural gas imports by interconnector pipelines and LNG, while the flows of gas across Europe for 2010 are illustrated in Map 4.1. The chart indicates the growth in imports, but also the increasing importance of LNG to the UK.

Chart 4.3: Imports of Natural Gas 2000 to 2011



4.18 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. As a result, 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. In 2011, Qatar accounted for 85 per cent of LNG imports.

4.19 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.

4.20 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:

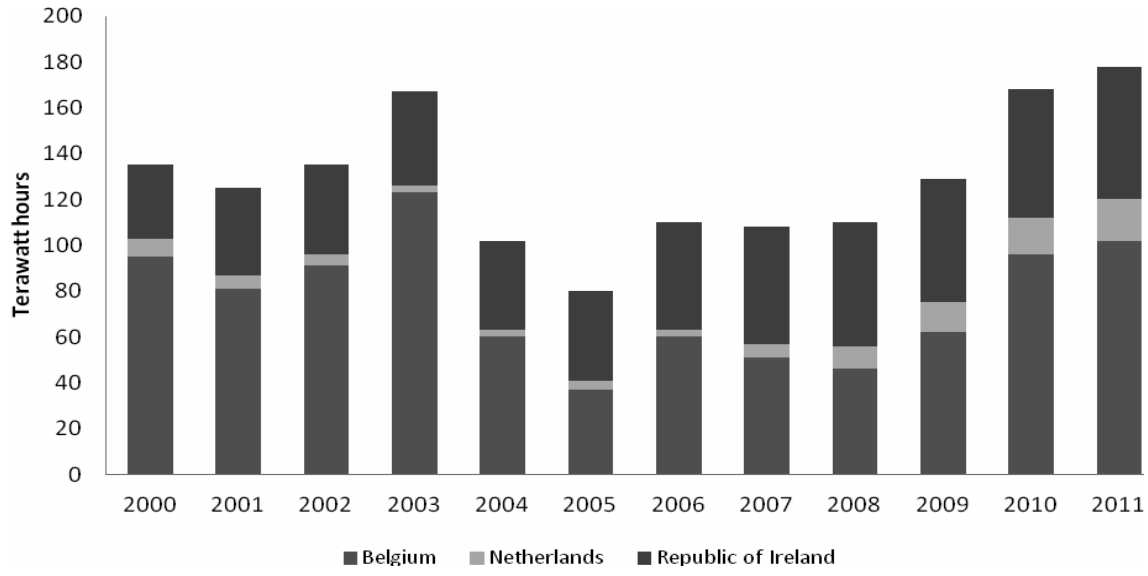
- October 2006 – The southern part of the Langeled pipeline from Sleipner to the UK became operational.
- December 2006 – An interconnector from the Netherlands, the Balgzand-Bacton Line (BBL) began importing gas to the UK.
- October 2007 – New pipeline from Statfjord B to the UK's FLAGS (Far North Liquids 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.

4.21 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. However, with the increase in LNG imports, exports to Belgium have increased to over 100 TWh, roughly double that seen in the middle of the last decade.

4.22 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 field goes straight to Den Helder in the Netherlands. Exports to the Republic of Ireland started in 1995. (See Map 4.2).

4.23 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. The bulk of this is driven by exports to Belgium which have increased in each of the last three years, coupled with more modest increases in exports to the Netherlands and the Republic of Ireland. 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 2011



4.24 The total volumes of gas traded in 2011 was at its highest ever level at 755 TWh. This is a small increase on last year's record high figure, and is some five times larger than 2000.

Sub-national gas data

4.25 Table 4A gives the number of consumers with a gas demand below 73,200 kWh per year in gas year 2010 (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 2010, which is approximately one year in arrears of the other data presented in this chapter, and excludes around 30,000 customers (approximately 0.1 per cent) not allocated to a region.

4.26 In December 2011, DECC published in *Energy Trends* and on its sub-national energy statistics website (www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx) gas consumption data at both regional and local level. The local level data are at "LAU1" level (see article in December 2011 *Energy Trends* for definition) and the regional data at "NUTS1" level. Data for earlier years are presented on the web site.

Table 4A: Consumption by gas customers by region in 2010

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 2010 (GWh)	Number of consumers (thousands)	Gas sales 2010 (GWh)
North West	2,834	26,673	2,868	69,833
South East	3,131	21,257	3,173	69,415
Greater London	2,988	22,722	3,032	67,423
Yorkshire and the Humber	2,083	22,541	2,109	55,027
Scotland	1,905	22,860	1,931	53,190
West Midlands	2,005	17,361	2,029	48,113
East of England	2,068	16,743	2,093	47,905
East Midlands	1,715	14,816	1,735	41,264
South West	1,780	11,368	1,801	35,287
North East	1,100	10,327	1,111	26,469
Wales	1,081	9,478	1,093	26,099
Great Britain[1]	22,719	196,321	23,003	540,642

Source: xoserve and the independent gas transporters

[1] Great Britain includes 30.6 thousand customers (616.3 GWh) that could not be allocated to a region as there was insufficient geographical information to be able to do so.

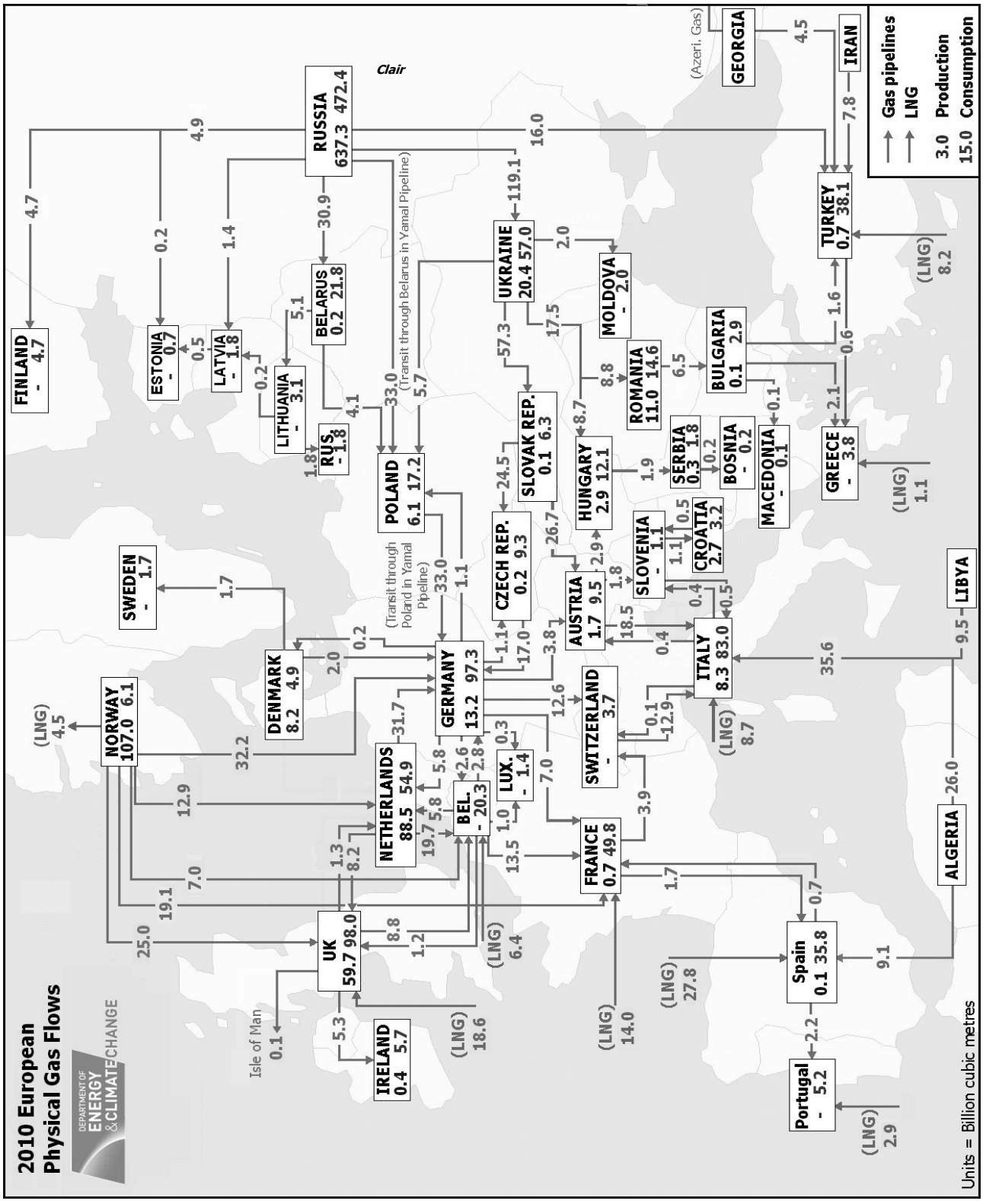
4.27 By December 2011, 12.6 million gas consumers (58 per cent) were no longer supplied by British Gas. Table 4B gives market penetration in more detail, by local distribution zone (LDZ). For all types of domestic customer, it is in the markets in Northern England that new suppliers have had most success. Since the market has opened up, British Gas had lost around 42 per cent of the credit market, 67 per cent of the direct debit market, and 56 per cent of the pre-payment market.

4.28 Competition in the domestic market remained broadly unchanged between 2007 and 2011, with the largest three suppliers accounting for just under 70 per cent of sales in 2010. In the industrial sector, there has been an increase in the proportion of the market supplied by the largest three suppliers to 64 per cent, an increase of 5 percentage points. The commercial sector is more competitive, with the three largest suppliers accounting for 47 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 2011

Region	British Gas Trading			Non-British Gas		
	Credit	Direct Debit	Prepayment	Credit	Direct Debit	Prepayment
Northern	48	25	33	52	75	67
Southern	50	30	27	50	70	73
North East	54	30	40	46	70	60
Scotland	58	32	36	42	68	64
Eastern	55	32	44	45	68	56
East Midlands	55	32	49	45	68	51
Wales	60	32	46	40	68	54
South East	59	33	46	41	67	54
West Midlands	60	36	42	40	64	58
North West	60	35	49	40	65	51
South Western	63	33	53	37	67	47
North Thames	65	40	54	35	60	46
Great Britain	58	33	44	42	67	56

Map 4.1: Gas European Transit System



Source: International Energy Agency and DECC

4.29 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 2011

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

4.30 **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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx. Output of the Norwegian share of the Frigg and Murchison fields is included under imports. A small quantity of onshore produced methane (other than colliery methane) is also included.

4.31 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.

4.32 **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.

4.33 **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 2.53 in Chapter 2.

4.34 **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 2007 to 2011 are shown in Table 4.2 and estimates for 2009 to 2011 in Table 4.1. The estimates for the years up to 2010 have been obtained from AEA's work for the National Atmospheric Emissions Inventory; 2011 data are DECC extrapolations.

Sectors used for sales/consumption

4.35 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

4.36 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.

4.37 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.

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

Period covered

4.39 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 5.82 and 5.83.

Monthly and quarterly data

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

Statistical and metering differences

4.41 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.

4.42 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.

4.43 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.

4.44 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.

4.45 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 2011, the allocation of about 5 per cent of demand is estimated.

Contact: Warren Evans
Energy Statistics Team
warren.evans@decc.gsi.gov.uk
0300 068 5059

Clive Evans
Energy Statistics Team
clive.evans@decc.gsi.gov.uk
0300 068 5040

4.1 Commodity balances

Natural gas

GWh

	2009			2010			2011		
	Natural gas	**Colliery methane**	**Total Natural gas**	**Natural gas**	**Colliery methane**	**Total Natural gas**	**Natural gas**	**Colliery methane**	**Total Natural gas**
Supply									
Production	693,965	775	694,740	664,353	730	665,083	526,030	669	526,699
Other sources	-	-	-	-	-	-	-	-	-
Imports	455,789	-	455,789	589,497	-	589,497	584,414	-	584,414
Exports	-137,100	-	-137,100	-176,399	-	-176,399	-183,689	-	-183,689
Marine bunkers	-	-	-	-	-	-	-	-	-
Stock change *(1)*	-4,876	-	-4,876	+15,271	-	+15,271	-22,623	-	-22,623
Transfers *(2)*	-351	-	-351	-263	-	-263	-60	-	-60
Total supply	**1,007,427**	**775**	**1,008,202**	**1,092,459**	**730**	**1,093,189**	**904,072**	**669**	**904,741**
Statistical difference *(3)*	+78	-	+78	-70r	-	-70r	-1,687	-	-1,687
Total demand	**1,007,349**	**775**	**1,008,124**	**1,092,529r**	**730**	**1,093,259r**	**905,759**	**669**	**906,428**
Transformation	**381,404**	**657**	**382,061**	**396,675r**	**618**	**397,293r**	**330,377**	**560**	**330,937**
Electricity generation	358,646	657	359,303	372,968r	618	373,586r	306,705	560	307,265
Major power producers	328,249	-	328,249	342,150r	-	342,150r	275,591	-	275,591
Autogenerators	30,397	657	31,054	30,818r	618	31,436r	31,114	560	31,673
Heat generation	22,758	-	22,758	23,707r	-	23,707r	23,672	-	23,672
Petroleum refineries	-	-	-	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Energy industry use	**68,976**	**89**	**69,065**	**69,474r**	**87**	**69,561r**	**59,940**	**87**	**60,027**
Electricity generation	-	-	-	-	-	-	-	-	-
Oil and gas extraction	61,110	-	61,110	61,124r	-	61,124r	53,163	-	53,163
Petroleum refineries	3,916	-	3,916	4,354r	-	4,354r	4,373	-	4,373
Coal extraction	-	89	89	-	87	87	-	87	87
Coke manufacture	-	-	-	-	-	-	-	-	-
Blast furnaces	450	-	450	641	-	641	453	-	453
Patent fuel manufacture	-	-	-	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-	-	-	-
Other	3,499	-	3,499	3,355	-	3,355	1,951	-	1,951
Losses *(4)*	**16,356**	-	**16,356**	**18,737**	-	**18,737**	**14,554**	-	**14,554**
Final consumption	**540,614**	**29**	**540,643**	**607,643r**	**25**	**607,668r**	**500,888**	**22**	**500,910**
Industry	**116,380**	**29**	**116,409**	**121,637r**	**25**	**121,662r**	**124,430**	**22**	**124,452**
Unclassified	-	29	29	-	25	25	-	22	22
Iron and steel	5,037	-	5,037	5,827r	-	5,827r	5,758	-	5,758
Non-ferrous metals	2,486	-	2,486	2,622	-	2,622	2,684	-	2,684
Mineral products	15,148	-	15,148	15,761r	-	15,761r	16,128	-	16,128
Chemicals	25,646	-	25,646	25,894r	-	25,894r	26,995	-	26,995
Mechanical Engineering, etc	6,422	-	6,422	6,768r	-	6,768r	6,640	-	6,640
Electrical engineering, etc	3,267	-	3,267	3,399r	-	3,399r	3,467	-	3,467
Vehicles	7,251	-	7,251	7,533r	-	7,533r	7,748	-	7,748
Food, beverages, etc	20,990	-	20,990	22,406r	-	22,406r	23,115	-	23,115
Textiles, leather, etc	5,192	-	5,192	5,288	-	5,288	5,406	-	5,406
Paper, printing, etc	14,406	-	14,406	14,985r	-	14,985r	15,256	-	15,256
Other industries	8,407	-	8,407	8,964r	-	8,964r	8,983	-	8,983
Construction	2,127	-	2,127	2,190	-	2,190	2,249	-	2,249
Transport	-	-	-	-	-	-	-	-	-
Air	-	-	-	-	-	-	-	-	-
Rail	-	-	-	-	-	-	-	-	-
Road	-	-	-	-	-	-	-	-	-
National navigation	-	-	-	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-	-	-	-
Other	**416,234**	-	**416,234**	**477,859r**	-	**477,859r**	**368,404**	-	**368,404**
Domestic	332,499	-	332,499	389,595	-	389,595	292,971	-	292,971
Public administration	37,084	-	37,084	38,324r	-	38,324r	31,165	-	31,165
Commercial	29,305	-	29,305	31,781r	-	31,781r	27,904	-	27,904
Agriculture	1,860	-	1,860	1,969	-	1,969	1,829	-	1,829
Miscellaneous	15,485	-	15,485	16,189r	-	16,189r	14,535	-	14,535
Non energy use	**8,001**	-	**8,001**	**8,147r**	-	**8,147r**	**8,054**	-	**8,054**

(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 4.41 to 4.45.

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

GWh

	2007	2008	2009	2010	2011
Supply					
Production	838,809	810,385	694,740	665,083	526,699
Imports	338,026	407,054	455,789	589,497	584,414
Exports	-123,158	-122,670	-137,100	-176,399	-183,689
Stock change *(2)*	+5,480	-3,087	-4,876	+15,271	-22,623
Transfers	-78	-68	-351	-263	-60
Total supply	**1,059,080**	**1,091,614**	**1,008,202**	**1,093,189**	**904,741**
Statistical difference *(3)*	+207	+14	+78	-70r	-1,687
Total demand	**1,058,873**	**1,091,600**	**1,008,124**	**1,093,259r**	**906,428**
Transformation	**379,518**	**402,236**	**382,061**	**397,293r**	**330,937**
Electricity generation	355,878	376,810	359,303	373,586r	307,265
Major power producers	319,836	344,454	328,249	342,150r	275,591
Autogenerators	36,042	32,357	31,054	31,436r	31,673
Heat generation	23,640	25,426	22,758	23,707r	23,672
Other	-	-	-	-	-
Energy industry use	**76,025**	**72,280**	**69,065**	**69,561r**	**60,027**
Electricity generation	-	-	-	-	-
Oil and gas extraction	64,230	61,292	61,110	61,124r	53,163
Petroleum refineries	5,206	4,971	3,916	4,354r	4,373
Coal extraction	91	95	89	87	87
Coke manufacture	-	-	-	-	-
Blast furnaces	719	718	450	641	453
Other	5,779	5,204	3,499	3,355	1,951
Losses *(4)*	**12,056**	**13,623**	**16,356**	**18,737**	**14,554**
Final consumption	**591,274**	**603,461**	**540,643**	**607,668r**	**500,910**
Industry	**133,350**	**138,688**	**116,409**	**121,662r**	**124,452**
Unclassified	40	34	29	25	-
Iron and steel	7,323	6,920	5,037	5,827r	5,758
Non-ferrous metals	2,864	2,989	2,486	2,622	2,684
Mineral products	16,878	18,363	15,148	15,761r	16,128
Chemicals	30,140	31,182	25,646	25,894r	26,995
Mechanical engineering, etc	7,670	7,704	6,422	6,768r	6,640
Electrical engineering, etc	3,736	3,895	3,267	3,399r	3,467
Vehicles	8,532	8,613	7,251	7,533r	7,748
Food, beverages, etc	22,973	24,361	20,990	22,406r	23,115
Textiles, leather, etc	6,078	6,099	5,192	5,288	5,406
Paper, printing, etc	15,511	16,602	14,406	14,985r	15,256
Other industries	9,229	9,475	8,407	8,964r	8,983
Construction	2,378	2,452	2,127	2,190	2,249
Transport	-	-	-	-	-
Road	-	-	-	-	-
Other	**447,695**	**455,190**	**416,234**	**477,859r**	**368,404**
Domestic	352,868	359,554	332,499	389,595r	292,971
Public administration	42,444	42,565	37,084	38,324r	31,165
Commercial	33,098	33,358	29,305	31,781r	27,904
Agriculture	1,998	2,161	1,860	1,969r	1,829
Miscellaneous	17,286	17,552	15,485	16,189r	14,535
Non energy use	**10,228**	**9,583**	**8,001**	**8,147r**	**8,054**

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

	2007	2008	2009	2010	2011
Total production	**717**	**736r**	**775r**	**730**	**669**
Electricity generation	586	607r	657r	618	560
Coal extraction	91	95	89	87	87
Unclassified industries	40	34	29	25	22
Total consumption	**717**	**736**	**775**	**730**	**669**

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

(3) Total supply minus total demand.

(4) For an explanation of what is included under losses, see paragraphs 4.41 to 4.45.

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

GWh

	2007	2008	2009	2010	2011
Upstream gas industry:					
Gross production *(2)*	838,092	809,649	693,965	664,353	526,030
Minus Producers' own use *(3)*	64,230	61,292	61,110	61,124	53,163
Exports	123,158	122,670	137,100	176,399	183,689
Plus Imports of gas	338,026	407,054	455,789	589,497	584,414
Gas available at terminals *(4)*	988,731	1,032,742	951,544	1,016,327	873,592
Minus Statistical difference *(5)*	45	213	-1,173	68	-662
Downstream gas industry:					
Gas input into the national transmission system *(6)*	988,686	1,032,529	952,717	1,016,259	874,255
Minus Operators' own use (7)	4,698	4,265	2,810	3,211	1,791
Stock change (storage sites) *(8)*	-5,480	3,087	4,876	-15,271	22,623
Metering differences *(5)*	4,472	5,759	9,111	10,848	8,037
Gas output from the national transmission system *(9)*	984,996	1,019,418	935,920	1,017,471	841,804
Minus Leakage assessment *(10)*	5,123	5,297	4,880	5,314	4,389
Own use gas *(11)*	414	428	394	429	355
Theft *(12)*	2,069	2,139	1,971	2,146	1,773
Transfers *(13)*	78	68	354	263	60
Statistical difference and metering differences *(5)*	141	-199	1,248	-138r	-1,025
Total UK consumption *(14)*	**977,172**	**1,011,685**	**927,073**	**1,009,457r**	**836,252**
Stocks of gas (at end year) *(15)*	28,048	31,135	36,011	20,740	43,363
Storage capacity *(16)*	48,126	47,410	47,190	49,700	47,620

(1) For details of where to find monthly updates of natural gas production and supply see paragraph 4.40.
(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 4.41 to 4.45.
(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 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 2012

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	45	Depleted field	Long
National Grid LNGS	Avonmouth	Bristol	0.08	13	LNG	Short
Scottish and Southern Energy	Hornsea	East Yorkshire	0.30	17	Salt cavern	Medium
EDF Trading	Holehouse Farm	Cheshire	0.06	7	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	0.20	12	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)	18
Gjøa Pipeline	Gassco	Links Gjøa/Vega to FLAGS (terminating at St Fergus)	25
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	69
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

	2007	2008	2009	2010	2011
Imports					
by pipelines from:					
Belgium *(2)*	6,471	12,174	7,945	13,568	4,032
The Netherlands *(3)*	76,602	90,563	69,529	87,120	69,001
Norway *(4)*	225,764	283,722	260,438	276,807	234,194
Liquefied Natural Gas (5)	14,903	8,912	110,579	203,789	270,733
of which:					
Algeria	*6,605*	*3,113*	*19,392*	*11,524*	*2,647*
Australia	-	-	*812*	-	-
Egypt	*1,751*	-	*5,804*	*1,263*	*877*
Nigeria	-	-	-	*3,674*	*12,833*
Norway	-	-	*1,862*	*8,904*	*9,965*
Qatar	*2,693*	-	*61,159*	*159,984*	*230,618*
Trinidad & Tobago	*3,854*	*5,799*	*21,550*	*16,646*	*5,816*
USA	-	-	-	-	*1,552*
Yemen	-	-	-	*1,794*	*6,425*
Total Imports	**323,740**	**395,371**	**448,491**	**581,284**	**577,960**
Exports to:					
Belgium *(2)*	51,390	45,949	62,084	95,932	101,526
The Netherlands *(6)*	6,358	10,389	13,094	15,830	17,544
Norway *(7)*	153	389	266	158	125
Republic of Ireland *(8)*	50,972	54,260	54,357	56,266	58,041
Total Exports	**108,873**	**110,987**	**129,801**	**168,186**	**177,236**
Net Imports *(9)*	**214,867**	**284,384**	**318,690**	**413,098**	**400,724**

(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 and Gasport Teesside.

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

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

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

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

4.6 Liquefied Natural Gas imports by terminal

GWh

	2007	2008	2009	2010	2011
LNG Imports via:					
Dragon (*Milford Haven) (1)*	-	-	10,034	19,097	28,365
Isle of Grain (*Isle of Grain*) *(2)*	14,861	8,912	50,483	59,770	85,081
South Hook (*Milford Haven*) *(3)*	-	-	49,249	124,922	157,287
Teesside GasPort (*Teesside*) *(4)*	42	-	813	-	-
	14,903	**8,912**	**110,579**	**203,789**	**270,733**

(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 with a small amount of gas in February 2007.

Chapter 5
Electricity

Key points

- UK electricity generation (including pumped storage) in the UK fell by 3.7 per cent, from 382 TWh in 2010 to 368 TWh in 2011. Total electricity supply (including net imports) decreased by 2.7 per cent. (Tables 5.6 and 5.1)
- Gas's share of generation in the UK fell from 46 per cent in 2010 to 40 per cent in 2011, as generation from gas fell from 176 TWh to 147 TWh, its lowest level since 1999, due to high gas prices. Coal's share increased from 28 to 30 per cent, as it substituted for gas. Nuclear's share of overall generation increased from 16 per cent to 19 per cent, due to higher availability after maintenance outages in 2010. (Table 5.6)
- Renewables' share of generation increased from 6.8 per cent in 2010 to a record 9.4 per cent in 2011, as a result of increased wind and hydro generation due to increased wind capacity, as well as high wind speeds and rainfall. (Table 6B)
- Final consumption of electricity fell by 3.3 per cent, from 329 TWh to 318 TWh, the lowest level since 1998. Of this, domestic consumption decreased by 6.1 per cent, to its lowest level in 12 years, reflecting the warmer winter and improved energy efficiency. (Table 5.1)
- Total UK Transmission Entry Capacity fell by one per cent, from 90 GW to 89 GW. This was mainly due to the mothballing of a large CCGT station, partially offset by increases in wind capacity. (Table 5.7)
- The UK remained a net importer of electricity, with net imports contributing 1.7 per cent of electricity supply in 2011. (Table 5.1)

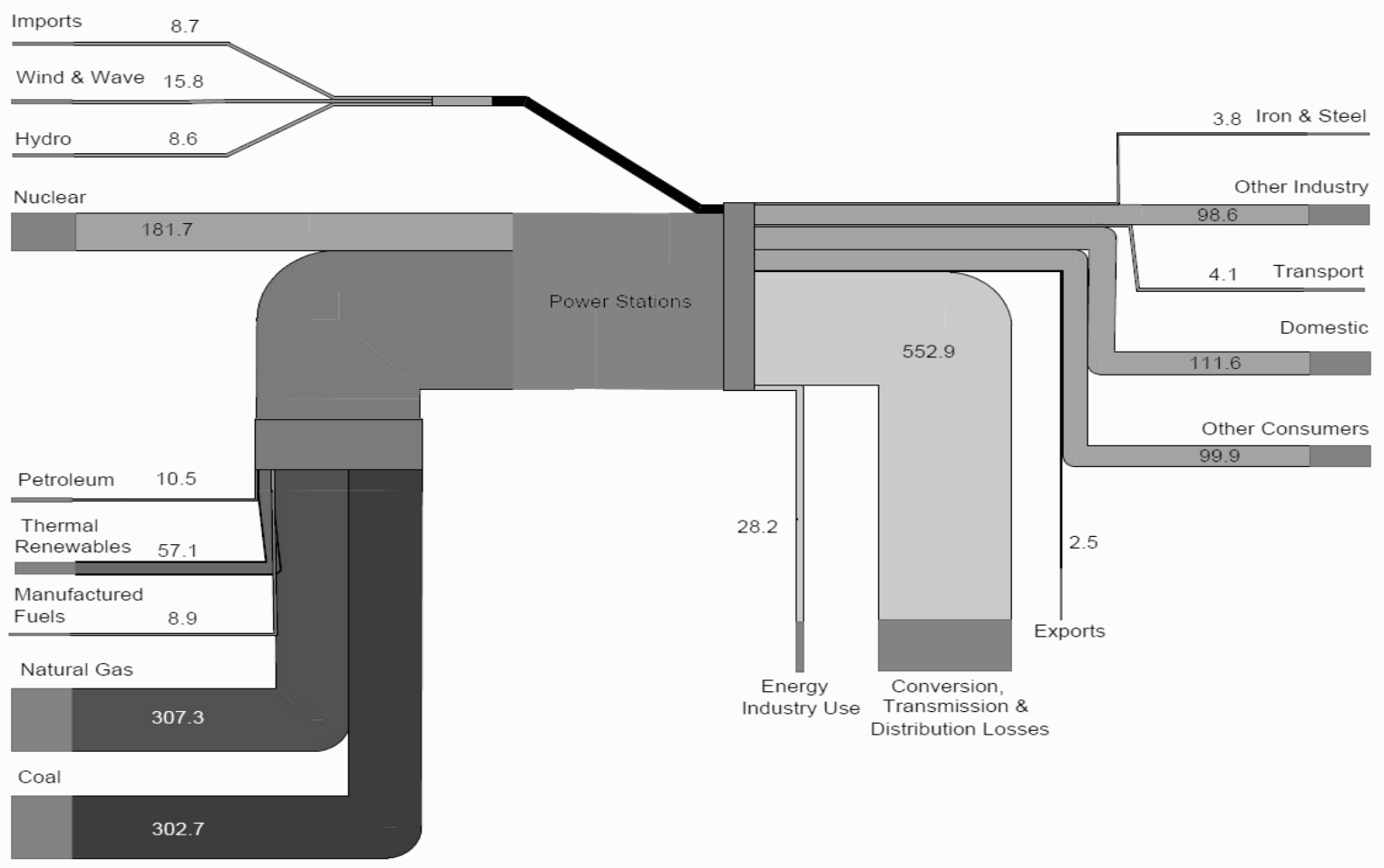
Introduction

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 2011, 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. Two of these contain data at a sub-national level. Table 5.11 lists individual power stations in operation and is supplemented by a table showing large scale Combined Heat and Power (CHP) schemes in the UK (Table 5.12). The long term trends commentary and tables on fuel use, generation, supply and consumption back to 1970 are to be found on DECC's energy statistics web site:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Electricity flow chart 2011 (TWh)



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

Commodity balances for electricity (Tables 5.1 and 5.2)

5.4 In 2011, total electricity supply was 374 TWh, a fall of 2.7 per cent on 2010, and the lowest level since 1997. Of this, just over 98 per cent of UK electricity supply was home produced and just under two per cent was from imports net of exports. For electricity, supply is totally driven by demand – with a milder winter and improving energy efficiency, supply decreased in 2011. The very cold final quarter in 2010, coupled with a recovering economy, had caused a 1.3 per cent increase in supply in 2010, compared with 2009. Prior to this, 2005 to 2009 had all shown falls in supply (compared to the previous year) after continuous growth since 1997, with 2009 showing a notable fall of 5.1 per cent on 2008. The table below summarises the trend in total generation and supply over the last three years.

GWh

	2009	2010	2011
Total Generation (excl. pumped storage)	373,089	378,622	364,897
Total Supply	379,635	384,436	374,024

5.5 In 2011, indigenous production fell by 3.6 per cent on 2010, to its lowest level since 1998. Of the 365 TWh produced (excluding pumped storage production), 90 per cent was from major power producers and 10 per cent from other generators, while 25 per cent was from primary sources (including nuclear, wind and hydro) and 75 per cent from secondary sources (including coal, gas and oil).

5.6 Net imports in 2011 were up by 134 per cent on 2010, to 6.2 TWh. This was due to imports rising by 22 per cent, and exports falling by 45 per cent, the highest level of imports and lowest level of exports since 2008. This followed successive falls in net imports in 2009 and 2010, with net imports in 2010 at a seven year low, and just a quarter of the level of 2008's eight year record high. In 2011, net imports from continental Europe more than doubled, to 6.5 TWh, with the French interconnector providing 4.7 TWh and the newly opened Netherlands interconnector 1.8 TWh. Continental Europe accounted for 99 per cent of imports to the UK. A 6.3 per cent rise in net exports to the Republic of Ireland was also seen, which accounted for 15 per cent of UK exports in 2011[1]. Net imports contributed 1.7 per cent of electricity supply in 2011, up from 0.7 per cent in 2012.

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 fell by 2.7 per cent, from 385 TWh in 2010 to 374 TWh in 2011 [2]. Of total demand, 28 TWh (8 per cent) was used within the energy industry, 28 TWh (8 per cent) was accounted for by losses, and 318 TWh (85 per cent) was final consumption, which fell by 3.3 per cent on 2010 to its lowest level since 1998.

5.9 After a slight increase in 2010, due to a particularly cold final quarter, domestic consumption in 2011 continued its decline from 2005's record high level. With continued energy efficiency improvements and a mild winter, domestic consumption in 2011 fell by 6.1 per cent on 2010, from 119 TWh to 112 TWh, the lowest level since 2000. Commercial sector consumption in 2011 also fell on 2010's level, by 0.9 per cent, to 77 TWh, although this was 1.7 per cent higher than the five year low level seen in 2009. Agriculture consumption fell by 2.0 per cent, while public administration consumption fell by 3.1 per cent on 2010.

5.10 With the manufacturing sector slowing again in 2011, industrial consumption of electricity decreased by 2.0 per cent on 2010, from 105 TWh to 102 TWh. With the economy recovering from recession, in 2010 industrial consumption increased by 4.8 per cent from 2009's level of 100 TWh, which was the lowest in at least the last decade. Consumption in the iron and steel industry in 2011 was 3.8 TWh, around the same level as a year earlier, after an increase of 6.3 per cent in 2010 from the record low of 3.6 TWh in 2009.

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

[2] The term statistical difference is used to define the difference between total supply and total demand. – see paragraph 5.89

5.11 Consumption in the Transport sector increased very slightly, by 0.1 per cent, to 4.1 TWh in 2011, with a small increase in numbers of electric road vehicles. Despite this, 99 per cent of transport electricity consumption was by Rail.

5.12 Industrial consumption was 27 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 39 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 2011, by final consumer.

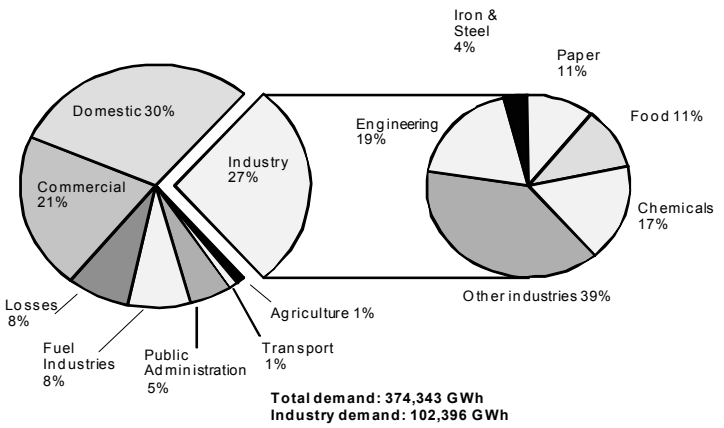
5.13 Consumption by the energy industries fell by 2.9 per cent, to its lowest level in at least the last decade. Energy industry use as a proportion of total demand was 7.5 per cent, unchanged from that in 2010 (as total demand also fell). The electricity industry itself uses 58 per cent of the energy industries' total use of electricity. This does not include the 14 per cent of energy industry use accounted for by pumping at pumped storage stations (see 'pumped storage' line in tables 5.1 and 5.2). Petroleum refineries are the next most significant consumer with 16 per cent of energy industry use.

5.14 Losses as a proportion of electricity demand in 2011, at 7.5 per cent, were up by half a percentage point on 2010 (7.0 per cent). The losses item has three components:

- transmission losses (6.5 TWh) from the high voltage transmission system, which represented about 23 per cent of the figure in 2011;
- distribution losses (20.7 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).

5.15 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 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. As a whole, 2010 was 1.1 degrees cooler on average than 2009, and the coldest year since 1987. Furthermore, 2010 saw the coldest December on record, with average temperatures in the final quarter 2.5 degrees lower than in 2009, and the first quarter also colder than a year earlier, by 1.4 degrees. In 2009, whilst the first quarter was also 1.1 degrees colder than a year earlier (and the coldest since 2006), the average temperature across the year was much the same as for 2008 (which was the coldest year since 1996).

Chart 5.1: Electricity demand by sector 2011



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 and electricity provided by other generators (largely autogeneration and generation from renewable sources). Further information on the definitions of other generators and major power producers (MPPs) can be found in paragraph 5.66. 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 rose from 8.9 per cent in 2010 to 9.6 per cent in 2011. Of electricity supplied by other generators, 46 per cent was transferred to the public distribution system in 2011, an increase of around one percentage point on 2010.

5.18 In 2011, 4.5 per cent of final consumption of electricity was by other generators and did not pass over the public distribution system. This was an increase from the 4.1 per cent in 2010. 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 2011, 70 per cent of electricity consumed was self-generated.

5.19 In 2011, 10.4 per cent of the industrial demand for electricity was met by autogeneration, a slight increase on the 9.6 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 2011, 21 per cent was reported as being purchased under some form of off-peak pricing structure (e.g. Economy 7), very slightly lower than in 2010 and 2009. Sixteen per cent of consumption was through prepayment systems, broadly unchanged from the level in 2010.

5.21 In the 2012 Digest, domestic consumption of electricity produced by other generators is included for the first time. 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 6.11 for further information on FiTs uptake). In 2011, consumption of self produced electricity by the domestic sector had increased ten-fold, from 10 GWh in 2010 to 104 GWh.

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[3].

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.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

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

5.25 Total electricity generated (including pumped storage) in the United Kingdom in 2011 was 368 TWh, a decrease of 3.7 per cent on the 382 TWh in 2010. Major power producers (MPPs, as defined in paragraph 5.66) accounted for 90 per cent of electricity generation in 2011. Generation by MPPs was down 4.4 per cent on 2010, at 332 TWh, while generation by other generators was 4.0 per cent up on a year earlier, at 35 TWh.

5.26 Generation from gas fell by 16 per cent, from 176 TWh in 2010 (marginally less than 2008's record high level), to 147 TWh in 2011, the lowest level since 1999. This was due to high gas prices making it comparatively more expensive to generate, as well as greater generation from nuclear and renewables. As a result, several stations have been running at zero or minimal levels during 2011. In 2010, high winter electricity demand had caused an increase in generation from coal. However, although winter electricity demand in 2011 was lower, generation from coal, at 109 TWh, was 0.8 per cent higher than in 2010, mainly because coal acted as a substitute for gas for much of the year.

5.27 After maintenance outages in 2010, particularly to Sizewell B which was offline for six months, increased availability in 2011 resulted in generation from nuclear sources increasing by 11 per cent, from 62 TWh in 2010 to 69 TWh in 2011.

5.28 In 2011, generation from oil continued to fall. It fell by 24 per cent, from 4.8 TWh in 2010 to 3.7 TWh in 2011, its lowest level since at least 1996 and a fall of 3.0 TWh on 2008's ten year high.

5.29 Generation by all renewable sources[4] rose 33 per cent (to 34 TWh) between 2010 and 2011. High wind speeds and much increased capacity in 2011 resulted in overall wind generation [5] increasing by 54 per cent to 16 TWh. With rainfall levels in 2011 almost double that of 2010, hydro generation also increased sharply (by 56 per cent) from 3.6 TWh to 5.7 TWh. Over the same period, generation from thermal renewables (including biodegradable wastes) rose 8.2 per cent to 13 TWh. In the Digest 2012, for consistency with the Renewables chapter (Chapter 6), non-biodegradable wastes (previously included in thermal renewables) have been moved to the 'other fuels' category for 2007 onwards. Prior to this, they remain in thermal renewables. 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 2011 was 3.9 per cent less than in 2010, at 351 TWh. For gas-fired stations it was 16 per cent less, for coal it was 0.8 per cent more, while for nuclear stations it was 11 per cent more.

---

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

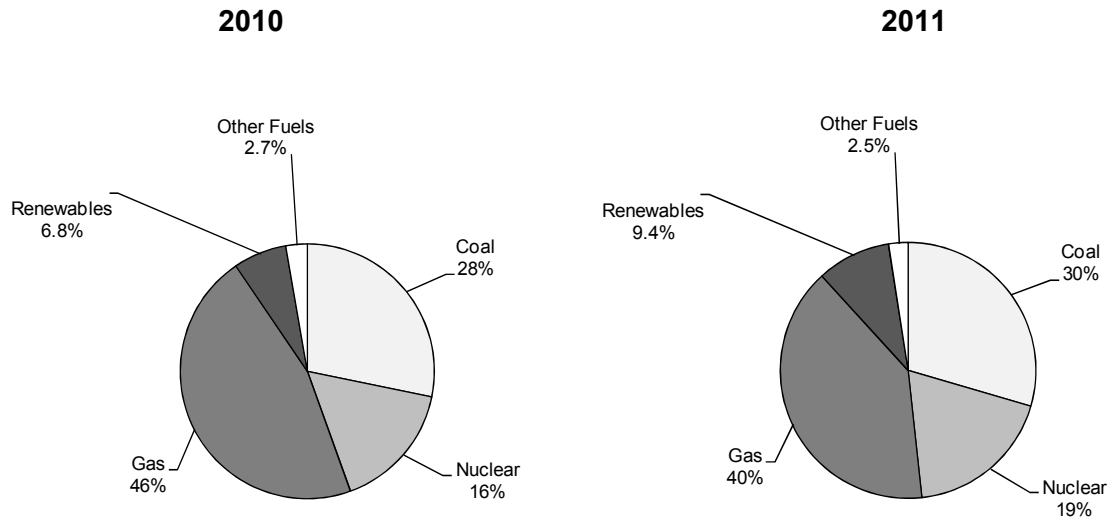
[4] Renewables includes wind, natural flow hydro and thermal renewables (including co-firing).

[5] Including generation from wave, tidal and solar photovoltaics

5.31 Chart 5.2 shows the shares of 2011 generation by fuel, on an output basis (i.e. the percentage of electricity generated by the fuel), compared with 2010. 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 2011, at 40 per cent, was six percentage points lower than in 2010's record high of 46 per cent. Coal's share, at 30 per cent, was two percentage point more than in 2010. With increased availability, nuclear's 19 per cent share was three percentage points higher than in 2010. Renewables' share increased from 6.8 per cent in 2010 to a record 9.4 per cent in 2011. Other fuels, including oil and pumped storage, fell from 2.7 per cent in 2010 to 2.5 per cent in 2011.

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.

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

5.36 In 2011, total capacity of all generators fell by 1.4 per cent, from 90,426 MW in 2010 to 89,115 MW. For MPPs, there was a decrease of 1,558 MW (1.9 per cent), from 83,307 MW to 81,750 MW. The main contributory factor was a fall of 1,541 MW of Combined Cycle Gas Turbine (CCGT) capacity, which was the result of the mothballing of Teesside power station and the closure of Fife power station (offset slightly by the opening of further capacity at EON's new Grain power station). In addition, the conversion of Tilbury B dual-fired power station (and its gas turbine) to dedicated biomass resulted in a net decline of 321 MW to overall capacity [7], while the closure of half of Oldbury nuclear power station

[6] A full definition of TEC and DNC is given in paragraph 5.79. Renewables installed capacity figures are given in table 6.4. Wind, small scale hydro, and solar photovoltaics DNC is de-rated to take into account intermittency.

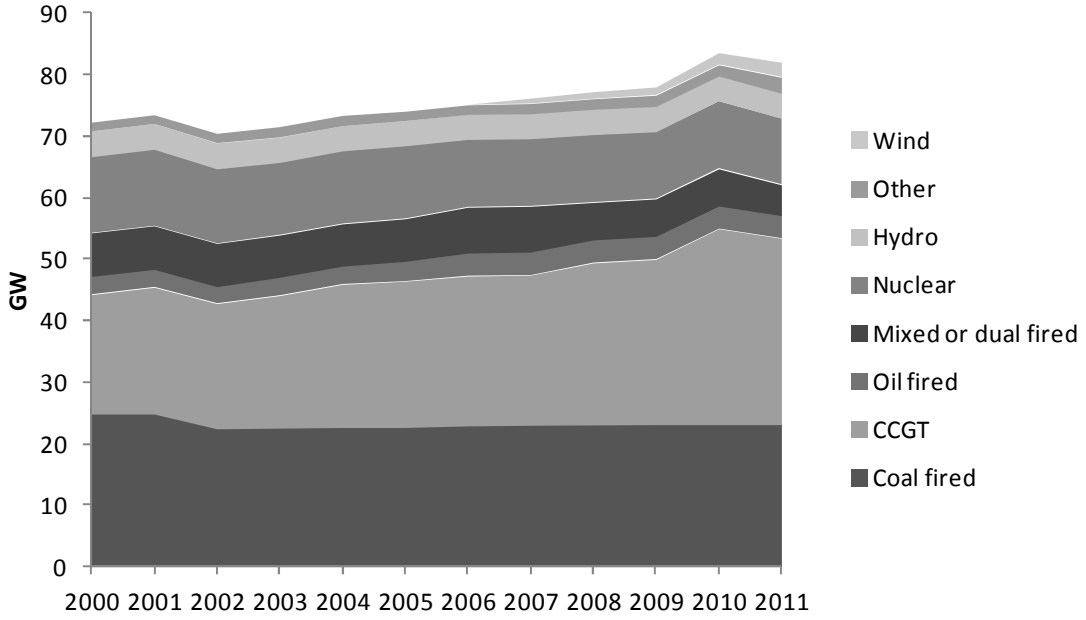
[7] The 321 MW net reduction consists of: 1,063 MW reduction to "mixed or dual-fired" capacity; 68 MW reduction to "gas turbines and oil engines"; and 742 MW and 68 MW increases to "renewables other than hydro and wind".

reduced capacity by a further 207 MW. After an increase of 571 MW in 2010, wind capacity increased by a further 465 MW, with many new sites opening, including four large new offshore wind farms. Additionally, around 50 MW of wind capacity was reclassified from other generators to MPPs. In December 2011, MPPs accounted for 91 per cent of the total generating capacity, one percentage point less than at the end of the previous two years. The capacity of other generators increased by 247 MW (3.5 per cent), with a 255 MW increase in capacity from renewables other than hydro and wind [8] offset by a 58 MW decrease in CCGT.

5.37 A breakdown of the capacity of the MPPs' plants at the end of December each year from 2000 to 2011 is shown in Chart 5.3.

5.38 Table 5.8 separates the capacities of MPPs geographically to show England and Wales, Scotland and Northern Ireland. In 2011, 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 1,558 MW between 2010 and 2011, 1,601 MW was in England and Wales, with Scotland showing a net increase of 37 MW. Northern Ireland's capacity increased by 6 MW, from 2,430 MW to 2,436 MW.

Chart 5.3: Generating capacity of major power producers 2000-2011



(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

5.39 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 2011, 15 per cent of the capacity was in the chemicals sector. Oil and gas terminals and oil refineries had 14 per cent of capacity, engineering and other metal trades had a nine per cent share and paper, printing and publishing and food, drink and tobacco had a six per cent share each. In 2011, 45 per cent of capacity was in the commercial and domestic sectors. 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

[8] Approximately 150 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.

MPP as the electricity generated is now exported to the grid rather than for use in the nearby paper mill. This change in classification led to a fall in capacity in the paper, printing and publishing sector.

Plant loads, demand and efficiency (Table 5.10)

5.40 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 2011.

5.41 Maximum load (demand) in the UK during the winter of 2011/2012 occurred on 8 February 2012. At 57,086 MW, this was 6.3 per cent lower than the previous winter's maximum on 7 December 2010. In 2011/12, the maximum load in Great Britain occurred on 8 February 2012 at the half hour period ending 18:00 (55,505 MW). However, in Northern Ireland the maximum load occurred on 12 December 2011 at the period ending 17:30 (1,740 MW), which was 10.1 per cent above that of the previous winter. In Great Britain the highest ever load met was 60,118 MW on 10 December 2002.

5.42 Maximum demand in 2011/2012 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 2011, compared with 73 per cent in 2010/2011.

5.43 In Great Britain, maximum demand in December 2011 was 70 per cent of the England, Wales and Scotland capacity of MPPs (Table 5.8) compared with 73 per cent for winter 2010/11. For Northern Ireland, the proportion was 65 per cent (73 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 2011 at 66.4 per cent was 7.1 percentage points higher than in 2010, due to increased availability after the extensive maintenance outages of 2010. However, it was 14 percentage points below the peak load factor of 80.1 per cent in 1998. With generation from gas at its lowest level since 2006 (due to high gas prices, as well as lower demand and increased nuclear availability), the CCGT load factor fell by 14 percentage points to a record low of 47.8 per cent. This was following reductions in 2010 (due to a large increase in capacity) and 2009 (partly due to lower electricity demand, coupled with a small increase in capacity), from 2008's eight-year high of 71.0 per cent. Between 2010 and 2011, the load factor for coal fired power stations increased by less than one percentage point, to 40.8 per cent, with high gas prices helping the higher coal generation levels of 2010 to be maintained. The load factor increase from 38.5 per cent in 2009 to 40.2 per cent in 2010 was largely due to high demand levels in the second half of the year. 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.[9] High wind speeds in 2011, after particularly low wind speeds in 2010, resulted in a six percentage point increase in the overall wind load factor (on an unchanged configuration basis), from 23.3 per cent in 2010 to 29.3 per cent in 2011. After a very dry 2010, high rainfall in 2011 resulted in the hydro load factor (on a standard basis) increasing from a seven year low of 25.4 per cent in 2010 to 39.1 per cent in 2011, the highest since at least 1997. This followed falls in the load factor, on account of less rain (and an increase in capacity in 2008), in both 2008 and 2009. [10] Pumped storage use is less affected by the dry weather and high electricity prices encouraged its use from 2006 to 2008. However, 2009 to 2011 saw successive falls in the load factors from 2008's peak, as lower peak time demand for electricity and lower prices deterred its use.

[9] 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.

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

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 and 2011 resulted in an increase to the overall thermal efficiency of these stations of one percentage point in each of the two years, to a record high of 48.5 per cent. 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. In 2011, the efficiency fell further, to 38.0 per cent. The efficiencies presented here are calculated using **gross** calorific values to obtain the energy content of the fuel inputs. [11]

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

5.47 Table 5.11 lists the operational power stations in the United Kingdom as at the end of May 2012, along with their installed capacity and the year they began to generate electricity. Where a company operates several stations they are grouped together. In general, the table aims to list all stations of 1 MW installed capacity or over that are owned by major power producers.

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 also listed in aggregate in this section. Details of the interconnectors between England and France, England and the Netherlands, Scotland and Northern Ireland, and Northern Ireland and the Irish Republic, are also given in this table. The total installed capacity of all the power stations individually listed in Table 5.11 is 86,998 MW. [12]

Carbon dioxide emissions from power stations

5.50 It is estimated that carbon dioxide emissions from power stations accounted for 32 per cent of the UK's total carbon dioxide emissions in 2011. Emissions vary by type of fuel used to generate the electricity and emission estimates for all electricity generation for 2009 to 2011 are shown in Table 5A below.

Table 5A: Estimated carbon dioxide emissions from electricity generation 2009 to 2011 ***(1)***

Fuel	Emissions (tonnes of carbon dioxide per GWh electricity supplied)		
	2009	2010	2011 *(2)*
Coal	910	908	912
Gas	403	394	392
All fossil fuels	592	586	609
All fuels (including nuclear and renewables)	449	456	443

(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 2011 figures are provisional.

11 For more information on gross and net calorific values, see paragraph 5.81

12 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 2011. See paragraph 5.78 for more information on the measures of capacity.

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 statistics pages of the DECC energy statistics web site: www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx. A summary of electricity consumption at regional level is given in Table 5B and relates to 2010. 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.

Table 5B: Electricity sales 2010

	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	13,468	3,378	28,245	400	41,714
South East	16,538	3,699	23,459	328	39,997
North West	12,555	3,134	20,777	235	33,332
Scotland	11,372	2,742	16,019	212	27,391
East of England	11,361	2,535	15,958	212	27,319
West Midlands	9,913	2,364	15,005	192	24,918
South West	10,669	2,415	14,333	245	24,001
Yorkshire and the Humber	9,000	2,332	15,676	176	24,676
East Midlands	8,109	1,976	13,075	154	21,184
Wales	5,361	1,369	10,457	124	15,818
North East	4,250	1,193	7,892	80	12,143
Unallocated Consumption	259	73	4,210	25	4,469
Sales direct from high voltage lines *(2)*					4,500
Great Britain	112,856	27,209	185,106	2,382	297,961
Northern Ireland *(3)*					8,059
Total					310,520

(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 2011, 15.9 million electricity consumers (61 per cent) were no longer with their home supplier. Table 5C gives market penetration in the fourth quarter of 2011, showing that by the end of 2011, the home suppliers (i.e. the former regional electricity companies) had lost 54 per cent of the credit, 66 per cent of the direct debit, and 58 per cent of the prepayment market. However, as Table 5C shows there is considerable regional variation with much higher retention in Northern Scotland and South Wales.

Table 5C: Domestic electricity market penetration (in terms of percentage of customers supplied) by Public Electricity Supply area and payment type, fourth quarter of 2011

Region	Home Supplier			Non-Home Supplier		
	Credit	Direct Debit	Prepayment	Credit	Direct Debit	Prepayment
North West	41	26	32	59	74	68
East Midlands	43	30	35	57	70	65
West Midlands	37	28	29	63	72	71
Merseyside and North Wales	41	31	45	59	69	55
Eastern	45	30	30	55	70	70
Yorkshire	37	29	28	63	71	72
North East	37	30	25	63	70	75
South East	42	32	39	58	68	61
London	45	38	46	55	62	54
Southern Scotland	45	40	58	55	60	42
South West	47	34	47	53	66	53
Southern	62	46	53	38	54	47
South Wales	67	54	74	33	46	26
Northern Scotland	81	63	67	19	37	33
Great Britain	46	34	42	54	66	58

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 2011, there were 31 major power producers operating in Great Britain [13]. 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 5C 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

[13] Some of these producers are joint ventures and so the number of generating companies involved is less than 31.

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.

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, 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[14]

5.59 The European Union (EU) as a whole generated 3,346 TWh of electricity in 2010. Of this, 11 per cent was generated in the UK. Germany generated the largest share of electricity in the EU, with 19 per cent. Industry had 36 per cent of EU final electricity consumption, households 30 per cent, services 29 per cent and transport two per cent.

5.60 In 2010, the largest source of the EU's generation was Nuclear, with 28 per cent of total generation. Coal had a 25 per cent share, and gas 23 per cent. France sources the largest share of its generation from nuclear, with 75 per cent, while 39 per cent of Sweden's electricity is from nuclear. The largest shares of coal in the generation mix are in Denmark, with 44 per cent, and Germany, with 42 per cent. Italy and the UK source most of their electricity from gas, with 51 per cent and 46 per cent of generation respectively in 2010.

5.61 Renewables represented 20 per cent of the EU's generation. Sweden sources 55 per cent of its electricity from renewables (mainly hydro). Denmark's 32 per cent renewables share comes from wind (20 per cent) and biomass (12 per cent), the highest share of generation from wind in the EU. Spain's 32 per cent renewables share comes mainly from wind (15 per cent) and hydro (14 per cent). Italy had 26 per cent of its generation from renewables, with Germany and France 17 per cent and 14 per cent respectively.

5.62 France's exports, net of imports, were five per cent of its generation in 2010. For Italy, however, net imports represented 15 per cent of its electricity requirements.

[14] At the time of writing, the latest available data were for 2010. Data from Eurostat, at: http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/introduction

The Electricity Supply System in Great Britain in 2011

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 163 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 5 years, these notes also cover data for earlier years that are available on the DECC energy statistics web site.

Electricity generation from renewable sources

5.64 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.

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 2011 were:**
AES Electric Ltd., Baglan Generation Ltd., Barking Power Ltd., British Energy plc., Centrica Energy, Coolkeeragh ESB Ltd., Corby Power Ltd., Coryton Energy Company Ltd., Derwent Cogeneration Ltd., DONG Energy Burbo UK Ltd., Drax Power Ltd., EDF Energy plc., E.On UK plc., Energy Power Resources, GDF Suez Teesside Power Ltd., Immingham CHP, Infinis plc., International Power Mitsui,

Magnox North Ltd., Peel Energy Ltd., Premier Power Ltd., RGS Energy Ltd, Rocksavage Power Company Ltd., RWE Npower plc., Scottish Power plc., Scottish and Southern Energy plc., Seabank Power Ltd., SELCHP Ltd., Spalding Energy Company Ltd., 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 five percentage points in 2011) 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 2012 Digest. For definitions of the sectors see Chapter 1 paragraphs 1.56 to 1.60 and Annex A paragraphs A.31 to A.42.

Transmission Entry Capacity, Declared Net Capacity and Installed Capacity

5.78 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.

5.79 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 6.87.

Load factors

5.80 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

5.81 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

5.82 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 – 2011:	12 months ended 31 December

5.83 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
	52 weeks ended
2011	31 December 2011

Monthly and quarterly data

5.84 Monthly and quarterly data on fuel use, electricity generation and supply and electricity availability and consumption are available on DECC's energy statistics web site: www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/electricity/electricity.aspx. Monthly data on fuel used in electricity generation by MPPs are given in Monthly Table 5.3 and monthly data on supplies by type of plant and type of fuel are given in Monthly Table 5.4. Monthly data on availability and consumption of electricity by the main sectors of the economy are given in Monthly Table 5.5. A quarterly commodity balance for electricity is published in DECC's quarterly statistical bulletin *Energy Trends* (Quarterly Table 5.2) along with a quarterly table of fuel use for generation, 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

5.85 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.

5.86 Another annual inquiry is sent to electricity distributors to establish electricity distributed by these companies. Similarly, an annual inquiry is sent to licensed suppliers of electricity to establish electricity sales by these companies. Electricity consumption for the iron and steel sector is based on data provided by the Iron and Steel Statistics Bureau (ISSB) rather than electricity suppliers since electricity suppliers tend to over-estimate their sales to this sector by including some companies that use steel rather than manufacture it. The difference between the ISSB and electricity suppliers' figures has been re-allocated to other sectors. A further means of checking electricity consumption data is now being employed on data for 2006 and subsequent years. Copies of the survey questionnaires are available in *electricity statistics: data sources and methodologies*, at:
www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/electricity/electricity.aspx

5.87 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.

5.88 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

5.89 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.

5.90 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 2011, for about six per cent of consumption of electricity supplied by the public distribution system, the sector figures are partially estimated.

Contact: *James Hemingway*
Energy Statistics Team
james.hemingway@decc.gsi.gov.uk
0300 068 5042

Chris Michaels
Energy Statistics Team
chris.michaels@decc.gsi.gov.uk
0300 068 5050

5.1 Commodity balances

Electricity

GWh

	2009	2010	2011
Total electricity			
Supply			
Production	373,089	378,622	364,897
Other sources *(1)*	3,685	3,150	2,906
Imports	6,609	7,144	8,689
Exports	-3,748	-4,481	-2,467
Marine bunkers	-	-	-
Stock change	-	-	-
Transfers	-	-	-
Total supply	**379,635**	**384,436**	**374,024**
Statistical difference *(2)*	+157	-378	-319
Total demand	**379,478**	**384,814**	**374,343**
Transformation	-	-	-
Electricity generation	-	-	-
Major power producers	-	-	-
Other generators	-	-	-
Heat generation	-	-	-
Petroleum refineries	-	-	-
Coke manufacture	-	-	-
Blast furnaces	-	-	-
Patent fuel manufacture	-	-	-
Other	-	-	-
Energy industry use	**29,686**	**28,993**	**28,153**
Electricity generation	16,572	16,107	16,453
Oil and gas extraction	594	563	576
Petroleum refineries	4,519	5,034	4,496
Coal extraction and coke manufacture	1,018	1,040	929
Blast furnaces	464	297	253
Patent fuel manufacture	-	-	-
Pumped storage	4,843	4,212	3,843
Other	1,676	1,740	1,602
Losses	**28,044**	**27,038**	**28,181**
Final consumption	**321,748**	**328,784**	**318,009**
Industry	**99,738**	**104,520**	**102,396**
Unclassified	-	-	-
Iron and steel	3,615	3,842	3,842
Non-ferrous metals	6,075	6,726	6,972
Mineral products	7,010	7,266	7,008
Chemicals	17,702	18,454	17,504
Mechanical engineering, etc	7,688	7,653	7,368
Electrical engineering, etc	6,455	6,657	6,396
Vehicles	5,012	5,284	5,189
Food, beverages, etc	10,741	11,520	11,352
Textiles, leather, etc	3,013	3,050	2,991
Paper, printing, etc	11,069	10,954	10,912
Other industries	19,771	21,494	21,325
Construction	1,586	1,621	1,539
Transport	**4,040**	**4,076**	**4,079**
Air	-	-	-
Rail	4,022	4,058	4,058
Road	18	18	21
National navigation	-	-	-
Pipelines	-	-	-
Other	**217,970**	**220,187**	**211,533**
Domestic	118,541	118,820	111,585
Public administration	19,442	19,101	18,504
Commercial	76,187	78,238	77,496
Agriculture	3,801	4,029	3,948
Miscellaneous	-	-	-
Non energy use			

5.1 Commodity balances (continued)

Electricity

GWh

	2009	2010	2011
Electricity production			
Total production *(3)*	**373,089**	**378,622**	**364,897**
Primary electricity			
Major power producers	**80,296**	**72,847**	**86,250**
Nuclear	69,098	62,140	68,980
Large scale hydro *(3)*	4,029	2,560	4,291
Small scale hydro	265	199	303
Wind *(4)*	6,904	7,950	12,675
Other generators	**3,367**	**3,152**	**4,167**
Nuclear	-	-	-
Large scale hydro	635	587	698
Small scale hydro	312	298	394
Wind *(4)*	2,420	2,266	3,075
Secondary electricity			
Major power producers	**258,394**	**271,651**	**243,157**
Coal	99,287	103,941	104,797
Oil	3,839	2,272	1,075
Gas	152,598	161,747	132,753
Renewables	2,670	3,690	4,531
Other	-	-	-
Other generators	**31,033**	**30,972**	**31,323**
Coal	3,751	3,753	3,786
Oil	2,155	2,532	2,589
Gas	13,901	13,908	14,062
Renewables	8,025	8,296	8,442
Other	3,200	2,482	2,444

Primary and secondary production *(5)*			
Nuclear	69,098	62,140	68,980
Hydro	5,241	3,644	5,686
Wind	9,324	10,216	15,750
Coal	103,038	107,694	108,583
Oil	5,995	4,805	3,665
Gas	166,499	175,655	146,814
Other renewables	10,694	11,987	12,973
Other	3,200	2,482	2,444
Total production	**373,089**	**378,622**	**364,897**

(1) Pumped storage production.
(2) Total supply minus total demand.
(3) Excludes pumped storage production.
(4) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.59
(5) These figures are the same as the electricity generated figures in Table 5.6 except that they exclude pumped storage production. Table 5.6 shows that electricity used on works is deducted to obtain electricity supplied. It is electricity supplied that is used to produce Chart 5.2 showing each fuel's share of electricity output (see paragraph 5.31).

5.2 Electricity supply and consumption

GWh

	2007	2008	2009	2010	2011
Supply					
Production	392,971r	384,900r	373,089r	378,622r	364,897
Other sources *(1)*	3,859	4,089	3,685	3,150	2,906
Imports	8,613	12,294	6,609	7,144	8,689
Exports	-3,398	-1,272	-3,748	-4,481	-2,467
Total supply	**402,044r**	**400,011r**	**379,635r**	**384,436r**	**374,024**
Statistical difference *(2)*	-392r	+338r	+157r	-378r	-319
Total demand	**402,437r**	**399,674r**	**379,478r**	**384,814r**	**374,343**
Transformation	**-**	**-**	**-**	**-**	**-**
Energy industry use	**32,558r**	**29,995r**	**29,686r**	**28,993r**	**28,153**
Electricity generation	17,694r	16,346r	16,572r	16,107r	16,453
Oil and gas extraction	560	598	594	563	576
Petroleum refineries	5,634	4,351	4,519	5,034r	4,496
Coal and coke	1,073	1,058	1,018	1,040	929
Blast furnaces	479	452	464	297	253
Pumped storage	5,071	5,371	4,843	4,212	3,843
Other	2,047	1,818	1,676	1,740r	1,602
Losses	**28,223r**	**27,857r**	**28,044r**	**27,038r**	**28,181**
Final consumption	**341,656r**	**341,822r**	**321,748r**	**328,784r**	**318,009**
Industry	**112,799r**	**114,151r**	**99,738r**	**104,520r**	**102,396**
Unclassified	-	-	-	-	-
Iron and steel	4,937	4,657r	3,615	3,842r	3,842
Non-ferrous metals	7,386	7,391r	6,075r	6,726r	6,972
Mineral products	7,811	7,931r	7,010r	7,266r	7,008
Chemicals	20,197	20,287r	17,702r	18,454r	17,504
Mechanical engineering. etc	8,458r	8,614r	7,688	7,653r	7,368
Electrical engineering, etc	7,290	7,397r	6,455r	6,657r	6,396
Vehicles	5,723	5,812r	5,012r	5,284r	5,189
Food, beverages, etc	12,082	12,257r	10,741	11,520r	11,352
Textiles, leather, etc	3,349	3,395r	3,013r	3,050r	2,991
Paper, printing, etc	12,741	12,865r	11,069r	10,954r	10,912
Other industries	21,028	21,729r	19,771r	21,494r	21,325
Construction	1,798r	1,817	1,586	1,621r	1,539
Transport *(3)*	**3,962**	**3,943r**	**4,040r**	**4,076r**	**4,079**
Other	**224,895**	**223,728**	**217,970**	**220,187r**	**211,533**
Domestic	123,076	119,800	118,541	118,820r	111,585
Public administration	20,087	20,355	19,442	19,101r	18,504
Commercial	77,677	79,506r	76,187	78,238r	77,496
Agriculture	4,055	4,067	3,801	4,029	3,948
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

	2009			2010			2011		
	Public distribution system	**Other generators**	**Total**	**Public distribution system**	**Other generators**	**Total**	**Public distribution system**	**Other generators**	**Total**
Supply									
Major power producers	338,689r	-	338,689r	344,499r	-	344,499r	329,406	-	329,406
Other generators	-	34,400r	34,400r	-	34,123r	34,123r	-	35,490	35,490
Other sources *(1)*	3,685	-	3,685	3,150	-	3,150	2,906	-	2,906
Imports	6,609	-	6,609	7,144	-	7,144	8,689	-	8,689
Exports	-3,748	-	-3,748	-4,481	-	-4,481	-2,467	-	-2,467
Transfers	16,265	-16,265	-	15,292r	-15,292r	-	16,394	-16,394	-
Total supply	**361,500r**	**18,135r**	**379,635r**	**365,605r**	**18,831r**	**384,436r**	**354,928**	**19,096**	**374,024**
Statistical difference *(2)*	+98r	58r	+157r	+47r	-426r	-378r	+410	-729	-319
Total demand	**361,402r**	**18,077r**	**379,478r**	**365,557r**	**19,257r**	**384,814r**	**354,518**	**19,825**	**374,343**
Transformation	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy industry use	**24,133r**	**5,553r**	**29,686r**	**23,143r**	**5,849r**	**28,993r**	**22,592**	**5,561**	**28,153**
Electricity generation	14,750r	1,822r	16,572r	14,403r	1,703r	16,107r	14,480	1,973	16,453
Oil and gas extraction	594	-	594	563	-	563	576	-	576
Petroleum refineries	1,464	3,055	4,519	1,407	3,627r	5,034r	1,357	3,139	4,496
Coke manufacture	928	89	1,018	950	90	1,040	847	82	929
Blast furnaces	-	464	464	-	297	297	-	253	253
Pumped storage	4,843	-	4,843	4,212	-	4,212	3,843	-	3,843
Other fuel industries	1,554	123	1,676	1,608	132r	1,740r	1,489	113	1,602
Losses	**28,024r**	**20**	**28,044r**	**27,022r**	**15**	**27,038r**	**28,161**	**20**	**28,181**
Final consumption	**309,244r**	**12,504**	**321,748r**	**315,392r**	**13,392r**	**328,784r**	**303,765**	**14,244**	**318,009**
Industry	**90,465r**	**9,273**	**99,738r**	**94,438r**	**10,082r**	**104,520r**	**91,796**	**10,601**	**102,396**
Iron and steel	2,713	902	3,615	3,094r	748	3,842r	3,167	675	3,842
Non-ferrous metals	3,756r	2,319	6,075r	3,981r	2,745	6,726r	3,936	3,035	6,972
Mineral products	6,941	69	7,010r	7,185r	82r	7,266r	6,916	92	7,008
Chemicals	15,723r	1,979	17,702r	15,844r	2,610r	18,454r	14,854	2,650	17,504
Mechanical engineering etc	7,345	443	7,788	7,451r	376r	7,827r	7,163	361	7,524
Electrical engineering etc	6,431r	-	6,431r	6,637r	-	6,637r	6,377	-	6,377
Vehicles	4,936	-	4,936	5,129r	-	5,129r	5,053	-	5,053
Food, beverages etc	9,782	959	10,741	10,256r	1,264r	11,520r	10,042	1,309	11,352
Textiles, leather, etc	3,009r	-	3,009r	3,045r	-	3,045r	2,986	-	2,986
Paper, printing etc	9,175r	1,894	11,069r	9,662r	1,292r	10,954r	9,436	1,476	10,912
Other industries	19,082r	692	19,774r	20,548r	951r	21,499r	20,342	988	21,330
Construction	1,571	15	1,586	1,606r	15	1,621	1,524	15	1,539
Transport *(3)*	**4,040r**	**-**	**4,040r**	**4,076r**	**-**	**4,076r**	**4,079**	**-**	**4,079**
Rail *(4)*	4,022r	-	4,022r	4,058r	-	4,058r	4,058	-	4,058
Road *(5)*	18	-	18	18	-	18	21	-	21
Other	**214,739**	**3,231r**	**217,970r**	**216,878r**	**3,310r**	**220,177r**	**207,890**	**3,643**	**211,533**
Domestic *(6)*	118,541	-	118,541	118,810r	10	118,820r	111,482	104	111,585
Standard	80,091r	-	80,091r	79,764r	-	79,764r	74,506	-	74,506
Economy 7 and other off-peak *(7)*	21,447	-	21,447	21,084	-	21,084	18,744	-	18,744
Prepayment (standard)	12,881	-	12,881	13,446	-	13,446	13,863	-	13,863
Prepayment (off-peak) *(7)*	4,122	-	4,122	4,516	-	4,516	4,369	-	4,369
Sales under any other arrangement	-r	-	-r	-	-	-	-	-	-
Public administration	17,688	1,753	19,442	17,125	1,976r	19,101r	16,510	1,993	18,504
Public lighting *(8)*	2,030	-	2,030	1,962	-	1,962	1,906	-	1,906
Other public sector	15,658	1,753	17,411	15,162	1,976r	17,138r	14,604	1,993	16,598
Commercial	74,709	1,477	76,187	76,914	1,324r	78,238r	75,950	1,546	77,496
Shops	27,629	-	27,629	28,246	-	28,246	27,766	-	27,766
Offices	23,045	-	23,045	24,868	-	24,868	24,731	-	24,731
Hotels	8,882	-	8,882	8,684	-	8,684	8,641	-	8,641
Combined domestic/ commercial premises	3,178	-	3,178	2,657	-	2,657	2,595	-	2,595
Post and telecommunications	6,142	-	6,142	6,149	-	6,149	5,970	-	5,970
Unclassified	2,176	-	2,176	2,369	-	2,369	2,354	-	2,354
Transport services	3,655	-	3,655	3,941	-	3,941	3,893	-	3,893
Agriculture	3,801	-	3,801	4,029	-	4,029	3,948	-	3,948

(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	2007	2008	2009	2010	2011
						Original units of measurement
Major power producers (2)						
Coal	M tonnes	51.03	46.25	38.26r	40.23	40.57
Oil (3)	"	0.54r	0.84	0.63	0.46	0.29
Gas (5)	GWh	319,836	344,454	328,249	342,150	275,591
Other generators (2)						
Transport undertakings:						
Gas	GWh	21	21	16	18	14
Undertakings in industrial and commercial sectors:						
Coal (4)	M tonnes	1.48	1.56	1.42	1.27	1.29
Oil (5)	"	0.41	0.42r	0.43r	0.48r	0.49
Gas (6)	GWh	36,021	32,336	31,038	31,418r	31,659
Major power producers (2)						**Mtoe**
Coal		31.991	28.990	23.791	24.780	25.232
Oil (3)		0.699	1.105	1.025	0.634	0.346
Gas		27.501	29.618	28.224	29.420	23.697
Nuclear		14.037	11.910	15.230	13.926r	15.626
Hydro (natural flow) (7)		0.356	0.363	0.369	0.237r	0.395
Wind		0.307	0.461	0.594	0.684	1.090
Other renewables (7)		0.625	0.766	0.744	1.013	1.264
Net imports		0.448	0.948	0.246	0.229	0.535
Total major power producers (2)		**75.964**	**74.160**	**70.223**	**70.923r**	**68.184**
Of which: conventional thermal and other stations (10)		35.357	31.796	26.455	27.556r	28.233
combined cycle gas turbine stations		25.766	29.144	27.923	28.975r	23.394
Other generators (2)						
Transport undertakings:						
Gas (6)		0.002	0.002	0.001	0.002	0.001
Undertakings in industrial and commercial sectors:						
Coal (4)		0.929	0.971	0.871	0.782r	0.798
Oil (5)		0.461r	0.477r	0.488r	0.544r	0.558
Gas		3.097	2.780	2.669	2.701r	2.722
Hydro (natural flow) (7)		0.080r	0.080r	0.081r	0.076r	0.094
Wind, wave and solar photovoltaics		0.148r	0.151r	0.208r	0.195r	0.264
Other renewables (7)		2.792r	2.745r	3.202r	3.344r	3.642
Other fuels (9)		1.257	1.124	0.993	0.802r	0.766
Total other generators *(2)*		**8.766r**	**8.330r**	**8.514r**	**8.446r**	**8.847**
All generating companies						
Coal (4)		32.920	29.961	24.662	25.562r	26.030
Oil (3)(5)		1.160r	1.582r	1.513r	1.178r	0.904
Gas (6)		30.600	32.400	30.895	32.123r	26.420
Nuclear		14.037	11.910	15.230	13.926r	15.626
Hydro (natural flow) (7)		0.437r	0.443r	0.451r	0.313r	0.489
Wind, wave and solar photovoltaics		0.455r	0.612r	0.802r	0.878r	1.354
Other renewables (7)		3.418r	3.511r	3.946r	4.357r	4.906
Other fuels (9)		1.257	1.124	0.993	0.802r	0.766
Net imports		0.448	0.948	0.246	0.229	0.535
Total all generating companies		**84.730r**	**82.490r**	**78.737r**	**79.369r**	**77.031**

(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

	2007	2008	2009	2010	2011
Total supply					
(as given in Tables 5.1 and 5.2)	402,044r	400,011r	379,635r	384,436r	374,024
less imports of electricity	-8,613	-12,294	-6,609	-7,144	-8,689
plus exports of electricity	+3,398	+1,272	+3,748	+4,481	+2,467
less electricity used in pumped storage	-5,071	-5,371	-4,843	-4,212	-3,843
less electricity used on works	-17,694r	-16,346r	-16,572r	-16,107r	-16,453
equals					
Electricity supplied (net)	374,064r	367,272r	355,359r	361,454r	347,506
(as given in Tables 5.6, 5.1.2 and 5.1.3)					
Total supply					
(as given in Tables 5.1 and 5.2)	402,044r	400,011r	379,635r	384,436r	374,024
less electricity used in pumped storage	-5,071	-5,371	-4,843	-4,212	-3,843
less electricity used on works	-17,694r	-16,346r	-16,572r	-16,107r	-16,453
equals					
Electricity available	379,279r	378,294r	358,220r	364,117r	353,728
(as given in Table 5.1.2)					
Final consumption					
(as given in Tables 5.2 and 5.3)	341,656r	341,822r	321,748r	328,784r	318,009
plus Iron and steel consumption counted as energy industry use	+607	+568	+603	+421	+370
equals					
Final users	342,263r	342,390r	322,351r	329,205r	318,379
(as given in Table 5.1.2)					
Final consumption					
Public distribution system					
(as given in Table 5.3)	325,479r	327,124r	309,244r	315,392r	303,765
plus Oil and gas extraction use	+560	+598	+594	+563	+576
plus Petroleum refineries use	+1,461	+1,482	+1,464	+1,407	+1,357
plus Coal and coke use	+983	+979	+928	+950	+847
plus Other fuel industries use	+1,763	+1,687	+1,554	+1,608	+1,489
equals					
UK Electricity sales *(1)*	330,246	331,870r	313,784r	319,920r	308,034

(1) The renewables obligation percentage is calculated using total renewables generation on an obligation basis from Table 6.4 (x 100) as the numerator, and this figure as the denominator. Separate electricity sales data for public electricity suppliers are given for England and Wales, Scotland and Northern Ireland in Table 5.5 of Energy Trends on the DECC website at www.decc.gov.uk/en/content/cms/statistics/source/electricity/electricity.aspx (scroll to the Monthly Tables section).

5.6 Electricity fuel use, generation and supply

GWh

	Thermal sources							Non-thermal sources			
	Coal	Oil	Gas	Nuclear	Renew-ables (1)	Other (3)	Total	Hydro-natural flow	Hydro-pumped storage	Wind (4)	Total All sources
2007											
Major power producers *(2) (5)*											
Fuel used	372,054	8,128	319,836	163,247	7,271	-	870,537	4,144	3,859	3,569	882,109
Generation	132,074	2,955r	149,346	63,028	2,341r	-	349,745r	4,144	3,859	3,569	361,317r
Used on works	6,706	431r	2,894	5,779	235r	-	16,046r	30	13	-	16,090r
Supplied (gross)	125,368	2,524r	146,452	57,249	2,106r	-	333,699r	4,114	3,846	3,569	345,227r
Used in pumping											5,071
Supplied (net)											340,156r
Other generators *(2) (5)*											
Fuel used	10,803	5,363r	36,042	-	32,474r	14,613	99,295r	933r	-	1,719	101,947r
Generation	3,870	2,093	16,447	-	6,983r	3,467r	32,860r	933r	-	1,719	35,513r
Used on works	207	152	510	-	555r	165r	1,589r	15r	-	-	1,605r
Supplied	3,662	1,941	15,937	-	6,428r	3,303r	31,271r	918r	-	1,719	33,908r
All generating companies											
Fuel used	382,857	13,491r	355,878	163,247	39,745	14,613	969,832r	5,077r	3,859	5,288	984,056r
Generation	135,944	5,048r	165,793	63,028	9,325	3,467r	382,606r	5,077r	3,859	5,288	396,830r
Used on works	6,914	583r	3,404	5,779	790	165r	17,635r	46	13	-	17,694r
Supplied (gross)	129,030	4,465r	162,389	57,249	8,534	3,303r	364,970r	5,032r	3,846	5,288	379,136r
Used in pumping											5,071
Supplied (net)											374,064r
2008											
Major power producers *(2) (5)*											
Fuel used	337,155	12,849	344,454	138,508	8,914	-	841,880	4,224	4,089	5,357	855,550
Generation	120,305	4,558r	161,583r	52,486	2,607r	-	341,539r	4,224	4,089	5,357	355,209r
Used on works	6,112	669r	2,778r	4,813	262r	-	14,633r	15	14	-	14,662r
Supplied (gross)	114,192	3,890r	158,805r	47,673	2,345r	-	326,906r	4,209	4,075	5,357	340,547r
Used in pumping											5,371
Supplied (net)											335,175r
Other generators *(2) (5)*											
Fuel used	11,296	5,544r	32,357	-	31,922r	13,074	94,193r	931r	-	1,757	96,880r
Generation	4,077	2,152	14,636	-	7,040r	3,188r	31,093r	931r	-	1,757	33,781r
Used on works	216	155	453	-	686r	158r	1,668r	16r	-	-	1,684r
Supplied	3,861	1,997	14,183	-	6,354r	3,031r	29,425r	915r	-	1,757	32,097r
All generating companies											
Fuel used	348,450	18,393r	376,810	138,508	40,836r	13,074	936,072r	5,155r	4,089	7,114	952,430r
Generation	124,381	6,710r	176,219r	52,486	9,647r	3,188r	372,631r	5,155r	4,089	7,114	388,989r
Used on works	6,328	824r	3,231	4,813	947r	158r	16,301r	31r	14	-	16,346r
Supplied (gross)	118,053	5,887r	172,988r	47,673	8,700r	3,031r	356,331r	5,124r	4,075	7,114	372,643r
Used in pumping											5,371
Supplied (net)											367,272r
2009											
Major power producers *(2) (5)*											
Fuel used	276,689	11,926r	328,249	177,124r	8,648	-	802,635r	4,294	3,685	6,904	817,519r
Generation	99,287	3,839r	152,598	69,098	2,670r	-	327,491r	4,294	3,685	6,904	342,374r
Used on works	5,030	476r	2,613r	6,336	268r	-	14,723r	15	13	-	14,750r
Supplied (gross)	94,257	3,364r	149,985r	62,762	2,402r	-	312,769r	4,279	3,672	6,904	327,624r
Used in pumping											4,843
Supplied (net)											322,781r
Other generators *(2) (5)*											
Fuel used	10,132	5,671r	31,054	-	37,239r	11,551	95,646r	947r	-	2,420	99,013r
Generation	3,751	2,155	13,901	-	8,025r	3,200r	31,033r	947r	-	2,420	34,400r
Used on works	210	154	431	-	845r	165r	1,805r	17r	-	-	1,822r
Supplied	3,541	2,002	13,471	-	7,179r	3,035r	29,228r	930r	-	2,420	32,578r
All generating companies											
Fuel used	286,820	17,597r	359,303	177,124r	45,886r	11,551	898,282r	5,241r	3,685	9,324	916,532r
Generation	103,038	5,995r	166,499r	69,098	10,694r	3,200r	358,524r	5,241r	3,685	9,324	376,774r
Used on works	5,240	629r	3,044r	6,336	1,113r	165r	16,528r	32r	13	-	16,572r
Supplied (gross)	97,798	5,365r	163,455r	62,762	9,581r	3,035r	341,996r	5,209r	3,672	9,324	360,202r
Used in pumping											4,843
Supplied (net)											355,359r

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 (4)	Total All sources
2010											
Major power producers *(2) (5)*											
Fuel used	288,195	7,376	342,150	161,959r	11,784	-	811,464r	2,758r	3,150	7,950	825,323r
Generation	103,941r	2,272r	161,747r	62,140	3,690r	-	333,791r	2,758r	3,150	7,950	347,649r
Used on works	5,233	311r	2,770	5,698r	371r	-	14,383r	10r	11	-	14,403r
Supplied (gross)	98,708r	1,962r	158,977r	56,442r	3,320r	-	319,408r	2,748r	3,139	7,950	333,246r
Used in pumping											4,212
Supplied (net)											329,034r
Other generators *(2) (5)*											
Fuel used	9,095r	6,328r	31,436r	-	38,891r	9,322r	95,072r	885r	-	2,266	98,223r
Generation	3,753r	2,532r	13,908r	-	8,296r	2,482r	30,972r	885r	-	2,266	34,123r
Used on works	195	186r	431r	-	740r	136r	1,687r	16r	-	-	1,703r
Supplied	3,558r	2,346r	13,478r	-	7,556r	2,346r	29,285r	869r	-	2,266	32,420r
All generating companies											
Fuel used	297,290r	13,705r	373,586r	161,959r	50,675r	9,322r	906,536r	3,644r	3,150	10,216	923,546r
Generation	107,694	4,805r	175,655r	62,140	11,987r	2,482r	364,763r	3,644r	3,150	10,216	381,772r
Used on works	5,428	497r	3,201r	5,698r	1,110r	136r	16,070r	26	11	-	16,107r
Supplied (gross)	102,266	4,308r	172,454r	56,442r	10,876r	2,346r	348,693r	3,618r	3,139	10,216	365,666r
Used in pumping											4,212
Supplied (net)											361,454r
2011											
Major power producers *(2) (5)*											
Fuel used	293,444	4,023	275,591	181,732	14,696	-	769,485	4,594	2,906	12,675	789,660
Generation	104,797	1,075	132,753	68,980	4,531	-	312,137	4,594	2,906	12,675	332,312
Used on works	5,245	160	2,268	6,325	456	-	14,454	16	10	-	14,480
Supplied (gross)	99,552	915	130,485	62,655	4,075	-	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	9,286	6,491	31,673	-	42,362	8,913	98,725	1,093	-	3,075	102,893
Generation	3,786	2,589	14,062	-	8,442	2,444	31,323	1,093	-	3,075	35,490
Used on works	204	191	435	-	981	140	1,952	21	-	-	1,973
Supplied	3,582	2,398	13,627	-	7,460	2,304	29,371	1,072	-	3,075	33,517
All generating companies											
Fuel used	302,729	10,514	307,265	181,732	57,058	8,913	868,211	5,686	2,906	15,750	892,553
Generation	108,583	3,665	146,814	68,980	12,973	2,444	343,460	5,686	2,906	15,750	367,802
Used on works	5,450	351	2,703	6,325	1,437	140	16,406	37	10	-	16,453
Supplied (gross)	103,134	3,313	144,112	62,655	11,536	2,304	327,054	5,650	2,895	15,750	351,349
Used in pumping											3,843
Supplied (net)											347,506

	2007		2008		2009		2010		2011	
	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	146,706r	140,011	128,944r	160,109	106,939r	151,454	111,133r	160,518r	111,270	131,886
Supplied (gross)	138,793r	137,657	121,816r	157,417	101,100r	148,907	105,148r	157,818	105,359	129,669
Other generators										
Generated	20,787r	12,073	19,570r	11,522	20,243r	10,790	20,363r	10,609r	20,801	10,522
Supplied (gross)	19,801r	11,471r	18,478r	10,947	18,976r	10,251	19,205r	10,079r	19,374	9,997
All generating companies										
Generated	167,493r	152,084	148,514r	171,631	127,183r	162,244	131,497r	171,126r	132,071	142,408
Supplied (gross)	158,594r	149,127	140,294r	168,364	120,076r	159,159	124,353r	167,898r	124,733	139,666

(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) Wind and other non-thermal sources, including wave and solar photovoltaics.
(5) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.70
(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				
	2007	2008	2009	2010	2011
Major power producers *(1)*					
Total transmission entry capacity *(2)*	**75,979**	**76,993r**	**77,776r**	**83,307r**	**81,750**
Of which:					
Conventional steam stations:	34,274r	32,963r	32,971r	32,979r	31,903
Coal fired	23,008	23,069	23,077	23,085	23,072
Oil fired	3,778	3,778	3,778	3,778	3,778
Mixed or dual fired *(3)*	7,488r	6,116r	6,116r	6,116r	5,053
Combined cycle gas turbine stations	24,269r	26,203r	26,785r	31,724r	30,183
Nuclear stations	10,979	10,979	10,858	10,865	10,663
Gas turbines and oil engines	1,490r	1,501r	1,605r	1,605r	1,532
Hydro-electric stations:					
Natural flow *(4)*	1,293	1,392	1,395	1,391	1,391
Pumped storage	2,744	2,744	2,744	2,744	2,744
Wind *(4) (5)*	795	997	1,205	1,776	2,241
Renewables other than hydro and wind	134	213	213	223r	1,092
Other generators *(1)*					
Total capacity of own generating plant *(6)*	**6,763**	**6,664**	**7,091**	**7,118r**	**7,365**
Of which:					
Conventional steam stations *(7)*	2,924	2,722	2,813	2,798r	2,826
Combined cycle gas turbine stations	2,076	2,015	1,945	1,966r	1,908
Hydro-electric stations (natural flow) *(4)*	126	127	131	133	154
Wind *(4) (7)*	246	435	656	484	486
Renewables other than hydro and wind *(4)*	1,391	1,365	1,547	1,737r	1,992
All generating companies					
Total capacity	**82,742**	**83,657r**	**84,867r**	**90,426r**	**89,115**
Of which:					
Conventional steam stations *(8)*	37,198r	35,685r	35,785r	35,778r	34,729
Combined cycle gas turbine stations	26,345r	28,218r	28,730r	33,690r	32,091
Nuclear stations	10,979	10,979	10,858	10,865	10,663
Gas turbines and oil engines	1,490r	1,501r	1,605r	1,605r	1,532
Hydro-electric stations:					
Natural flow *(4)*	1,419	1,519	1,526	1,524	1,545
Pumped storage	2,744	2,744	2,744	2,744	2,744
Wind *(4)*	1,042	1,432	1,860	2,260	2,727
Renewables other than hydro and wind *(4)*	1,525	1,578	1,760	1,960r	3,084

(1) See paragraphs 5.66 to 5.72 for information on companies covered.
(2) See paragraph 5.78 for definition. Data before 2006 are based on declared net capability.
(3) Includes gas fired stations that are not Combined Cycle Gas Turbines, or have some CCGT capability but mainly operate as conventional thermal stations.
(4) 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 5.79.
(5) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.70
(6) "Other generators" capacities are given in declared net capacity terms, see paragraph 5.79
(7) Falls in capacity in 2007 and 2010 due to re-classification of capacity to Major Power Producers.
(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.

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

MW

	2007	2008	2009	2010	2011
					end December
Major power producers in England and Wales *(1)*					
Total transmission entry capacity *(2)*	**63,891**	**64,344r**	**65,010r**	**70,614r**	**69,013**
Of which:					
Conventional steam stations:	28,258	28,447	28,455	28,463	27,387
Coal fired	19,552	19,613	19,621	19,629	19,616
Oil fired	3,778	3,778	3,778	3,778	3,778
Mixed or dual fired *(3)*	4,928	5,056	5,056	5,056	3,993
Combined cycle gas turbine stations	23,313r	23,516r	24,120r	29,404r	27,985
Nuclear stations	8,569	8,569	8,569	8,576	8,374
Gas turbines and oil engines	1,063r	1,063r	1,082r	1,082r	1,013
Hydro-electric stations:					
Natural flow	136	129	130	130	131
Pumped storage	2,004	2,004	2,004	2,004	2,004
Wind *(4)*	419	447	481	786	1,080
Renewables other than hydro and wind	134	169	169	169	1,039
Major power producers in Scotland *(1)*					
Total transmission entry capacity *(2)*	**10,034**	**10,346**	**10,379r**	**10,264r**	**10,301**
Of which:					
Conventional steam and combined cycle gas turbine stations	5,119	5,119	5,097r	4,752r	4,638
Nuclear stations	2,410	2,410	2,289	2,289	2,289
Gas turbines and oil engines	263	264	265	265	260
Hydro-electric stations:					
Natural flow	1,157	1,263	1,265	1,261	1,261
Pumped storage	740	740	740	740	740
Wind *(4)*	345	506	680	904	1,060
Renewables other than hydro and wind	-	44	44	54r	54
Major power producers in Northern Ireland *(1)*					
Total transmission entry capacity *(2)*	**2,054r**	**2,303r**	**2,387r**	**2,430r**	**2,436**

(1) See paragraphs 5.66 to 5.72 for information on companies covered.
(2) See paragraph 5.78 for definition. Data before 2006 are based on declared net capability.
(3) Includes gas fired stations that are not Combined Cycle Gas Turbines, or have some CCGT capability but mainly operate as conventional thermal stations.
(4) From 2007, major wind farm companies are included under Major Power Producers, see paragraph 5.70.

5.9 Capacity of other generators

MW

	2007	2008	2009	2010	2011
					end December
Capacity of own generating plant *(1) (2)*					
Undertakings in industrial and commercial sector:					
Oil and gas terminals and oil refineries	1,015	1,013	1,011	1,045r	1,045
Iron and steel	316	316	316	316	316
Chemicals	1,075	1,051	1,039	1,104r	1,109
Engineering and other metal trades	634	632	626	626	646
Food, drink and tobacco	426	406	408	411r	417
Paper, printing and publishing	763	569	522	491	433
Other *(3)*	2,432r	2,572r	3,064	3,021r	3,297
Total industrial, commercial and domestic sector	6,660r	6,561r	6,988	7,015r	7,263
Undertakings in transport sector	103	103	103	103	103
Total other generators	**6,763r**	**6,664r**	**7,091**	**7,118r**	**7,366**

(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 5.70
(3) Includes companies in the commercial sector, and domestic installations.

5.10 Plant loads, demand and efficiency

Major power producers [1]

	Unit	2007	2008	2009	2010	2011
Simultaneous maximum load met *(2) (3)*	MW	61,527	60,289	60,231	60,893	57,086
of which England and Wales	MW	..	..	..	..	
Scotland	MW	..	..	..	..	
Great Britain	MW	59,880	58,590	58,510	59,130	55,505
Northern Ireland	MW	1,647	1,699	1,721	1,763	1,581
Maximum demand as a percentage of UK capacity	Per cent	81.0	78.3r	77.4r	73.1r	69.8
Plant load factor *(2) (4)*						
Combined cycle gas turbine stations	Per cent	64.7r	71.0r	64.2r	61.6r	47.8
Nuclear stations	"	59.6	49.4	65.6	59.3r	66.4
Pumped storage hydro	"	16.1	16.9	15.3	13.1	12.0
Conventional thermal and other stations *(5)*	"	44.6r	39.3r	33.2r	34.5r	34.7
of which coal-fired stations *(6)*	"	46.7r	45.0r	38.5r	40.2r	40.8
All plant *(7)*	"	**52.7**	**49.9r**	**47.4r**	**46.1**	**42.6**
System load factor *(8)*	"	**66.1**	**67.6**	**64.5**	**64.7**	**66.9**
Thermal efficiency *(9)* **(gross calorific value basis)**						
Combined cycle gas turbine stations	"	46.7	47.2	46.6	47.6	48.5
Coal fired stations	"	35.5	35.7	35.9	36.1	35.7
Nuclear stations	"	38.6	37.9	39.0	38.4r	38.0

(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 5.80 for definitions.
(3) Data cover the 12 months ending March of the following year, e.g. 2011 data are for the year ending March 2012.
In 2011/12, the highest load met simultaneously in GB and NI was on 8 February 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.
(9) Average electricity available as percentage of maximum demand. See paragraph 5.80.
(9) See paragraph 5.81 for definition of thermal efficiency.

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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	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 (2)	Barking	CCGT	1000	1994	London
Beaufort Wind Ltd (3)	Bears Down	wind	10	2001	South West
	Bein Ghlas	wind	8	1999	Scotland
	Bryn Titli	wind	10	1994	Wales
	Carno	wind	34	1996	Wales
	Causeymire	wind	48	2004	Scotland
	Kirkby Moor	wind	5	1993	North West
	Lambrigg	wind	7	2000	North West
	Llyn Alaw	wind	20	1997	Wales
	Mynydd Gorddu	wind	10	1996	Wales
	Novar	wind	17	1997	Scotland
	Taff Ely	wind	9	1993	Wales
	Tow Law	wind	2	2001	North East
	Trysglwyn	wind	6	1996	Wales
	Windy Standard	wind	22	1996	Scotland
	North Hoyle	wind (offshore)	60	2003	Wales
	Farr	wind	92	2006	Scotland
	Ffynnon Oer	wind	32	2006	Wales
BNP Paribas Clean Energy Partners GP Limited	Gruig	wind	25	2009	Northern Ireland
Braes of Doune Windfarm (4)	Braes of Doune	wind	72	2007	Scotland
British Energy (5)	Dungeness B	nuclear	1040	1983	South East
	Hartlepool	nuclear	1180	1984	North East
	Heysham1	nuclear	1160	1984	North West
	Heysham 2	nuclear	1220	1988	North West
	Hinkley Point B	nuclear	870	1976	South West
	Sizewell B	nuclear	1191	1995	East
	Hunterston B	nuclear	890	1976	Scotland
	Torness	nuclear	1190	1988	Scotland
Cemmaes Windfarm Ltd (6)	Cemmaes	wind	15	2002 (7)	Wales
Centrica	Barry	CCGT	230	1998	Wales
	Glanford Brigg	CCGT	260	1993	Yorkshire and the Humber
	Killingholme	CCGT	665	1994	Yorkshire and the Humber
	Kings Lynn (8)	CCGT	99	1996	East
	Peterborough	CCGT	405	1993	East
	Roosecote	CCGT	229	1991	North West
	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 Farm	wind (offshore)	97	2009	East Midlands
	Inner Dowsing Wind Farm	wind (offshore)	97	2009	East Midlands
Citigen (London) UK Ltd	Charterhouse St, London	gas/gas oil CHP	31	1995	London
Cold Northcott Windfarm Ltd (6)	Cold Northcott	wind	7	1993	South West

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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	53	2005	Northern Ireland
Corby Power Ltd	Corby	CCGT	401	1993	East Midlands
Derwent Cogeneration (2)	Derwent	gas CHP	228	1994	East Midlands
Dong Energy	Burbo Bank	Wind	90	2009	North West
	Gunfleet Sands 1	Wind	108	2010	South East
	Gunfleet Sands 2	Wind	65	2010	South East
	Walney (2)	Wind (offshore)	184	2011	North West
	Barrow Offshore Windfarm (9)	wind (offshore)	90	2006	North West
	Severn	CCGT	848	2010	Wales
Drax Power Ltd	Drax	coal	3870	1974	Yorkshire and the Humber
	Drax GT	gas oil	75	1971	Yorkshire and the Humber
EDF Energy	Sutton Bridge	CCGT	819	1999	East
	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
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
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	Kingsnorth	coal/oil	1940	1970	South East
	Ironbridge	coal	940	1970	West Midlands
	Ratcliffe	coal	1960	1968	East Midlands
	Grain	oil	1300	1979	South East
	Grain GT	gas oil	55	1978	South East
	Kingsnorth GT	gas oil	34	1967	South East
	Ratcliffe GT	gas oil	34	1966	East Midlands
	Taylor's Lane GT	gas oil	132	1979	London
	Connahs Quay	CCGT	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

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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	1320	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 Offshore	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
Fenland Windfarms Ltd (6)	Deeping	wind	16	2006	East Midlands
	Glass Moor	wind	16	2006	East Midlands
	Red House	wind	12	2006	East Midlands
	Red Tile	wind	24	2007	East Midlands
Fred Olsen	Crystal Rig Windfarm	wind	63	2003	Scotland
	Paul's Hill	wind	64	2005	Scotland
	Rothes	wind	51	2004	Scotland
	Crystal Rig II	wind	138	2010	Scotland
GDF Suez (International Power)	Shotton	gas CHP	210	2001	Wales
	Teesside Power Station (11)	OCGT	45	1992	North East
	Scotia Wind	wind	20	2010	Scotland
Great Orton Windfarm Ltd (6)	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 (6)	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
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
	Glenkerie	wind	20	2012	Scotland

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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
Intergen	Coryton	CCGT	800	2001	East
	Rocksavage	CCGT	810	1998	North West
	Spalding	CCGT	880	2004	East Midlands
International Power / Mitsui	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 (6)	Kirkheaton	wind	1	2000	North East
K/S Winscales (6)	Winscales 1	wind	2	1999	North West
	Winscales 2	wind	7	2005	North West
Llangwyryfon Windfarm Ltd (6)	Llangwyryfon	wind	9	2003	Wales
Magnox Ltd (12)	Wylfa	nuclear	490	1971	Wales
	Maentwrog	hydro	28	1928	Wales
Marchwood Power Limited (2)	Marchwood	CCGT	842	2009	South West
Peel Energy Ltd	Scout Moor	Wind	65	2009	North West
	Seaforth	Wind	3	1999	North West
	Port of Liverpool	Wind	10	2008	North West
Px Limited (13)	Fellside CHP	gas CHP	180	1995	North West
RES-Gen Ltd	Dyffryn Brodyn	wind	6	1994	Wales
	Four Burrows	wind	5	1995	South West
	Forss	wind	2	2003	Scotland
	Forss2	wind	5	2007	Scotland
	Lendrum's Bridge	wind	13	2000	Northern Ireland
	Altahullion	wind	26	2003	Northern Ireland
	Altahullion2	wind	12	2007	Northern Ireland
	Black Hill	wind	29	2006	Scotland
	Lough Hill	wind	8	2007	Northern Ireland
	Kelburn	wind	28	2011	Scotland
	Hill of Towie	wind	48	2012	Scotland
RGS Energy Ltd	Knapton	gas	40	1994	Yorkshire and the Humber
RWE Npower Plc	Aberthaw B	coal	1586	1971	Wales
	Tilbury B	biomass	750	1968	East
	Didcot A	coal/gas	1958	1972	South East
	Aberthaw GT	gas oil	51	1971	Wales
	Cowes	gas oil	140	1982	South East
	Didcot GT	gas oil	100	1972	South East
	Fawley GT	gas oil	68	1969	South East
	Littlebrook GT	gas oil	105	1982	South East
	Tilbury GT	rapeseed oil	68	1968	East

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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
	Little Barford GT	gas oil	17	2006	East
	Fawley	oil	968	1969	South East
	Littlebrook D	oil	1370	1982	South East
	Didcot B	CCGT	1430	1998	South East
	Great Yarmouth	CCGT	420	2001	East
	Little Barford	CCGT	714	1995	East
	Staythorpe C	CCGT	1724	2010	East Midlands
	Pembroke (14)	CCGT	2180	2012	Wales
RWE Npower Renewables Ltd (Part of RWE Npower)	Braevallich	hydro	2	2005	Scotland
	Cwm Dyli	hydro	10	2002 (7)	Wales
	Dolgarrog High Head	hydro	17	2002 (7)	Wales
	Dolgarrog Low Head	hydro	15	1926/2002	Wales
	Garrogie	hydro	2	2005	Scotland
	Inverbain	hydro	1	2006	Scotland
	Kielder	hydro	6	2006 (7)	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
	An Suidhe	wind	19	2010	Scotland
	Novar 2	wind	37	2012	Scotland
	Hellrigg	wind	9	2012	North West
Scottish and Southern Hydro Schemes:					
Affric/Beauly	Mullardoch Tunnel	hydro	2	1955	Scotland
	Fasnakyle	hydro	69	1951	Scotland
	Fasnakyle Compensation Set	hydro	8	2006	Scotland
	Deanie	hydro	38	1963	Scotland
	Culligran	hydro	17	1962	Scotland
	Culligran Compensation Set	hydro	2	1962	Scotland
	Aigas	hydro	20	1962	Scotland
	Kilmorack	hydro	20	1962	Scotland
Breadalbane	Lubreoch	hydro	4	1958	Scotland
	Cashlie	hydro	11	1959	Scotland
	Lochay	hydro	46	1958	Scotland
	Lochay Compensation Set	hydro	2	1959	Scotland
	Finlarig	hydro	17	1955	Scotland
	Lednock	hydro	3	1961	Scotland
	St. Fillans	hydro	17	1957	Scotland
	Dalchonzie	hydro	4	1958	Scotland
Conon	Achanalt	hydro	3	1956	Scotland
	Grudie Bridge	hydro	19	1950	Scotland
	Mossford	hydro	19	1957	Scotland
	Luichart	hydro	34	1954	Scotland
	Orrin	hydro	18	1959	Scotland
	Torr Achilty	hydro	15	1954	Scotland
Foyers	Foyers	hydro/ pumped storage	300	1974	Scotland
Great Glen	Foyers Falls	hydro	5	1968	Scotland
	Mucomir	hydro	2	1962	Scotland
	Ceannacroc	hydro	20	1956	Scotland
	Livishie	hydro	17	1962	Scotland

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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
	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
	Loch Dubh	hydro	1	1954	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
	Bu	wind	3	2002	Scotland
	Hadyard Hill	wind	120	2005	Scotland
	Spurness	wind	8	2004	Scotland
	Tangy	wind	19	2002	Scotland
	Drumderg	wind	37	2008	Scotland
	Bessy Bell 1	wind	5	1995	N Ireland
	Bessy Bell 2	wind	9	2008	N Ireland
	Bin Mountain	wind	9	2007	N Ireland
	Tappaghan	wind	29	2005	N Ireland
	Slieve Kirk	wind	28	2011	N Ireland
	Carcant	wind	7	2010	Scotland
	Toddleburn	wind	28	2010	Scotland
	Griffin	wind	156	2011	Scotland
	Greater Gabbard (15)	wind (offshore)	439	2011	East
	Achany	wind	38	2010	Scotland
	Fairburn	wind	40	2009	Scotland
	Clyde South	wind	129	2011	Scotland
	Clyde Central	wind	113	2011	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 (16)	gas/oil	1180	1980	Scotland

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[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	688	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	47	1998	South East
	Thatcham	light oil	10	1994	South East
	Five Oaks	light oil	9	1995	South East
	Chippenham	gas	10	2002	South West
	Wheldale	mines gas	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:	Cockenzie	coal	1152	1967	Scotland
	Longannet	coal	2304	1970	Scotland
	Damhead Creek	CCGT	800	2000	South East
	Pilkington - Greengate	gas	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	wind	30	2001	Scotland
	Beinn Tharsuinn	wind	30	2007	Scotland
	Black Law	wind	124	2005	Scotland
	Callagheen	wind	17	2006	Northern Ireland
	Carland Cross	wind	5	1992	South West
	Clachan Flats	wind	15	2009	Scotland
	Coal Clough	wind	10	1992	North West
	Coldham	wind	16	2006	East
	Corkey	wind	5	1994	Northern Ireland

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[1] (continued)

Station type		Fuel	Capacity (MW)		
	Cruach Mhor	wind	30	2004	Scotland
	Dun Law 1	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 1	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
	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	18	2012	Scotland
	Wolf Bog	wind	10	2008	Northern Ireland
Seabank Power Limited (2)	Seabank 1	CCGT	812	1998	South West
	Seabank 2	CCGT	410	2000	South West
Sembcorp Utilities (UK) Ltd	Wilton Power Station	Gas/Coal/Oil	280	1952	North East
	Wilton GT2	Gas	42	2005	North East
	Wilton 10	Biomass	38	2007	North East
Snowmountain	Long Hill Road	wind	2	2005	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)	169	2012	East
Talisman Energy	Beatrice *(2)*	wind (offshore)	10	2007	Scotland
Triodos	FMC	wind	2	2011	Scotland
Vattenfall Wind Power	Kentish Flats	wind (offshore)	90	2005	South East
	Thanet	wind (offshore)	300	2010	South East
	Edinbane	Wind (onshore)	41	2010	Scotland
	Ormonde	wind (offshore)	150	2011	North West
Windcluster	Haverigg III	wind	3	2005	North West
Yorkshire Windpower Ltd *(17)*	Ovenden Moor	wind	9	1993	Yorkshire and the Humber
	Royd Moor	wind	7	1993	Yorkshire and the Humber
Total			**86,998**		

Other power stations[18]

Renewable sources	wind	1278	
and combustible wastes	landfill gas	1067	
	sewage gas	198	
	hydro	232	
	biomass and waste	789	
	solar photovoltaics and wave/tidal	979	
CHP schemes listed in Table 5.12	various fuels	2,193	
CHP schemes other than major power producers and renewables and those listed in Table 5.12	mainly gas	2,060	
Other autogenerators	various fuels	187	

For footnotes see page 153

5.11 Power Stations in the United Kingdom
(operational at the end of May 2012)[1] (continued)

Interconnectors

	Capacity (MW)
England - France	2,000
England - Netherlands *(19)*	1,000
Scotland - Northern Ireland	500
Northern Ireland - Irish Republic	600

Footnotes

(1) This list covers stations of more than 1 MW capacity, but excludes some renewables stations of over 1 MW which are included in the sub table on page 154.

(2) Joint venture with Scottish and Southern Energy and OPW

(3) Managed by RWE

(4) Joint venture between Centrica and SSE, but operated by SSE

(5) Now owned by EDF

(6) Managed by EDF Energy Renewables Ltd

(7) Recommissioning dates.

(8) King's Lynn station partially mothballed, reducing capacity from 340 MW to 99 MW

(9) Co-owned with Centrica

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

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

(12) Owned by NDA but operated by Magnox Ltd

(13) Owned by NDA but operated by Px Limited

(14) As at May 2012, station in commissioning.

(15) Joint venture between Greater Gabbard Offshore Wind Ltd and SSE, operated by SSE

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

(17) Owned by E.On and EPR

(18) As at end December 2010.

(19) Offically opened 1st April 2011

5.12 Large scale CHP schemes in the United Kingdom (operational at the end of December 2011)[1]

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
Alta Estate Services Limited	Chp Station, Alta Estate Services Ltd, University Of	6
Anglian Water Services Limited	Tilbury Sewage Treatment Works	2
Archer Daniels Midland Erith Limited	Erith Oil Works	14
Astrazeneca Limited	Astrazeneca - Avlon	3
Balcas Limited	Balcas Limited	3
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	Wissington Sugar Factory, British Sugar Plc (Chp 2)	94
British Sugar Plc	Bury St Edmunds Sugar Factory (Chp 2)	90
Cambridge University Hospitals Foundation	Addenbrookes Hospital	4
Carillion Services Ltd Ta Carillion Health	Queen Alexandra Hospital	3
Carlsberg Uk Limited	Carlsberg Brewery Leeds, Carlsberg Uk Limited	1
Celts Limited	Levenmouth Wwtw, Celts Limited	3
Citywesthomes	Pump House	3
Cofely District Energy Ltd	Icc Energy Centre	2
Cofely District Energy Ltd	Soas Chp, The Boiler House	2
Cofely District Energy Ltd	Aston University Energy Centre, Aston University	3
Cofely District Energy Ltd	The Heat Station (Chp 2)	7
Cofely District Energy Ltd	Mod Main Building	5
Cofely District Energy Ltd	Birmingham Children's Hospital	2
Cofely Ltd	Hillhouse International,Vinnolit	5
Cofely Ltd	Kellogg Trafford Park	5
Crisp Maltings Group Ltd	Crisp Maltings Ryburgh	1
Cyclerval Uk Ltd	Newlincs Efw, Newlincs Development Ltd	4
Dalkia Clean Power 2 Ltd	Fribo Foods Limited	1
Dalkia Plc	Lincoln County Hospital	1
Dalkia Utilities Services	Freeman Hospital (Newcastle Upon Tyne Nhs Trust)	4
Dalkia Utilities Services	North Tyneside General Hospital	1
Dalkia Utilities Services	Royal Victoria Infirmary	4
Dalkia Utilities Services Plc	Astrazeneca	23
Dalkia Utilities Services Plc	Eli Lilly & Co Ltd,Speke Operation	10
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	Stoke Chp, Michelin Tyre Plc	61
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	Citigen Chp. Citigen (London) Limited	16
E.On Uk Cogeneration Ltd	Leeds Teaching Hospital Nhs Trust	5
E.On Uk Cogeneration Ltd	Nufarm Uk Limited	5
E.On Uk Cogeneration Ltd	Queens Medical Centre Nhs Trust	5
E.On Uk Plc	Workington Chp	48
East Sussex Hospitals Trust	Eastbourne District General Hospital	1
Ed&F Man Ltd (Man Group Plc)	Sugar Quay	1
Ener-G	Granada Studios (Unit 730)	1
Ener-G	Loughborough University (Unit 1285)	1
Energy Centre For Sustainable Communities	Tcmk Phase 1 Chp No 2 Gas Engine, Thameswey Central	6
Energy Centre For Sustainable Communities	Woking Town Centre Phase I	1
Enviroenergy Ltd	Nottingham District Heating Scheme	14
Esso Petroleum Company Limited	Esso Fawley Chp	316
Fine Organics Limited	Fine Organics Limited	4
Fortum O&M (Uk) Ltd	Sullom Voe Power Station	89
Genzyme Ltd	Genzyme - Haverhill	1
Georgia Pacific Gb Ltd	Georgia Pacific Chp, Bridgend Paper Mills	9
Glaxosmithkline	Glaxosmithkline Montrose	1
Glaxosmithkline	Glaxosmithkline Coleford	5

For footnotes see page 156

5.12 Large scale CHP schemes in the United Kingdom
(operational at the end of December 2011)[1] *(continued)*

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
Glaxosmithkline	Barnard Castle	2
Glaxosmithkline, Irvine	Glaxosmithkline, Irvine	4
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 Chlor Limited	Ineos Chlor 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 Heathcoat & Company Limited	John Heathcoat & Company Limited	1
John Thompson And Son Ltd	John Thompson & Sons Limited	3
Johnson Matthey Plc	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, Murco Petroleum Limited	24
Mill Nurseries Ltd	Millchp, Mill Nurseries	15
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 Limited	Bran Sands (Biogas)	5
Npower Cogen Ltd	Hythe Chp, Npower Cogen (Hythe) Ltd	53
Npower Cogen Ltd	Dow Corning Chp C/O Dow Corning Ltd	27
Npower Cogen Ltd	Ppco Generating Plant C/O Conoco Phillips Teesside	97
Npower Cogen Ltd	Basf Chp C/O Basf Plc	98
Npower Cogen Ltd	Aylesford Chp C/O Aylesford Newsprint Ltd	100
Prosper De Mulder	De Mulder & Sons - Hartshill	3
Royal Mail Group Property	Royal Mail (Hwdc) Chp 1, Consignia Plc	3
Ryobi Aluminium Casting (Uk) Ltd	Ryobi	1
Scottish And Southern Energy Plc	Slough Nurseries, G + C Property	2
Scottish And Southern Energy Plc	Western General Hospital, Lothian Universities Nhs Trust	1
Scottish And Southern Energy Plc	Port Clarence Works, Koppers	2
Scottish And Southern Energy Plc	Bradon Farm	10
Scottish And Southern Energy Plc	Ninewells Hospital, Tayside University Hospitals Nhs Trust	3
Scottish And Southern Energy Plc	Red Roofs - North Moor & Dunswell Road	3
Shell Uk Oil Products Ltd	Stanlow Manufacturing Complex	109
Slough Heat & Power Ltd	Slough Power Station	104
Smithkline Beecham Plc/Glaxo Smith Kline	Glaxo Smith Kline Worthing	2
Smurfit Kappa Ssk Limited	Smurfit Kappa Ssk Limited	9
Springfield Fuels Ltd	Springfields, Springfield Fuels Ltd	12
Syngenta Limited	Huddersfield Works, Syngenta Ltd	16
T & L Sugars Ltd	Thames Refinery, T & L Sugars Ltd	20
Tangmere Airfield Nurseries Limited	Tangmere Nursery	9
Thames Water Utilities Ltd	Reading (Island Road) Stw	1
Thames Water Utilities Ltd	Long Reach Stw	4
Thames Water Utilities Ltd	Maple Lodge Stw	4
Thames Water Utilities Ltd	Mogden Stw	8
Thames Water Utilities Ltd	Deephams Stw	3
Thames Water Utilities Ltd	Beckton Stw Bio Diesel Chp	8
Thames Water Utilities Ltd	Crawley Stw Chp 2	1
Thames Water Utilities Ltd	Beddington Stw Chp 2	4
Thames Water Utilities Ltd	Ryemeads Stw	2
The Boots Group Plc	Boots Energy Centre	14

For footnotes see page 156

5.12 Large scale CHP schemes in the United Kingdom
(operational at the end of December 2011)(1) *(continued)*

Company Name	Scheme Location	Installed Capacity (MWe) *(2)*
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	King's Buildings, University Of Edinburgh Utilities Supply	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 (Chp2), University Of Warwick	4
Upm Kymmene (Uk) Ltd	Upm Shotton	22
Van Heyningen Brothers Ltd	West End Nurseries	2
Van Heyningen Brothers Ltd	Runcton Nursery	4
Weetabix Limited	Weetabix Limited	6
Wessex Water Services Ltd	Bristol Waste Water Treatment Works Scheme A	6
Total *(2)*		2,193
Electrical capacity of good quality CHP for these sites in total		1,233

(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

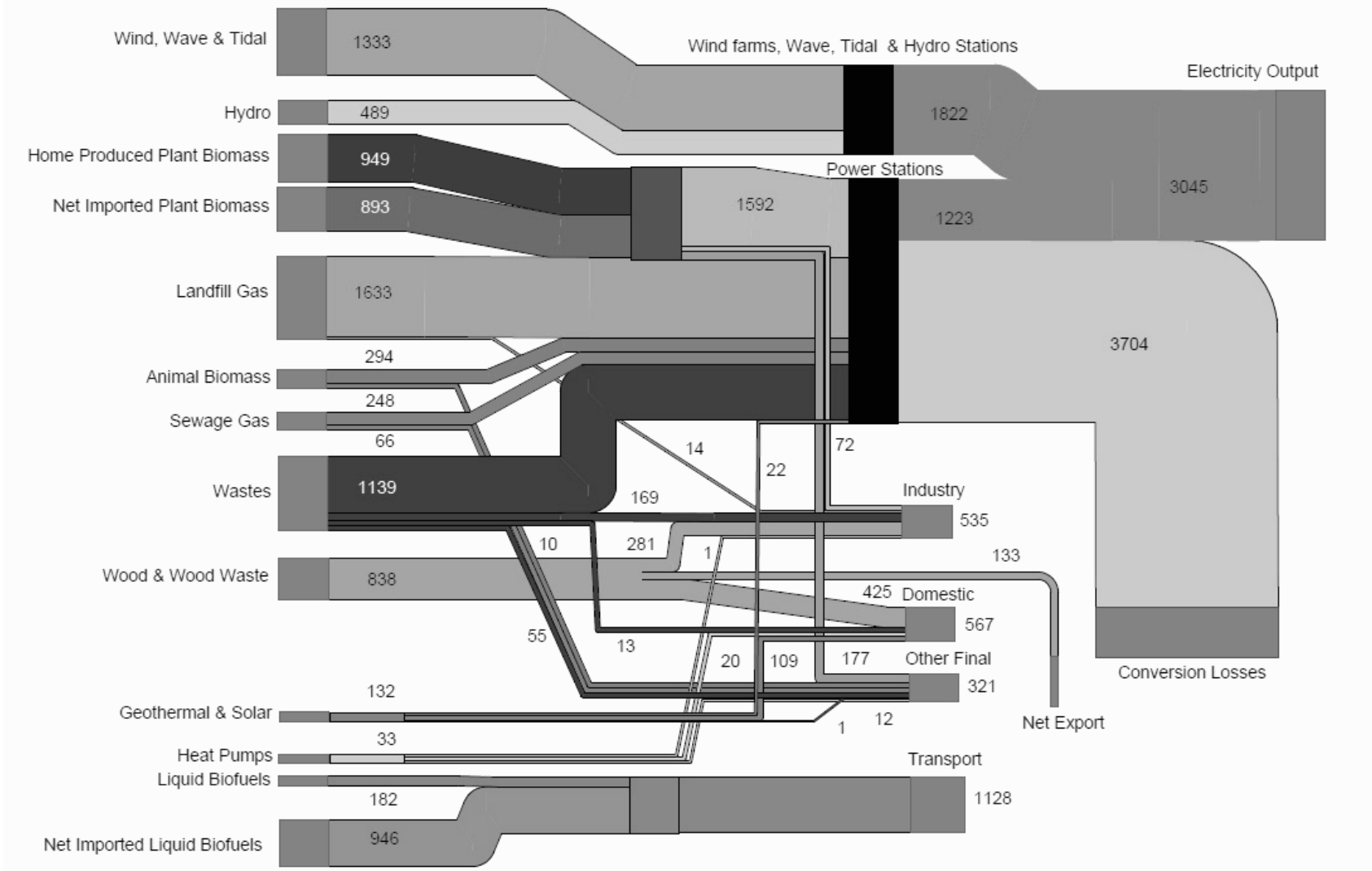
- Electricity generation from renewable sources increased by around one third between 2010 and 2011 to reach 34.4 TWh. Capacity grew by a similar proportion (to 12.3 GW) over the same period (paragraphs 6.9 and 6.11; table 6.4).
- Offshore wind generation was 68 per cent higher than in 2010, with capacity up 37 per cent. Onshore wind generation was 45 per cent higher, with capacity up 15 per cent. Overall wind generation was 52 per cent higher and capacity 21 percent higher (paragraphs 6.9 and 6.11; table 6.4).
- Generation from hydro sources increased by 56 per cent, and bioenergy generation was 8 per cent higher (paragraph 6.9; table 6.4).
- 855 MW of renewable electricity capacity was *introduced* via Feed-in Tariffs during 2011, following the introduction of the FiT scheme in April 2010 (paragraph 6.11).
- Load factors for wind and hydro generation in 2011 recovered from the low rates observed in 2010, as wind speeds and rain returned to more usual levels (paragraph 6.16; table 6.5).
- The contribution of all renewables to UK electricity generation was 9.4 per cent in 2011, 2.6 percentage points higher than one year earlier. However when using normalised load factors to take account of fluctuations in wind and hydro, the contribution of renewables to gross electricity consumption increased from 7.4 per cent to 8.7 percent (table 6A).
- Heat from renewable sources increased by 5 per cent during 2011 (to 1,220 ktoe); and renewable biofuels for transport fell by 7 per cent (to 1,128 ktoe) (paragraphs 6.21 and 6.27; table 6.6).
- Progress has been made against the UK's 15 per cent target introduced in the 2009 EU Renewables Directive. Using the methodology required by the Directive, 3.8 per cent of energy consumption in 2011 came from renewable sources; this is up from 3.2 per cent in 2010 (table 6B).

Introduction

6.1 This chapter provides information on the contribution of renewable energy sources to the United Kingdom's energy requirements; in previous editions of the Digest, this information has been contained in Chapter 7. 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 geothermal, active solar and heat pumps, 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.

6.2 The data summarise the results of DECC surveys of electricity generators, information from CHP schemes, and an ongoing study undertaken by 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.

Renewables flow chart 2011 (thousand tonnes of oil equivalent)



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

6.3 The renewable energy flow chart summarises the flows of renewables from fuel inputs through to consumption for 2011. 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). The sub-set of electricity generation only from sources eligible for the Renewables Obligation (RO), previously contained in the fifth table of this chapter, has now been incorporated in Table 6.4. Table 6.5 focuses on load factors for electricity generation, which was previously part of the fourth table in the chapter. 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 DECC's energy statistics web site and accessible from the Digest of UK Energy Statistics home page:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

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 2011 (Table 6.1), 2010 (Table 6.2) and 2009 (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. Less than 3 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 geothermal aquifers.

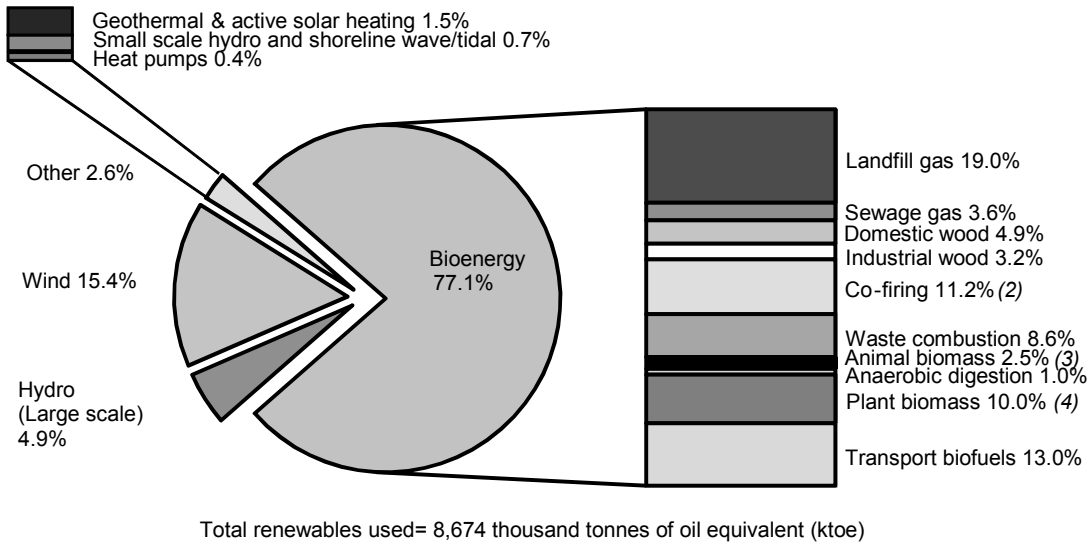
6.8 Around three quarters (73 per cent) of the 8,674 ktoe of renewable energy (excluding non-biodegradable wastes) produced in 2011 was transformed into electricity. This proportion reduced year-on-year between 2005 (when electricity accounted for 85 per cent of renewable energy) and 2010 (68 per cent); however the reduced demand for biofuels in the transport sector in 2011 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 5.75). 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 158) illustrates.

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 2011 amounted to 34,410 GWh, an

increase of 8,565 GWh (+33 per cent) on 2010. The largest absolute increase in generation came from onshore wind, rising by 3,235 GWh to 10,372 GWh (a 45 per cent increase on the previous year), reflecting increased installed capacity over the course of the year and also higher average wind speeds. Similar factors helped offshore wind generation contribute the second largest absolute increase, by 2,082 GWh to 5,126 GWh (68 per cent higher). There was a further 2,043 GWh increase in generation from hydro schemes, with the total contribution of hydro amounting to 5,686 GWh during the year, 56 percent higher than during 2010, reflecting higher rainfall. Additionally, co-firing of renewables with fossil fuels contributed 27 per cent more electricity, an increase of 631 GWh to 2,964 GWh in 2011. Other sources showing large increases – but from smaller initial levels - included solar photovoltaics (an increase of 219 GWh, nearly 7 times higher), anaerobic digestion (147 GWh, a near two-fold increase), biodegradable municipal solid waste (141 GWh, 9 per cent higher), plant biomass (58 GWh, 4 per cent higher), and sewage sludge digestion (57 GWh, 8 per cent higher). There were small reductions in generation from landfill gas (35 GWh lower), and animal biomass (13 GWh lower). Wind continued to be the leading individual technology for the generation of electricity from renewable sources during 2011 with 45 per cent of renewables generation coming from this source; a further 17 per cent came from hydro. However the combined generation from the variety of different bioenergy sources accounted for 38 per cent of renewable generation, with landfill gas accounting almost two-fifths of the bioenergy generation. Total generation from bioenergy sources was 8 per cent higher than in 2010, with wind being 52 per cent higher and hydro's contribution 56 per cent higher.

Chart 6.1: Renewable energy fuel use 2011 *(1)*



(1) Excludes all passive use of solar energy and all (540 ktoe) non-biodegradable wastes. In this chart renewables are measured in primary input terms.
(2) Biomass co-fired with fossil fuels in power stations; imported 10.5% of total renewables, home produced 0.7%
(3) 'Animal biomass' includes farm waste, poultry litter, and meat and bone combustion.
(4) 'Plant biomass' includes straw and energy crops.

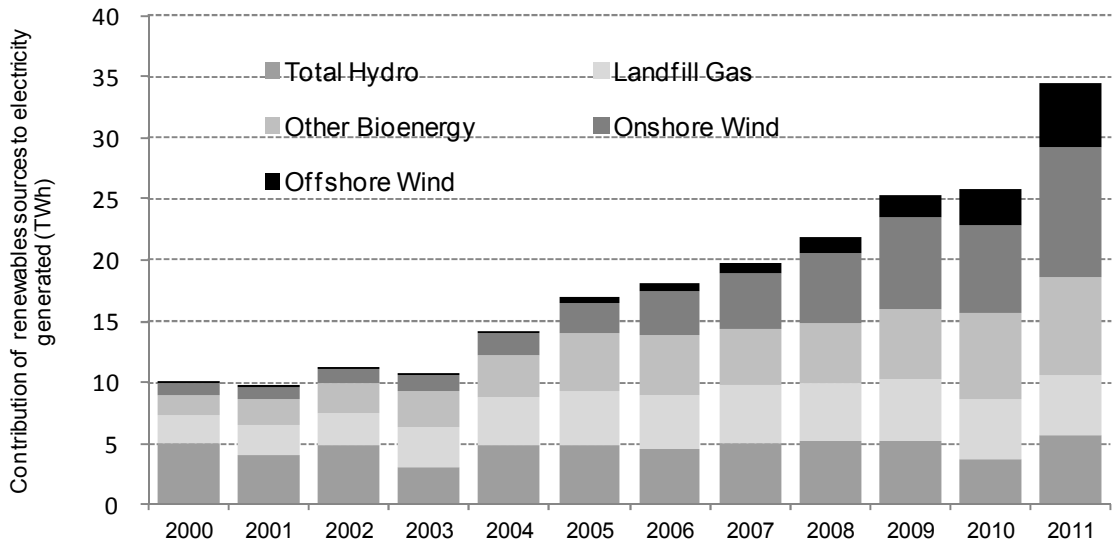
6.10 Renewable sources provided 9.4 per cent of the electricity generated in the United Kingdom in 2011 (measured using the "international basis", i.e. electricity generated from all renewables except non-biodegradable wastes as a percentage of all electricity generated in the UK), 2.6 percentage points higher than the proportion recorded during 2010. 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 6.40 to 6.42), and progress towards the 2001 Renewables Directive (using both the original and normalised calculation methods) and 2009 Renewable Energy Directive (see paragraph 6.38).

Table 6A: Percentages of electricity derived from renewable sources

	2007	2008	2009	2010	2011
Overall renewables percentage (international basis)	5.0	5.6	6.7	6.8	9.4
Percentage on a Renewables Obligation basis	4.8	5.4	6.7	7.0	9.7
Percentage on original 2001 Renewables Directive basis	4.9	5.5	6.7	6.7	9.2
Percentage on normalised 2001 Renewables Directive basis	4.7	5.4	6.6	7.3	8.6
Percentage on a 2009 Renewable Energy Directive basis (normalised)	4.8	5.4	6.6	7.4	8.7

6.11 Installed generation capacity reached 12,310 MW at the end of 2011, an increase of 3,072 MW (33 per cent) during the year; this excludes the capacity within conventional generation stations that was used for co-firing (a further 338 MW). The largest contributor towards the increase was 899 MW from solar PV, representing a more than 11 fold increase on the capacity installed at the end of 2010, resulting from the inclusion of this form of generation in the Feed-in Tariff scheme. Other main contributors to the increase were 829 MW (251 per cent) from plant biomass (of which 750 MW was due to the conversion of Tilbury B's, previously coal-fired, power station to dedicated biomass in December 2011); 614 MW (15 per cent) from onshore wind, and 497 MW (37 per cent) from offshore wind. In capacity terms, wind was the leading technology at the end of 2011, with hydro second, followed by plant biomass and landfill gas. Fifty three per cent of renewable electricity capacity at the end of 2011 was from wind, 14 per cent from hydro, and around 9 per cent each from plant biomass and landfill gas. During the first nine months of the FiT scheme, between April and December 2010, a total of 72 MW of renewable capacity was installed and subsequently confirmed on the FiT scheme. During 2011, a further 855 MW of FiT supported renewable capacity was installed, with 94 per cent of this new capacity relating to photovoltaics. A further 90 MW of PV capacity was installed in 2011 and awaiting accreditation on FiTs. It should be noted that, due to administrative lags of around three months, much capacity installed towards the end of 2011 was not confirmed on FiTs until the first quarter of 2012 (so the amount of capacity installed under FiTs at the end of 2011 will not equal the amount actually confirmed on the Central FiTs Register). [1]

Chart 6.2: Electricity generation by main renewable sources since 2000



Note: Onshore Wind bar includes solar PV (0.25 TWh in 2011);
Hydro bar includes shoreline wave/tidal (0.001TWh in 2011)

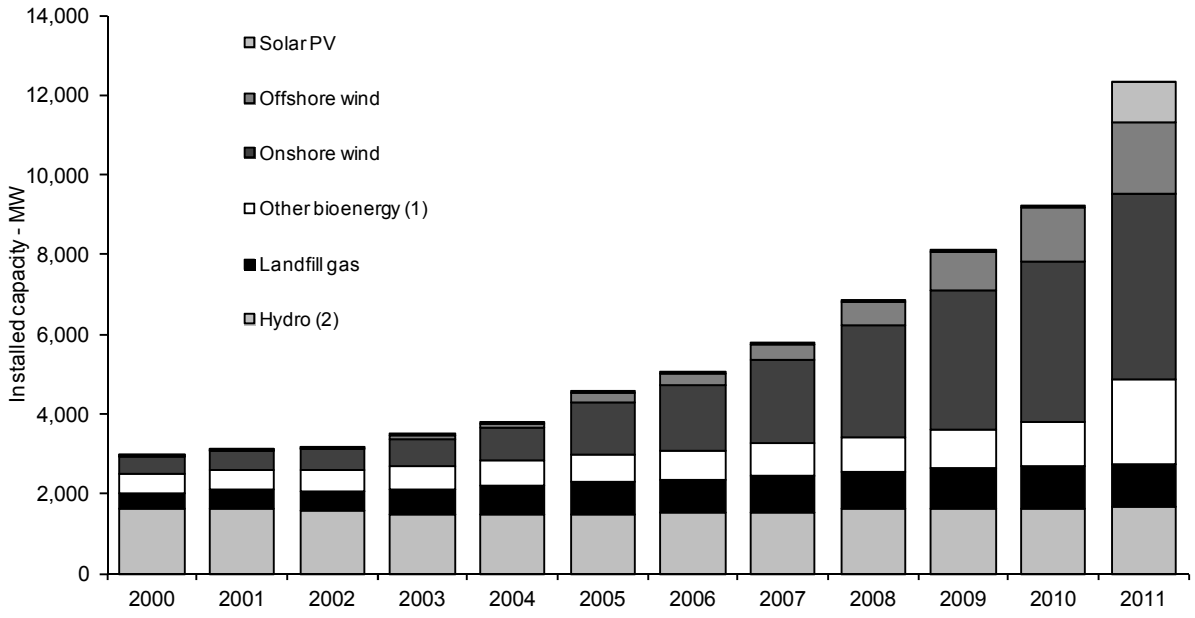
6.12 Chart 6.3 illustrates the continuing increase in the electricity generation capacity from all significant renewable sources. This upward trend in the capacity of renewable sources should continue as recently consented onshore and offshore windfarms and other projects come on stream. The map, shown on page 163, shows the location of wind farms in operation at the end of December 2011, together with an indication of the capacity.

[1] At the end of 2011, 658 MW of renewable capacity was confirmed on the Central FiTs Register.

6.13 Electricity generated in the UK from renewable sources eligible under the Renewables Obligation in 2011 was 33 per cent greater than in 2010; this compares with a 6 percent growth in 2010. Chart 6.4 includes a line showing the growth in the proportion of electricity produced from renewable sources under the Renewables Obligation 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 under the RO as a percentage of electricity sales. RO eligible generation has increased by over 24 TWh since its introduction in 2002, an increase of 418 per cent, although some of this is due to existing hydro stations being refurbished and thus becoming within the scope of the RO definition, as opposed to new capacity being installed. This compares with an all-renewable electricity generation figure that has increased by 209 per cent over the same period, but from a higher starting level.

6.14 As shown in Table 6A, during 2011 renewable generation measured using the RO basis (ie as a proportion of electricity sales by licensed suppliers) increased to 9.7 per cent. Since the introduction of the RO in 2002 generation from wind has increased on average by nearly one-third each year.

Chart 6.3: Electrical generating capacity of renewable energy plant



(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 (3.1 MW in 2011).

The Location of Wind Farms in the United Kingdom as at 31 December 2011.

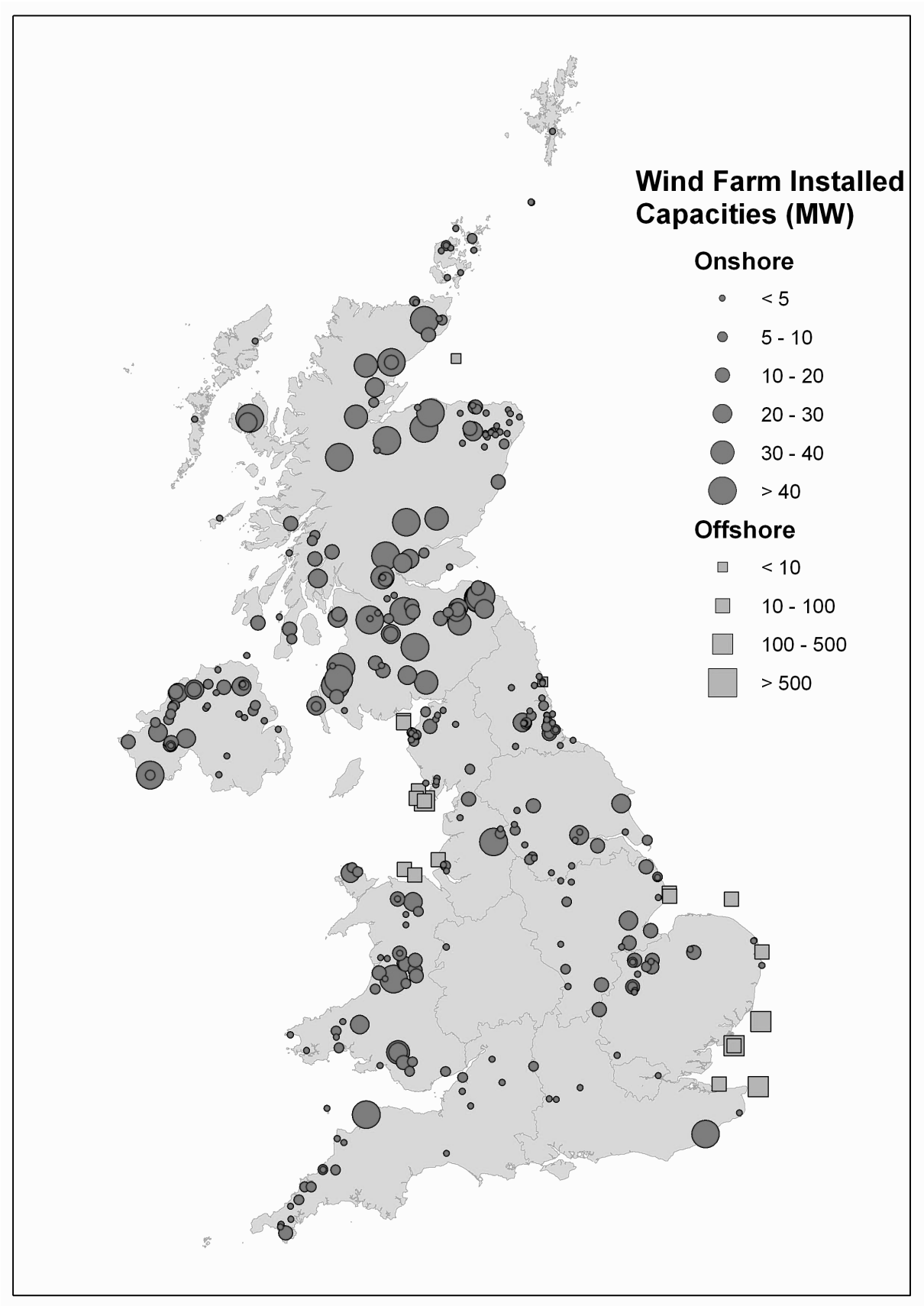
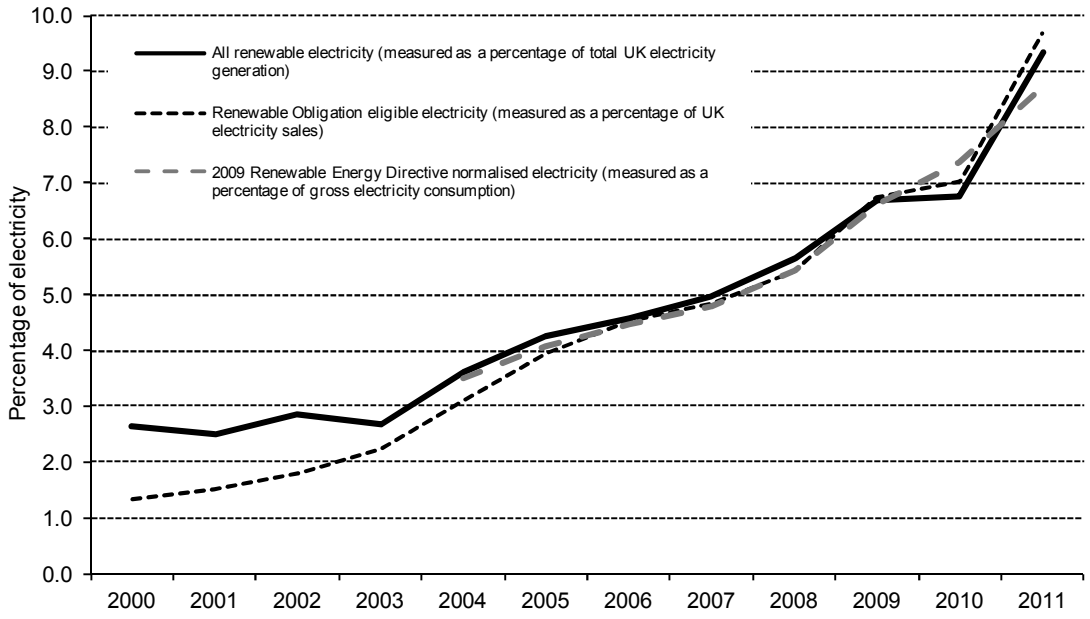


Chart 6.4: Growth in electricity generation from renewable sources since 2000



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

6.15 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:

$$\frac{\text{Electricity generated during the year (kWh)}}{(\text{Installed capacity at the beginning of the year} + \text{Installed capacity at the end of the year (kW)}) \times 0.5 \times 8760 \text{ hours}}$$

6.16 A number of factors can have major impacts on load factors. For instance, rain levels during 2010 were 63 per cent of the amount 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 25.4 per cent in 2010. Rain levels in 2011 were 84 per cent higher than in 2010; this resulted in a record high hydro load factor of 39.1 per cent. Additionally 2010 experienced the lowest average wind speeds this century, reducing onshore load factors during 2010 by one-fifth to 21.7 per cent compared with 2009. Wind speeds in 2011 were around 1.4 knots higher than in 2010, returning load factors to a similar level obtained in 2007 to 2009. Load factors for all non-renewable generating plant in the UK are shown in Chapter 5, Table 5.10.

6.17 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

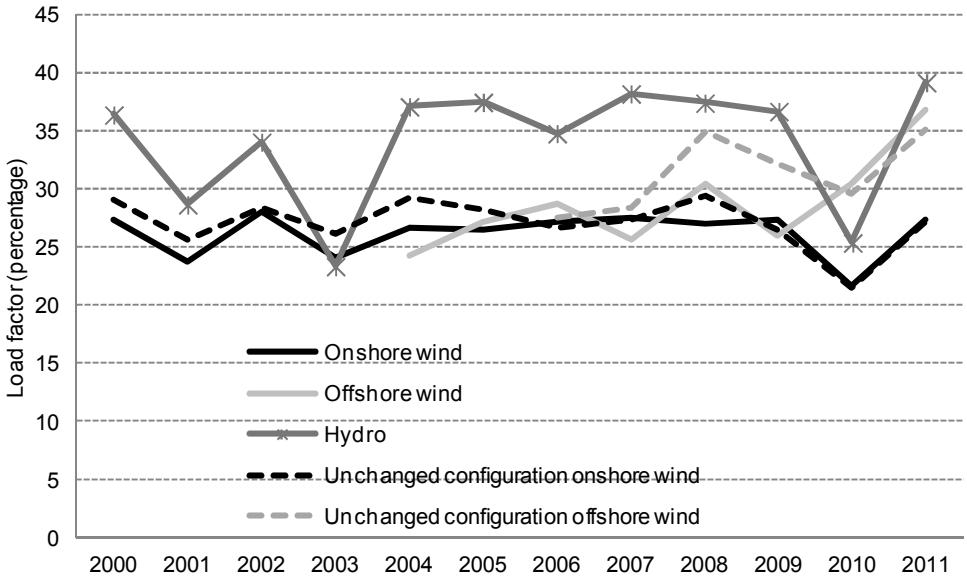
less than one month. Similarly the large increase in solar PV capacity towards the end of 2010 and 2011 affected the load factors for this technology.

6.18 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 are calculated in the same way 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. For formula for calculating the unchanged configuration load factors is:

$$\frac{\text{Electricity generated during the year (kWh)}}{\text{(Installed capacity operating throughout the year with an unchanged configuration (kW))} \times 8760 \text{ hours}}$$

6.19 Chart 6.5 shows load factors for wind and hydro. The impacts of new capacity and poor 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)

6.20 Between 2010 and 2011 there was an increase of 23 per cent in the **input** of renewable sources into electricity generation. Hydro grew by 56 percent, with combined on and off-shore wind increasing by 52 per cent, bioenergy sources increased by 13 per cent.

Renewable heat

6.21 Table 6.6 also shows the contribution from renewables to heat generation. Around 14 per cent of renewable sources were used to generate heat in 2011. 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 increased by 90 percent to 1,077 ktoe; the increase between 2010 and 2011 was 2 per cent. Further significant growth in this area is anticipated, especially in the industrial and domestic wood use sectors, together with additional heat pumps, as a result of the

Renewable Heat Incentive (RHI) and Renewable Heat Premium Payment (RHPP) schemes; however they only had a minor impact during 2011. Further information on the RHI and RHPP schemes can be found in paragraphs 6.46 and 6.47. Energy from all forms of renewable heat increased by 5 per cent during 2011 to 1,220 ktoe.

6.22 Domestic use of wood is the main contributor to renewables used for heat – comprising around 35 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 23 per cent and 20 per cent respectively. Non-bioenergy renewable heat sources include solar thermal, geothermal aquifers and heat pumps, but combined these accounted for 12 per cent of renewable heat in 2011.

6.23 The contribution of energy from Air Source and Ground Source heat pumps was first included in the Digest last year, with historic data collected from 2008. The data have been revised slightly since last year as the contribution of non-domestic heat pumps was considered too high. Only the net gain in energy (ie 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) of 3, and that there was no significant contribution from heat pumps installed before 2008. EUROSTAT, the statistics division of the European Commission, are currently developing statistical guidance on measuring the contribution of heat pumps; this should be finalised in time for use in the 2013 edition of the Digest, and may result in further revisions to historic data. The total installed capacity of GSHP and ambient air to water heat pumps meeting the minimum performance factor was estimated to be 428 MW at the end of 2011. The capacity installed during 2011 was assumed to be installed at a steady rate throughout the year. Heat pumps were estimated to deliver 378 GWh of renewable heat in 2011, with 57 per cent of this heat coming from ground source heat pumps.

Liquid Biofuels for transport

6.24 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; further information on this is given in Chapter 3. 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 was 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 925 million litres of biodiesel were consumed in 2011, around 12 percent lower than in 2010. It is estimated that 201 million litres of biodiesel were produced in the UK in 2011, around two-fifths of the production in 2007 (485 million litres). Therefore around 724 million litres of biodiesel were imported in 2011. The total annual capacity for biodiesel production in the UK in 2011 is estimated to be around 570 million litres.

6.25 HMRC data also show that 652 million litres of bioethanol was consumed in the UK in 2011; this continues a trend of increasing bioethanol use that started with 85 million litres in 2005, and is nearly double the amount used in 2009 (320 million litres); however growth between 2010 and 2011 fell to just 3 per cent. The UK capacity for bioethanol production at the end of 2011 was estimated to be around 475 million litres, although actual production was less than 10 per cent of capacity.

6.26 During 2011, biodiesel accounted for 3.6 per cent of diesel, and bioethanol 3.3 per cent of motor spirit. The combined contribution of liquid biofuels for transport was 3.5 per cent. The monthly HMRC source data can be obtained from their Hydrocarbon Duty statistical bulletins available at: www.uktradeinfo.com/Statistics/StatisticalBulletins/Pages/BulletinArchive.aspx?viewname=Hydrocarbon Oils Duties Archive

6.27 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 2010 and 2011, the use of biofuels for transport fell by 7 per cent to 1,128 ktoe. In 2011 13 per cent of the renewable sources used in the UK in primary input terms were liquid biofuels for transport, down from 16 per cent

in 2010, but significantly higher than the half of one per cent in 2003. 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. Further information on the RTFO is given in paragraphs 6.44 and 6.45.

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

6.28 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 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 percent; certain fuels also receive a higher weighting in the calculation, with full details being set out in the Directive, which is available at:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF.

6.29 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 2011 have been calculated on a net calorific value basis and are available in Table I.1 at:
www.decc.gov.uk/en/content/cms/statistics/source/total/total.aspx

6.30 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 renewables sources.

Table 6B: Percentages of energy derived from renewable sources

	2007	2008	2009	2010	2011
Eligible renewable energy sources as a percentage of capped gross final energy consumption (ie the basis for the Renewable Energy Directive)	1.8	2.4	3.0	3.2	3.8
Renewable energy as a percentage of primary energy demand	2.2	2.6	3.1	3.3	4.1

6.31 Table 6B shows that, on the basis used to monitor the RED, the UK percentage of energy derived from eligible renewable sources rose by 0.6 percentage points in 2011 to 3.8 per cent. Overall, renewable sources, excluding non-biodegradable wastes and passive solar design (see paragraph 6.48), provided 4.1 per cent of the United Kingdom's total primary energy requirements in 2011 (excluding energy products used for non-energy purposes). 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 8 per cent, the final consumption denominator fell by 8 per cent.

6.32 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.

6.33 Eurostat publishes data on how all countries are progressing towards their RED targets. The latest comparative data relates to 2010, and was published in a news release report[2] on 18 June 2012. It shows that, in 2010, the UK had the third lowest RED percentage, with Malta and Luxembourg having lower percentages. The 2010 RED percentage for all EU countries was 12.4 per cent, but with wide variation amongst member states, from 0.4 per cent in Malta to 47.9 per cent in Sweden. Between 2006 and 2010, all Member States increased their share of renewable energy in total consumption. The largest increase were recorded in Estonia (from 16.1 per cent in 2006 to 24.3 per cent in 2010), Romania (from 17.1 per cent to 23.4 per cent), Denmark (from 16.5 per cent to 22.2 per cent), Sweden (from 42.7 per cent to 47.9 per cent), and Spain (from 9.0 per cent to 13.8 per cent). The UK showed a 1.7 percentage point increase over the same time period.

[2] http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/8-18062012-AP/EN/8-18062012-AP-EN.PDF

Technical notes, definitions, and policy context

6.34 The AEA 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. This technical notes section defines these renewable energy sources. The database now contains 23 years of data from 1989 to 2011. 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.

6.35 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 website at:
www.decc.gov.uk/en/content/cms/statistics/source/renewables/renewables.aspx

6.36 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 227 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 6.87, below).

6.37 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 energy statistics web site.

European and UK Renewable Energy Policy Context

EU Renewables Directives

6.38 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. 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 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 and submitted in December 2011) are available at:
www.decc.gov.uk/en/content/cms/meeting_energy/Renewable_ener/uk_action_plan/uk_action_plan.aspx
and http://ec.europa.eu/energy/renewables/reports/2011_en.htm

UK Renewables Policy

6.39 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 for small scale (under 5 MW) electricity generation, the Renewable Transport Fuel Obligation, the launch of 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 at: www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/re_roadmap/re_roadmap.aspx. An update to this document will be published later in 2012.

Renewables Obligation (RO)

6.40 In April 2002 the Renewables Obligation came into effect[3]. 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, 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.

6.41 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 continues to receive 1 ROC/MWh. The more established renewable technologies such as sewage gas and landfill gas receive 0.5 ROCs/MWh and 0.25 ROCs/MWh respectively. A review of the current bands across the UK started in October 2010 and will set the bands for the period 2013-17. 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. Subject to parliamentary and state aid approval the new bands will come into effect on 1 April 2013 (with the exception of offshore wind for which new bands will come in on 1 April 2014).

6.42 Table 6.4 contains a row showing the total electricity generated on an RO basis. Prior to 2002 the main instruments for pursuing the development of renewables capacity were the Non Fossil Fuel

[3] 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.

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 energy statistics web site (see paragraphs 6.5 and 6.6).

Feed-in Tariffs (FiTs)

6.43 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 3.2p 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 has two parts, the first considers support for solar PV and the second other technologies and administrative issues. On 24 May 2012 DECC announced new tariffs for solar PV, to come into effect from 1 August 2012, with further announcements later in the year relating to other technologies. Any changes implemented as a result of the review will 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.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/feedin_tariff/feedin_tariff.aspx and www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/fits/fits.aspx respectively.

Renewable Transport Fuel Obligation (RTFO)

6.44 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 5 per cent (by volume) of their overall fuel sales are from a renewable source by 2013/14, with incremental levels of 2.5 per cent (by volume) for 2008/09, 3.25 per cent (by volume) in 2009/10, 3.5 per cent (by volume) in 2010/11, and 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.. Information on the RTFO policy can be found on the DfT website at: www.dft.gov.uk/publications/rtfo-guidance/

6.45 The verified RTFO biofuels statistics, including information on origin and sustainability for obligation year 2010/11 were published by DfT on 29 March 2012 and can be found at: www.dft.gov.uk/statistics/releases/verified-rtfo-biofuel-statistics-2010-11/.

Renewable Heat Incentive (RHI)

6.46 On 28 November 2011, the Renewable Heat Incentive opened for applications. 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. For applications made between 28 November and 31 December, 15 have been accredited for RHI tariffs, reflecting a total capacity of 2.3 MW. 13 of the applications were for biomass schemes, and 2 for heat pumps. Policy information on the RHI can be found at:
www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx

Renewable Heat Premium Payment (RHPP)

6.47 The Renewable Heat Premium Payment scheme was launched in August 2011 to householders and social landlords, and provided a one-off payment to support the purchase of renewable heat technologies. Between the scheme launch and the end of 2011 there were 883 installations across all the technologies, with a total capacity of around 4.5 MW. Of these, 326 were air source heat pumps with a total capacity of 1.7 MW; there were also 102 biomass boilers (total capacity 1.3 MW), 147 ground source heat pumps (0.8 MW), and 308 solar thermal panels (0.8 MW).

The RHPP scheme was extended in April 2012 to run until the end of the 2012/13 financial year. Further information on the RHPP scheme can be found at:
www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/premium_pay/premium_pay.aspx

Sources of Renewable Energy

Use of passive solar energy

6.48 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 resource 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

6.49 Active solar heating employs solar collectors to heat water mainly for domestic hot water systems but also for swimming pools and other applications. Updated figures have been obtained by AEA (on behalf of DECC). For 2011, an estimated 131 GWh for domestic hot water generation replaces gas and electricity heating; for swimming pools, an estimated 832 GWh generation replaces gas (45 per cent), oil (45 per cent) or electricity (10 per cent).

Solar photovoltaics (PV)

6.50 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 975.8 MW in 2011. 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). Solar PV is also supported by the Renewables Obligation. The level of support for solar PV within the Renewables Obligation from April 2013 forms part of the banding review.

Onshore wind power

6.51 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.

6.52 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 2011, the UK has more than 4.6 GW of installed capacity, from about 550 (excluding very small-scale and FITs) wind schemes in the UK. Turbine size has steadily increased over the years and the average new turbine size is around 2.5 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 many 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 6.15 to 6.18 regarding load factors) and the wind farm installed capacity.

6.53 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[4]. 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 2011 there were 2,075 FiT wind installations, with a combined capacity of 34.8 MW.

6.54 In terms of operational characteristics, siting considerations and the value and nature of the market, small-scale wind systems vary markedly from large-scale units. They can be off-grid or on-grid, mobile or fixed, free-standing or building-mounted, and can form part of combined installations, most commonly with photovoltaic systems. As a result, they have a greater range of applications compared to large-scale wind turbines and can be sited on board boats, in commercial, public and domestic settings or as single or multiple installations providing power to communities. With the arrival of new financial incentives it is anticipated that the main growth market will be for those applications connecting to the grid, with free-standing turbines continuing to make up the greatest share of installations.

Offshore wind power

6.55 The UK has the largest offshore wind resource in the world, with relatively shallow waters and strong winds extending far into the North Sea. The UK has the world's largest offshore wind installed capacity, with over 1.85 GW installed by June 2012, across 15 full operational wind farms. A further six wind farms were under construction, totalling over 2.35 GW. Two of these currently have partial generation, although construction is not yet fully complete. The Renewable Energy Roadmap – referred to in paragraph 6.39 – 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. This would correspond to around 17 per cent of the UK's net electricity production.

6.56 Offshore winds tend to flow at higher speeds and are more consistent than on land, thus allowing turbines to produce more electricity (because the potential energy produced from the wind is directly proportional to the cube of the wind speed, increased wind speeds of only a few miles per hour can produce a significantly larger amount of electricity). Due to economies of scale, offshore turbines are also larger than their onshore counterparts. Today's operational offshore wind turbines are essentially marine versions of land-based turbines. The current commercially available turbines have a rated capacity of between 3 MW and 5 MW. Design variations currently being pursued include increasing turbine capacities up to 10 MW. As installation costs are similar offshore regardless of the size of turbine, larger machines are more cost effective due to their higher energy yields, direct drive generators (removing the need for transmission gearboxes and offering the prospect of simplicity and high reliability) and floating concepts are also being developed as they are considered by many to be more viable (both economically and environmentally) in deeper waters. In addition, onshore constraints such as planning, noise effects and visual impact and transportation of large components are reduced offshore.

6.57 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. This is considered sufficient to ensure that the 25 GW that has been enabled by the Government's SEA for offshore renewable energy can be achieved. 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

6.58 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

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

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 the available UK resource could be up to 67 TWh per year.

6.59 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 Wavegen Limpet, the Pelamis P2, the Aquamarine Oyster, Marine Current Turbines SeaGen tidal turbine and several others.

Large scale hydro

6.60 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

6.61 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 205 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 283 FITs and 288 non-FITs schemes in operation; around three quarters (76 per cent) of these non-FITs schemes claim ROCs, with 25 schemes having current NFFO contracts. There was a small increase in installed capacity during 2011 of 17 MW.

Geothermal aquifers

6.62 Aquifers containing water at elevated temperatures occur in some parts of the United Kingdom at between 1,500 and 3,000 metres below the surface. This water can be pumped to the surface and used, for example, in community heating schemes. There is currently only one scheme operating in the UK at Southampton, although two schemes in Cornwall received planning permission during 2010.

Heat pumps

6.63 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. This excludes specifically air to air systems and 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. This survey gives total number of installations only. The number of these installations in the commercial and industrial sectors was estimated by using information provided by the Federation of Environmental Trade Associations (FETA), and DECCs Renewable Heat Incentive (RHI) team. The average capacities, load factors and split between heating and hot water production for the domestic, commercial and industrial sectors were determined in discussion with FETA and heat pump manufacturers and installers assumed to be the same as in 2010, except that for ASHP the average load was reduced to reflect use in offices and the average capacity of GSHP was reduced in line with advice from the DECC RHI team.

6.64 Heat pumps use a substantial amount of electricity to operate the compression cycle and, as part of the drafting of the Renewable Energy Directive, a formula was developed to estimate the

proportion of the energy produced by the heat pump that could be counted as renewable for the purpose of monitoring the Directive. There is a cut off in the heat pump performance (Seasonal performance factor or SPF) below which the heat pump is deemed not to contribute to renewable energy generation. It was assumed that the heat pumps installed in 2008 and later in the UK have an SPF of 3, which meets this minimum standard.

Bioenergy and wastes

(a) Landfill gas

6.65 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 AEA in 2008 on behalf of DECC. In 2011 the number of operating landfill gas sites increased by 17, with a corresponding increase in installed capacity of 42 MW.

(b) Sewage sludge digestion

6.66 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 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 87 percent of the schemes (90 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

6.67 Domestic wood use includes the use of logs in open fires, "AGA"-type cooker boilers and other wood burning stoves. Up to 2002 the figure given for each year is an approximate estimate based on a survey carried out in 1989.

6.68 A review of the approach to calculate domestic wood use carried out a few years ago suggested a 50 per cent growth rate over a 2 to 3 year period based on anecdotal information and subsequently supported from other sources (HETAS, the National Association of Chimney Sweeps and discussions with a risk assessor acting on behalf of insurance companies); additional discussions in 2011 to glean further anecdotal information have confirmed that this growth rate still persists. The Forestry Commission is continuing to review wood fuel data availability and gaps to identify further work that could be taken forward within the available resources that includes domestic wood use. Any new data that might arise from this work will be used to refine the UK estimates for this resource.

(d) Non-domestic wood combustion

6.69 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 management, for space heating and hot water in commercial and public sector properties such as hotels, schools, hospitals, nursing homes, and government buildings. This has been almost exclusively in response to incentives such as the Bioenergy Capital Grants Scheme and requirements to reduce carbon emissions in planning and building regulation. In 2011 additional datasets from Wood Energy Biomass Scheme (WEBS) and the Forestry Commission Scotland were added. The combined 2011 results showed an increase of 289 GWh of biomass heating compared to 2010. Future reporting is expected to be facilitated by the introduction of the Renewable Heat Incentive which will require recipients to report key data.

(e) Energy crops and forestry residues

6.70 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

6.71 The use of wood fuels from forestry and woodland management for heating has expanded rapidly in the past five years. This is as a result of various grant schemes instituted by Central and devolved government, to encourage the installation of biomass boilers, and carbon reduction requirements contained in building regulations.

(f) Straw combustion

6.72 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

6.73 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 non-biodegradable portion of waste is counted in renewables statistics although non-biodegradable wastes are included in this chapter as “below the line” items. The paragraphs below describe various categories of waste combustion in greater detail.

6.74 **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.

6.75 **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.

6.76 In 2011, 27 waste-to-energy plants were in operation, burning municipal solid waste (MSW), refuse derived fuel (RDF) and general industrial waste (GIW).

6.77 **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.

6.78 **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.

6.79 **Hospital waste**. Information is based on a RESTATS survey in 2007 and 2010. 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 show an ongoing process of centralisation and consolidation, as the industry responds 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.

6.80 **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)

6.81 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, in accordance with the Quality Protocol (PAS110). 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.

6.82 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 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 75 AD plants generating at the end of 2011. Of these 18 (20MW) qualified as CHP plant, 23 (21.5 MW) were electricity only and 18 were heat only. A further 16 (13.7 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

6.83 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)

6.84 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)

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

6.86 Chapter 7 of this Digest summarises information on the contribution made by CHP to the United Kingdom's energy requirements in 2007 to 2011 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 2007 to 2011. Corresponding data for 1996 to 2006 are available on the DECC energy statistics web site. The information contained in those tables is therefore a subset of the data contained within the tables presented in this chapter. There are occasionally differences in the numbers reported by CHAPSTATS compared with RESTATS that are primarily attributed to whether the electricity is considered to be 'good quality'; further details on 'good quality' CHP are to be found in Chapter 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

6.87 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 energy statistics web site.

6.88 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.

6.89 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 2012, when 2011 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.

Contacts:

Steve Dagnall,
AEA
steve.dagnall@aeat.co.uk
0870 190 6092

Julian Prime
DECC Energy Statistics Team
julian.prime@decc.gsi.gov.uk
0300 068 5054

6.1 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	381	457	304	949	314	1,647
Other sources	-	-	-	-	-	-
Imports	31	3	-	910	-	-
Exports	-131	-35	-	-17	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**281**	**425**	**304**	**1,841**	**314**	**1,647**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**281**	**425**	**304**	**1,841**	**314**	**1,647**
Transformation	**-**	**-**	**294**	**1,592**	**248**	**1,633**
Electricity generation	-	-	294	1,592	248	1,633
Major power producers	-	-	192	978	-	-
Autogenerators	-	-	102	615	248	1,633
Heat generation	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Other	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-
Other	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**281**	**425**	**10**	**249**	**66**	**14**
Industry	**281**	**-**	**-**	**72**	**-**	**14**
Unclassified	281	-	-	72	-	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**	**177**	**66**	**-**
Domestic	-	425	-	-	-	-
Public administration	-	-	-	-	66	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	10	177	-	-
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.

6.1 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
1,376	132	33	489	1,333	182	7,595	Production
-	-	-	-	-	-	-	Other sources
-	-	-	-	-	947	1,890	Imports
-	-	-	-	-	-1	-184	Exports
-	-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	-	Transfers
1,376	**132**	**33**	**489**	**1,333**	**1,128**	**9,300**	**Total supply**
-	-	-	-	-	-	-	**Statistical difference** *(2)*
1,376	**132**	**33**	**489**	**1,333**	**1,128**	**9,300**	**Total demand**
1,139	**22**	**-**	**489**	**1,333**	**-**	**6,749**	**Transformation**
1,139	22	-	489	1,333	-	6,749	Electricity generation
94	-	-	395	1,090	-	2,749	Major power producers
1,045	22	-	94	243	-	4,001	Autogenerators
-	-	-	-	-	-	-	Heat generation
-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	Other
-	-	-	-	-	-	-	**Energy industry use**
-	-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	-	Oil and gas extraction
-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	Other
-	-	-	-	-	-	-	**Losses**
237	**110**	**33**	**-**	**-**	**1,128**	**2,551**	**Final consumption**
169	**-**	**1**	**-**	**-**	**-**	**535**	**Industry**
169	-	1	-	-	-	535	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
68	**110**	**32**	**-**	**-**	**-**	**889**	**Other**
13	109	20	-	-	-	567	Domestic
46	0	-	-	-	-	112	Public administration
9	0	12	-	-	-	22	Commercial
-	-	-	-	-	-	187	Agriculture
-	-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	-	**Non energy use**

6.2 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	253r	429r	304	585r	287r	1,658r
Other sources	-	-	-	-	-	-
Imports	48r	1r	-	883r	-	-
Exports	-45r	-38r	-	-24	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**256**	**392**	**304**	**1,444r**	**287r**	**1,658r**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**256**	**392**	**304**	**1,444r**	**287r**	**1,658r**
Transformation	**-**	**-**	**259**	**1,177r**	**229r**	**1,644r**
Electricity generation	-	-	259	1,177r	229r	1,644r
Major power producers	-	-	190r	734	-	-
Autogenerators	-	-	70	444r	229r	1,644r
Heat generation	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Other	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-
Other	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**256**	**392**	**45**	**266r**	**58r**	**14**
Industry	**256**	**-**	**40**	**88**	**-**	**14**
Unclassified	256	-	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	**-**	**392**	**5**	179r	**58r**	**-**
Domestic	-	392	-	-	-	-
Public administration	-	-	-	-	58r	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	5	179r	-	-
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.

6.2 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	91	21r	313r	876	302r	6,324r	Production
-	-	-	-	-	-	-	Other sources
-	-	-	-	-	994r	1,925r	Imports
-	-	-	-	-	-81	-189r	Exports
-	-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	-	Transfers
1,205	**91**	**21r**	**313r**	**876**	**1,214**	**8,060r**	**Total supply**
-	-	-	-	-	-	-	**Statistical difference** *(2)*
1,205	**91**	**21r**	**313r**	**876**	**1,214**	**8,060r**	**Total demand**
1,047	**3**	**-**	**313r**	**876**	**-**	**5,549r**	**Transformation**
1,047	3	-	313r	876	-	5,549r	Electricity generation
90	-	-	237r	684	-	1,934r	Major power producers
957	3	-	76r	192	-	3,615r	Autogenerators
-	-	-	-	-	-	-	Heat generation
-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	Other
-	-	-	-	-	-	-	**Energy industry use**
-	-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	-	Oil and gas extraction
-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	Other
-	-	-	-	-	-	-	**Losses**
157	**88**	**21r**	**-**	**-**	**1,214**	**2,511r**	**Final consumption**
84	**-**	**0r**	**-**	**-**	**-**	**482r**	**Industry**
84	-	0r	-	-	-	482r	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
-	-	-	-	-	**1,214**	1,214	**Transport**
-	-	-	-	-	-	-	Air
-	-	-	-	-	-	-	Rail
-	-	-	-	-	1,214	1,214	Road
-	-	-	-	-	-	-	National navigation
-	-	-	-	-	-	-	Pipelines
73	**88**	**21r**	**-**	**-**	**-**	814r	**Other**
15	87	12r	-	-	-	506r	Domestic
47	0	-	-	-	-	106r	Public administration
11	0	9r	-	-	-	20r	Commercial
-	-	-	-	-	-	183r	Agriculture
-	-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	-	**Non energy use**

6.3 Commodity balances 2009

Renewables and waste

Thousand tonnes of oil equivalent

	Wood waste	Wood	Poultry litter, meat and bone, and farm waste	Straw, SRC, and other plant-based biomass (3)	Sewage gas	Landfill gas
Supply						
Production	177r	387r	272	706r	247	1,638
Other sources	-	-	-	-	-	-
Imports	72r	4r	-	423	-	-
Exports	-25r	-16r	-	-5	-	-
Marine bunkers	-	-	-	-	-	-
Stock change *(1)*	-	-	-	-	-	-
Transfers	-	-	-	-	-	-
Total supply	**223**	**375**	**272**	**1,124r**	**247**	**1,638**
Statistical difference *(2)*	-	-	-	-	-	-
Total demand	**223**	**375**	**272**	**1,124r**	**247**	**1,638**
Transformation	**-**	**-**	**232**	**900r**	**196**	**1,624**
Electricity generation	-	-	232	900r	196	1,624
Major power producers	-	-	165	491	-	-
Autogenerators	-	-	67	409r	196	1,624
Heat generation	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Other	-	-	-	-	-	-
Energy industry use	**-**	**-**	**-**	**-**	**-**	**-**
Electricity generation	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
Coal extraction	-	-	-	-	-	-
Coke manufacture	-	-	-	-	-	-
Blast furnaces	-	-	-	-	-	-
Patent fuel manufacture	-	-	-	-	-	-
Pumped storage	-	-	-	-	-	-
Other	-	-	-	-	-	-
Losses	**-**	**-**	**-**	**-**	**-**	**-**
Final consumption	**223**	**375**	**40**	**224r**	**51**	**14**
Industry	**223**	**-**	**38**	**69**	**-**	**14**
Unclassified	223	-	38	69	-	14
Iron and steel	-	-	-	-	-	-
Non-ferrous metals	-	-	-	-	-	-
Mineral products	-	-	-	-	-	-
Chemicals	-	-	-	-	-	-
Mechanical engineering, etc	-	-	-	-	-	-
Electrical engineering, etc	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-
Food, beverages, etc	-	-	-	-	-	-
Textiles, leather, etc	-	-	-	-	-	-
Paper, printing, etc	-	-	-	-	-	-
Other industries	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**-**
Air	-	-	-	-	-	-
Rail	-	-	-	-	-	-
Road	-	-	-	-	-	-
National navigation	-	-	-	-	-	-
Pipelines	-	-	-	-	-	-
Other	**-**	**375**	**2**	**155r**	**51**	**-**
Domestic	-	375	-	-	-	-
Public administration	-	-	-	-	51	-
Commercial	-	-	-	-	-	-
Agriculture	-	-	2	155r	-	-
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.

6.3 Commodity balances 2009 (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
1,165	72	11r	451r	800	226	6,151r	Production
-	-	-	-	-	-	-	Other sources
-	-	-	-	-	812	1,311r	Imports
-	-	-	-	-	-	-46r	Exports
-	-	-	-	-	-	-	Marine bunkers
-	-	-	-	-	-	-	Stock change *(1)*
-	-	-	-	-	-	-	Transfers
1,165	**72**	**11r**	**451r**	**800**	**1,038**	**7,416r**	**Total supply**
-	-	-	-	-	-	-	**Statistical difference** *(2)*
1,165	**72**	**11r**	**451r**	**800**	**1,038**	**7,416r**	**Total demand**
993	**2**	**-**	**451r**	**800**	**-**	**5,198r**	**Transformation**
993	2	-	451r	800	-	5,198r	Electricity generation
87	-	-	369	594	-	1,706	Major power producers
906	2	-	81r	206	-	3,491r	Autogenerators
-	-	-	-	-	-	-	Heat generation
-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	Other
-	-	-	-	-	-	-	**Energy industry use**
-	-	-	-	-	-	-	Electricity generation
-	-	-	-	-	-	-	Oil and gas extraction
-	-	-	-	-	-	-	Petroleum refineries
-	-	-	-	-	-	-	Coal extraction
-	-	-	-	-	-	-	Coke manufacture
-	-	-	-	-	-	-	Blast furnaces
-	-	-	-	-	-	-	Patent fuel manufacture
-	-	-	-	-	-	-	Pumped storage
-	-	-	-	-	-	-	Other
-	-	-	-	-	-	-	**Losses**
172	**70**	**11r**	**-**	**-**	**1,038**	**2,219r**	**Final consumption**
102	**-**	**0r**	**-**	**-**	**-**	**446r**	**Industry**
102	-	0r	-	-	-	446r	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
-	-	-	-	-	**1,038**	**1,038**	**Transport**
-	-	-	-	-	-	-	Air
-	-	-	-	-	-	-	Rail
-	-	-	-	-	1,038	1,038	Road
-	-	-	-	-	-	-	National navigation
-	-	-	-	-	-	-	Pipelines
70	**70**	**11r**	**-**	**-**	**-**	**734r**	**Other**
16	69	6r	-	-	-	466r	Domestic
45	0	-	-	-	-	97	Public administration
9	0	5r	-	-	-	14r	Commercial
-	-	-	-	-	-	157r	Agriculture
-	-	-	-	-	-	-	Miscellaneous
-	**-**	**-**	**-**	**-**	**-**	-	**Non energy use**

6.4 Capacity of, and electricity generated from, renewable sources

	2007	2008	2009	2010	2011
Installed Capacity (MW) *(1)*					
Wind:					
Onshore	2,083	2,820	3,483	4,037	4,650
Offshore	394	586	941	1,341	1,838
Shoreline wave / tidal	1	1	2	3	3
Solar photovoltaics	18	23	27	77	976
Hydro:					
Small scale	163	170	179r	188r	205
Large scale *(2)*	1,359	1,456	1,459	1,453	1,471
Bioenergy:					
Landfill gas	901	908	985	1,025	1,067
Sewage sludge digestion	150	148	157	186r	198
Municipal solid waste combustion *(3)*	352	401r	418r	461r	577
Animal Biomass (non-AD)*(4)*	111	111r	111r	111r	111
Anaerobic digestion	4	4	9	28	55
Plant Biomass *(5)*	211	219r	300r	330r	1,159
Total bioenergy and wastes	1,728	1,791r	1,979r	2,140r	3,167
Total	5,745	6,846r	8,069r	9,238r	12,310
Co-firing (6)	201	180r	208r	266r	338
Generation (GWh)					
Wind:					
Onshore *(7)*	4,491	5,792	7,564	7,137	10,372
Offshore	783	1,305	1,740	3,044r	5,126
Shoreline wave / tidal *(8)*	0	0	1	2	1
Solar photovoltaics	14	17	20	33	252
Hydro:					
Small scale *(7)*	523r	555r	577	497r	697
Large scale *(2)*	4,554	4,600	4,664	3,147r	4,989
Bioenergy:					
Landfill gas	4,677	4,757	4,952	5,014r	4,979
Sewage sludge digestion	494r	532	598	698r	755
Biodegradable municipal solid waste combustion *(9)*	1,189r	1,239r	1,509	1,597r	1,739
Co-firing with fossil fuels	1,757r	1,575r	1,625	2,332r	2,964
Animal Biomass *(4)*	585r	620r	637	627r	614
Anaerobic digestion	15	13	30	92	239
Plant Biomass *(5)*	607r	912r	1,343	1,624r	1,683
Total bioenergy	9,325r	9,649r	10,694	11,986r	12,973
Total generation	19,690r	21,918r	25,259	25,845r	34,410
Non-biodegradable wastes *(10)*	714r	744r	873	924r	1,005
Total generation from sources eligible for the Renewable Obligation *(11)*	15,967	18,005	21,102	22,465	29,804

(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 6.40 to 6.42 for definition and coverage.

6.5 Load factors for renewable electricity generation

Per cent

	2007	2008	2009	2010	2011
Load factors - based on average beginning and end of year capacity (1)					
Wind	27.2	27.5	27.1	23.7	29.8
Onshore wind	27.5	27.0	27.4	21.7	27.3
Offshore wind	25.6	30.4	26.0	30.4	36.8
Solar photovoltaics	9.9	9.6	9.3	7.3	5.5
Hydro	38.2	37.4	36.7	25.4	39.1
Hydro (small scale)	37.8	38.1	37.8	31.0	40.6
Hydro (large scale)	38.2	37.3	36.5	24.7	39.0
Bioenergy (excludes cofiring and non-biodegradable wastes)	52.7	52.4	54.9	53.5	43.1
Landfill gas	60.8	60.0	59.7	57.0	54.4
Sewage sludge digestion	38.3	40.8	44.8	46.5	45.0
Municipal solid waste combustion (3)	38.6	37.6	42.1	41.5	38.2
Animal Biomass (4)	68.3	64.1	65.8	64.8	63.4
Anaerobic Digestion	44.0	37.6	53.4	57.2	65.6
Plant Biomass (5)	43.5	48.4	59.1	58.9	25.8
All renewable technologies (excluding cofiring and non-biodegradable wastes)	38.0	36.9	36.2	31.0	33.3
Load factors - for schemes operating on an unchanged configuration basis (2)					
Wind	27.5	30.4	27.4	23.3	29.3
Onshore wind	27.3	29.4	26.5	21.6	27.2
Offshore wind	28.3	34.9	32.1	29.5	35.0
Hydro	..	..	38.2	26.4	41.7
Hydro (small scale)	..	..	37.2	29.4	43.2
Hydro (large scale)	..	..	38.4	26.1	41.5
Bioenergy (excludes cofiring and non-biodegradable wastes)	..	..	60.4	59.8	61.0
Landfill gas	..	..	59.5	57.7	59.5
Sewage sludge digestion	..	..	50.8	51.9	53.5
Municipal solid waste combustion (3)	..	..	66.5	68.9	63.0
Animal Biomass (4)	..	..	56.9	59.6	68.9
Anaerobic Digestion	..	..	38.6	51.5	56.1
Plant Biomass (5)	..	..	61.7	65.8	60.9
All renewable technologies (excluding cofiring and non-biodegradable wastes)	..	..	37.4	31.9	37.3

(1) See paragraph 6.15 for details of the calculation.

(2) See paragraph 6.18 for details of the calculation. Unchanged configuration calculations have previosuly only been available for wind schemes.

(3) Calculation is based on non-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

	2007	2008	2009	2010	2011
Used to generate electricity *(3)*					
Wind:					
Onshore	386.2	498.0	650.4	613.7	891.8
Offshore	67.3	112.2	149.6	261.7	440.7
Shoreline wave / tidal (4)	0.0	0.0	0.1	0.2	0.1
Solar photovoltaics	1.2	1.5	1.7	2.9	21.6
Hydro:					
Small scale	45.0r	47.7r	49.6r	42.7r	60.0
Large scale *(5)*	391.6	395.5	401.0	270.6r	429.0
Bioenergy:					
Landfill gas	1,533.9	1,560.3	1,624.2	1,644.5r	1,633.1
Sewage sludge digestion	161.9r	174.4r	196.1r	228.8r	247.6
Biodegradable municipal solid waste combustion	486.8	506.8	624.5	659.0	717.3
Co-firing with fossil fuels	576.4r	516.7r	533.0r	765.0r	972.0
Animal Biomass *(6)*	217.6r	249.1r	222.2r	229.0r	215.3
Anaerobic digestion	4.9	4.2	9.7	30.3	78.5
Plant Biomass *(7)*	137.8	189.5	367.3	412.3	620.3
Total bioenergy	3,119.2r	3,200.9r	3,576.9r	3,968.8r	4,484.1
Total	**4,010.4r**	**4,255.9r**	**4,829.3r**	**5,160.5r**	**6,327.4**
Non-biodegradable wastes *(8)*	298.3	310.3	368.6	388.4	422.0
Used to generate heat					
Active solar heating	44.9	55.7	69.5	87.0	109.3
Bioenergy:					
Landfill gas	13.6	13.6	13.6	13.6	13.6
Sewage sludge digestion	49.5r	49.8	51.0	57.8r	66.1
Wood combustion - domestic	332.0	358.6	375.2	391.8	425.0
Wood combustion - industrial	101.2	220.3	223.4	255.7	280.6
Animal Biomass *(9)*	45.8r	40.4r	38.3r	40.3r	-
Anaerobic digestion	2.0	2.0	2.0	4.8	9.8
Plant Biomass *(10)*	112.9r	190.3r	223.8r	266.4r	249.1
Biodegradable municipal solid waste combustion *(6*	33.7	31.5	31.3	25.6	32.7
Total bioenergy	690.7r	906.4r	958.5r	1,055.9r	1,076.8
Geothermal aquifers	0.8	0.8	0.8	0.8	0.8
Heat Pumps	-	2.7r	10.9r	21.2r	32.5
Total	**736.4r**	**965.6r**	**1,039.7r**	**1,165.0r**	**1,219.5**
Non-biodegradable wastes *(8)*	137.3	153.7	140.4	131.5	204.0
Renewable sources used as transport fuels					
as Bioethanol	85.8	116.3	180.4	355.4	367.5
as Biodiesel	275.9	728.2	858.1	859.0	760.0
Total	**361.7**	**844.5**	**1,038.5**	**1,214.4**	**1,127.5**
Total use of renewable sources and wastes					
Solar heating and photovoltaics	46.1	57.2	71.2	89.8	131.0
Onshore wind	386.2	498.0	650.4	613.7	891.8
Offshore wind	67.3	112.2	149.6	261.7	440.7
Shoreline wave / tidal	0.0	0.0	0.1	0.2	0.1
Hydro	436.6r	443.2r	450.6r	313.3r	489.0
Bioenergy	3,809.9r	4,107.3r	4,535.4r	5,024.8r	5,561.0
Geothermal aquifers	0.8	0.8	0.8	0.8	0.8
Heat Pumps	-	2.7r	10.9r	21.2r	32.5
Transport biofuels	361.7	844.5	1,038.5	1,214.4	1,127.5
Total	**5,108.5r**	**6,066.0r**	**6,907.5r**	**7,539.9r**	**8,674.4**
Non-biodegradable wastes *(8)*	435.6	464.1	509.0	520.0	626.0
All renewables and wastes *(11)*	**5,544.2r**	**6,530.1r**	**7,416.4r**	**8,059.9r**	**9,300.4**

(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

	2007	2008	2009	2010	2011
Electricity generation component:					
Normalised hydro generation *(1) (2)*	393	421r	420r	410r	431
Normalised wind generation *(3)*	444	602	803	966	1,213
Electricity generation from renewables other than wind, hydro, and compliant biofuels	803r	831r	921r	1,034r	1,137
Electricity generation from compliant biofuels	0	0	0	0	-
Total renewable generation from all compliant sources	1,640r	1,854r	2,144r	2,410r	2,782
Total Gross Electricity Consumption *(2)*	34,238r	34,043r	32,326r	32,785r	31,911
Percentage of electricity from renewable sources	4.8%	5.4%	6.6%	7.4%	8.7%
Heat component:					
Renewable energy for heating and cooling	696r	904r	962	1,070r	1,162
Total Gross energy consumption for heating and cooling	61,397r	62,422r	55,999r	61,628r	52,110
Percentage of heating and cooling energy from renewable sources	1.1%	1.4%	1.7%	1.7%	2.2%
Transport component (excluding air transport):					
Road transport renewable electricity	-	-	-	-	-
Non-road transport renewable electricity	47.7r	50r	54r	59r	59
Biofuels	349r	806	988	1,147	1,063
Total electricity consumption in transport	341r	339r	347r	350r	351
Total petrol and diesel consumption in transport	41,973r	40,347r	38,901r	38,285r	37,835
Percentage of transport energy from renewable sources	0.9%	2.1%	2.6%	3.0%	2.9%
Overall directive target:					
Renewables used for:					
Electricity generation	1,640r	1,854r	2,144r	2,410r	2,782
Heating and Cooling	696r	904r	962	1,070r	1,162
Transport (Biofuels only)	349r	806	988r	1,147	1,063
Total Final Consumption of Renewable Energy ["Row A"]	2,684r	3,564r	4,095r	4,628r	5,007
Final Electricity Consumption *(4)*	29,377r	29,391r	27,665r	28,270r	27,344
Transport Final Energy Consumption (including air transport) *(5)*	56,198r	54,731r	52,683r	51,805r	51,831
Heating and Cooling Final Energy Consumption	61,397r	62,422r	55,999r	61,628r	52,110
Total Final Energy Consumption *(6)*	146,971r	146,545r	136,347r	141,704r	131,286
plus Distribution losses for electricity	2,393r	2,424r	2,425r	2,292r	2,396
plus Distribution losses for heat	0	0	0	0	0
plus Consumption of electricity in the electricity and heat generation sectors	1,521	1,405r	1,425r	1,385r	1,415
plus Consumption of heat in the electricity and heat generation sectors	-	-	-	-	-
Gross Final Energy Consumption (GFEC)	150,886r	150,375r	140,197r	145,381r	135,096
of which Air transport	13,211	12,832	12,114	11,673	12,162
Air transport as a proportion of GFEC	8.76%	8.53%	8.64%	8.03%	9.00%
Air transport cap specificed in Directive	6.18%	6.18%	6.18%	6.18%	6.18%
Capped air transport	9,325r	9,293.2r	8,664r	8,985r	8,349
Capped Gross Final Energy Consumption (CGFEC) ["Row B"] *(7)*	147,000r	146,836.0r	136,747r	142,692r	131,283
Headline Directive percentage : Renewable Energy Consumption as a percentage of Capped Gross Final Energy Consumption ["Row A" divided by "Row B"]	1.8%	2.4%	3.0%	3.2%	3.8%

(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) Final Electricity Consumption is Gross Electricity Consumption minus generators' own use of electricity and losses.
(5) Includes consumption of petrol and diesel, biofuels, other oil products, and coal.
(6) Total final consumption less non-energy use, as shown in Annex I, Table I.1, available on the DECC website.
(7) 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

- CHP capacity increased by 1.0 per cent between 2010 and 2011 from 6,053 MWe to 6,111 MWe. (Table 7.1)
- The amount of electricity produced from good quality CHP sites also increased, by 1.6 per cent, to just over 27 TWh in 2011. This corresponds to about 7.4 per cent of all electricity produced in the UK. (Table 7.4)
- Seventy per cent of the fuel used in CHP schemes was natural gas. The use of renewable fuel increased between 2010 and 2011 and now makes up just over 6 per cent of fuel used. (Table 7.2)
- Heat generation increased by 0.7 per cent between 2010 and 2011. The refineries sector had the largest share of heat generation (at 35 per cent), followed by the chemicals sector (31 per cent) and then the paper sector (10 per cent). (Table 7.8)

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 significant transmission and distribution losses. CHP can also provide important network services such as black start (i.e. the CHP can be used to re-start a plant without having to rely on the grid), improvements to power quality, and some have the ability to operate in island mode if the grid goes down. There are four principal types of CHP system: steam turbine, gas turbine, combined cycle systems and reciprocating engines. Each of these is defined in paragraph 7.39 later in this chapter.

[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.*

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

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 generated from it whether for own use or export. This is known as the spark spread (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 spread need to be taken into account.

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[3], along with supplementary boilers and generating plant, subject to appropriate metering being installed to support the CHP scheme boundaries proposed, and subject to appropriate metering and threshold criteria (see CHPQA Guidance Note 11 available at www.chpqa.com). This point is relevant when considering the figures in Table 7D, where the power efficiencies, heat efficiencies and heat to power ratios stated in that table for 2011 are those of the scheme and 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. 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.
- 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.
- Between 2007 and 2010 there was been a noticeable fall in the load factor as measured by both methods. Over the same period there has been a loss of heat load in the chemicals sector and the relevant schemes have responded by either reducing power outputs or continuing to generate power in spite of the fall in heat demand. In the latter case, the power output considered Good Quality is reduced and for both responses there is a consequential downward pressure on load factor. In 2010 an appreciable additional increment of generating capacity was commissioned in the oil refineries sector. This was under-utilized, due to energy market conditions, contributing to a fall in load factor that year. However, in 2011, the load factor remained approximately the same as in 2010 with the sharp decrease in the load factor in the chemicals sector being offset by an increase in the load factor in the paper, publishing and printing sector.

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

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

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

	Unit	2007	2008	2009	2010	2011
Number of schemes		1,407	1,427	1,485	1,577	1,880
Net No. of schemes added during year (2)		45	20	58	92	303
Electrical capacity (CHP_{QPC})	MWe	5,398	5,410	5,573	6,053	6,111
Net capacity added during year		-33	12	162	481	57
Capacity added in percentage terms	Per cent	-0.6	0.2	3.0	8.6	0.9
Heat capacity	MWth	11,065	10,880	10,738	10,496	10,405
Heat to power ratio *(3)*		1.84	1.89	1.82	1.80	1.79
Fuel input	GWh	118,601	118,689	111,298	112,570	112,858
Electricity generation (CHP_{QPO})	GWh	27,833	27,529	26,428	26,772	27,191
Heat generation (CHP_{QHO})	GWh	51,298	51,913	48,096	48,273	48,627
Overall efficiency *(4)*	Per cent	66.7	66.9	67.0	66.7	67.2
Load factor (CHPQA) *(5)*	Per cent	58.9	58.1	54.1	50.5	50.8
Load factor (Actual) *(6)*	Per cent	65.3	64.8	56.8	54.6	54.6

(1) All data in this table for 2007 to 2010 have been revised since last year's Digest.
(2) Net number of schemes added = New schemes – Decommissioned existing schemes
(3) Heat to power ratios are calculated from the qualifying heat output (QHO) and the qualifying power output (QPO).
(4) Overall efficiencies are calculated using gross calorific values; overall net efficiencies are some 6 percentage points higher.
(5) 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
(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 1996. Installed capacity at the end of 2011 stood at 6,111 MWe, an increase of 57MWe (1%) compared to 2010. There was a net increase of 303 schemes between 2010 and 2011. This is the result of 194 small scale schemes (ranging from 30 to 600 kWe which were reported by suppliers but are not registered under CHPQA) and 140 new CHP schemes (registered with CHPQA) coming into operation, while 31 CHP schemes which were operating in 2010 subsequently closed and did not operate in 2011.

7.7 A number of operators have chosen to mothball their CHP schemes rather than continue to operate. As these schemes are still able to operate they have been included in the capacity figures. At the end of 2011, there were 115 mothballed schemes with a Good Quality capacity of 100 MWe.

7.8 Table 7A gives a summary of the overall CHP market. The electricity generated by CHP schemes in 2011 was 27,191 GWh, an increase of 1.6 per cent in comparison to 2010. This generated electricity represents 7.4 per cent of the total electricity generated in the UK. Most of this electrical output increase was in the refineries, chemicals, sewage treatment and transport, commerce and administration sectors. CHP schemes supplied a total of 48,627 GWh of heat in 2011, an increase of 0.7 per cent in comparison to 2010.

7.9 In terms of electrical capacity, schemes larger than 10 MWe represent about 82 per cent of the total electrical capacity of CHP schemes as shown in Table 7B. However, schemes less than 1MWe constitute the majority (83 per cent) in terms of 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.

Chart 7.1: Installed CHP capacity by year

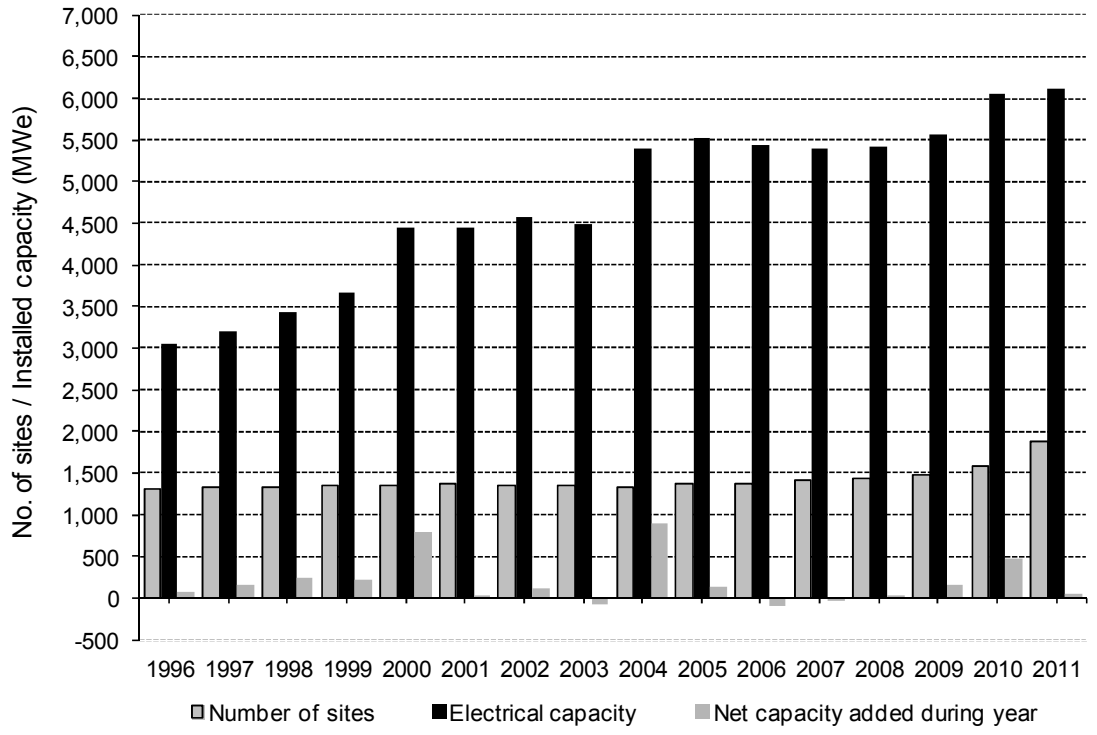


Table 7B: CHP schemes by capacity size ranges in 2011

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	535	28.5	33	0.5
100 kWe - 999 kWe	1,024	54.5	250	4.1
1 MWe - 9.9 MWe	252	13.4	828	13.6
Greater than 10 MWe	69	3.7	5,000	81.8
Total	**1,880**	**100%**	**6,111**	**100%**

Fuel used by types of CHP installation

7.10 Seventy-six per cent of electrical capacity is now gas turbine based[4], with the majority (66 out of the 76 percentage points) in combined cycle (CCGT) mode. After combined cycle, reciprocating engines represent the second largest technology in terms of installed electrical capacity, followed by open cycle gas turbines (OCGT). Table 7.7 provides data on heat capacity for each type of CHP installation. Over the years there has been a clear downward trend in the capacity of steam turbines, before flattening in out in recent years. The heat capacity for OCGT and CCGT reduced slightly between 2010 and 2011.

7.11 Table 7.2 shows the fuel used to generate electricity and heat in CHP schemes (see paragraphs 7.40 to 7.42 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 7.39). Total fuel use is summarised in Chart 7.2. In 2011, 70 per cent of the total fuel use was natural gas, a small increase on the proportion in 2010. In comparison to 2010, there was also an increase in renewables' proportion of total fuel used, continuing a trend that has been present for the last 8 years. CHP schemes accounted for 9 per cent of UK gas demand in 2011 (see Table 4.3). Over the last 10 years, the refineries sector has seen a decrease in the use of heavy fuel

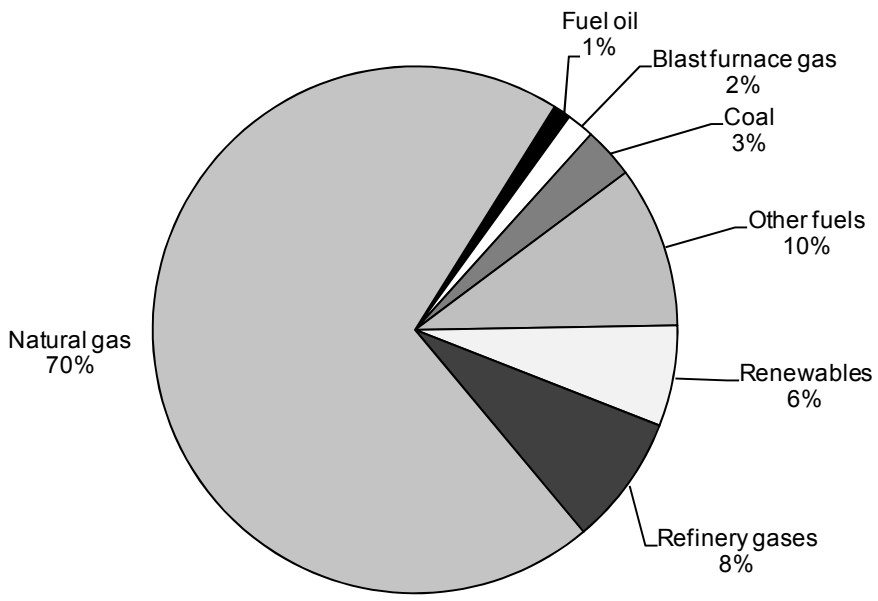
[4] *See Table 7.5 Gas turbine and Combined cycle.*

oil and an increase in the use of natural gas. Since 2006 there has also been an increase in the use of refinery gas. This may be a reflection of the rise in the market value of heavy fuel oil over this time period. A refinery selling, rather than burning, the heavy fuel oil it produces and substituting this with lower value refinery gas and natural gas, would likely increase its revenue. The total use (i.e. across all sectors) of refinery gas in 2011 increased by 6 per cent in comparison to 2010.

7.12 The proportion of all fuels that are renewable in 2011 has increased slightly on that in 2010 (from 5.8 per cent in 2010 to 6.2 per cent in 2011), mainly due to an increase in the use of sewage gas and wood fuels.

7.13 Non-conventional fuels (liquids, solids or gases which are by-products or waste products from industrial processes) accounted for 20 per cent of all fuel used in CHP in 2011, similar to the proportion seen in 2010. Some of these are fuels that are not commonly used by the mainstream electricity generating industry, and some would otherwise be flared or disposed of by some means. These fuels, with the exception of some waste gases, will generally be utilised in steam turbines being fed by boilers. In almost all cases, the technical nature of the combustion process and the lower fuel quality (lower calorific value of the fuel, high moisture content of the fuel, the need to maintain certain combustion conditions to ensure complete disposal, etc.) will generally result in a lower efficiency.

Chart 7.2: Types of fuel used by CHP schemes in 2011



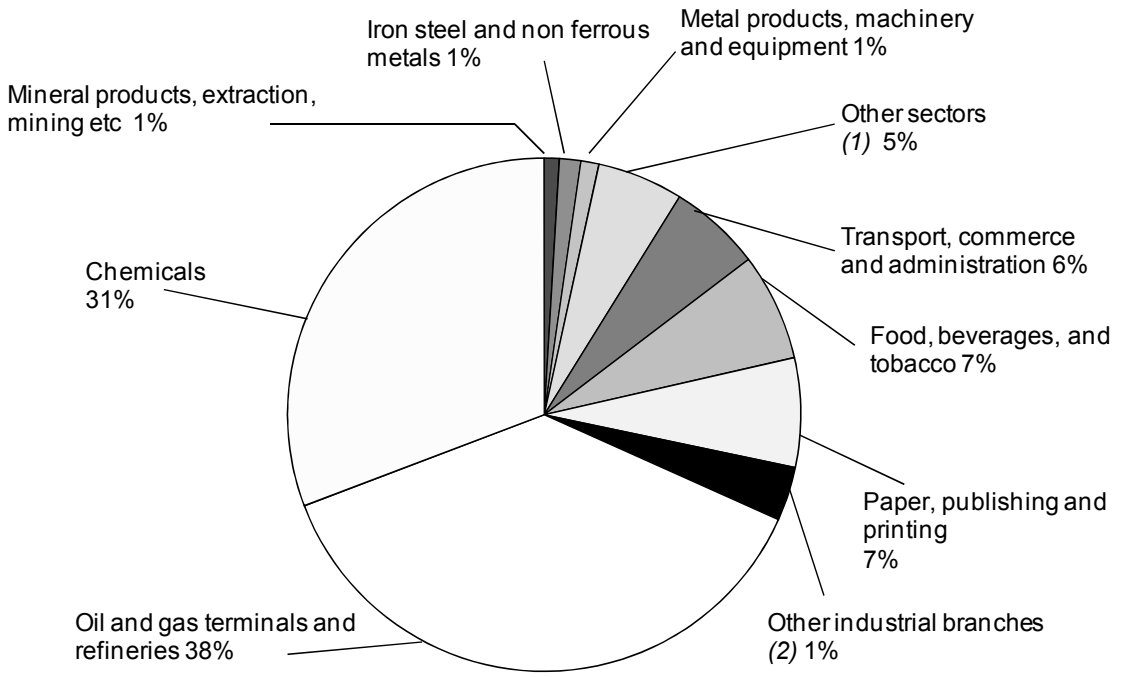
CHP capacity, output and fuel use by sector

7.14 In this chapter, a CHP scheme is allocated to a sector according to where the heat is sent 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 7.33 and Table 7J of DUKES 2008.

7.15 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:

- 377 schemes (89 per cent of electrical capacity) are in the industrial sector and 1,503 schemes (11 per cent of capacity) are in the agricultural, commercial, public administration, residential and transport sectors.
- As shown in Chart 7.3, two industrial sectors account for over two thirds of the CHP electrical capacity – oil refineries (38 per cent) and chemicals (31 per cent). The capacity attributed to oil refineries remained broadly unchanged, while that attributed to the chemicals sector increased by about 3 per cent due to the commissioning of two additional schemes.

Chart 7.3: CHP electrical capacity by sector in 2011



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

7.16 Table 7C gives a summary of the 1,160 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 (35 per cent) is in the health sector, mainly hospitals. The leisure sector and hotels together account for nearly 56 per cent of the total number of schemes but only about 22 per cent of the electrical capacity, with an average scheme capacity of 134 kWe. Table 7.9 gives details of the quantities of fuels used in each sector.

Table 7C: Number and capacity of CHP schemes installed in buildings by sector in 2011

	Number of schemes	Electrical capacity (MWe)	Heat capacity (MWth)
Leisure	398	51.1	51.0
Hotels	248	35.6	38.2
Health	193	136.9	147.2
Residential Group Heating	39	27.4	58.9
Universities	48	64.1	65.2
Offices	18	14.8	11.4
Education	25	11.2	17.7
Government Estate	17	14.0	17.5
Retail	172	38.2	3.4
Other *(1)*	2	0.5	0.7
Total	**1,160**	**393.9**	**411.2**

(1) All schemes under Other are at airports

CHP performance by main prime mover

7.17 Table 7D gives a summary of the performance of schemes in 2011 by main prime mover type. In 2011 the prime mover type with the highest average operating hours was gas turbines followed by back pressure steam turbines. Combined cycle schemes have historically had the highest average operating hours. However, the data for the past two years is somewhat distorted due to a large addition of combined cycle capacity in 2010 which was only partially utilised. As the operating hours are calculated by dividing power generation by capacity, this gives a lower value of operating hours than would be the case during a normal year. The average operating hours for all schemes is 4,450, which is 2 per cent higher than the figure for 2010 (4,355 hours).

7.18 The average electrical efficiency is 24 per cent and the average heat efficiency 43 per cent, giving an overall average of 67 per cent, which is the same as in 2010 and 2009. Note that all are measured on a gross calorific value (GCV) basis.

7.19 The average operating hours for reciprocating engines is the lowest of all the prime mover types. This is reflects the fact that many reciprocating engines are deployed in buildings to satisfy space heating and hot water loads, which are seasonal.

Table 7D: A summary of scheme performance in 2011

	Average operating hours per annum (Full load equivalent)	Average electrical efficiency (% GCV)	Average heat efficiency (% GCV)	Average overall efficiency (% GCV)	Average heat to power ratio
Main prime mover in CHP plant					
Back pressure steam turbine	4,613	12	59	71	5.1
Pass out condensing steam turbine	3,929	16	43	58	2.7
Gas turbine	5,052	21	52	73	2.4
Combined cycle	4,602	27	40	67	1.5
Reciprocating engine	3,533	27	41	68	1.5
All schemes	**4,450**	**24**	**43**	**67**	**1.8**

CHP schemes which export and schemes with mechanical power output

7.20 Table 7E shows the electrical exports from CHP schemes between 2009 and 2011. 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 7.11). Exports accounted for around 37 per cent of power generation from CHP in 2011 (compared to 31 per cent in 2010), but this may still be an underestimate as the reporting of exports remains voluntary under CHPQA.

Table 7E: Electrical exports from CHP

GWh

	2009	2010	2011
To part of same qualifying group *(1)*	565	350	431
To a firm NOT part of same qualifying group	2,069	1,138	1,227
To an electricity supplier	6,159	8,216	8,491
Total	**8,794**	**9,703**	**10,148**

(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.

7.21 In 2011, 38 large schemes also exported heat, some larger schemes to more than one customer. As Table 7F shows, together they supplied 8,660 GWh of heat in 2011.

Table 7F: Heat exports from CHP

GWh

	2009	2010	2011
To part of same qualifying group *(1)*	3,618	1,919	2,140
To a firm NOT part of same qualifying group	5,787	6,498	6,520
Total	**9,405**	**8,416**	**8,660**

(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.

7.22 There are an estimated 12 schemes with mechanical power output. For those schemes, mechanical power accounts for around 6 per cent of their total power capacity (Table 7G). 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 7G: CHP schemes with mechanical power output in 2011

	Unit	
Number of schemes		12
Total Power Capacity of these schemes (CHP_{TPC})	MWe	4,183
Mechanical power capacity of these schemes	MWe	231

Emissions savings

7.23 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 (www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx). 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 2011, as compared to the fossil fuel basket were, 13.97 $MtCO_2$, which equates to 2.29 Mt CO_2 per 1,000 MWe installed capacity.

7.24 In 2011, against the total basket, CHP saved 9.10 Mt CO_2 (1.49 Mt CO2 per 1,000 MWe installed capacity). Corresponding figures for 2009 and 2010 are shown in Table 7H. The 2009 and 2010 CO_2 savings are revised based on the new CO_2 intensities and the new capacity, power and heat output and fuel input (by type of fuel) figures reported for these years in Tables 7.1, 7.4, 7.6 and 7.9. In comparison to CO_2 savings in 2008 (10.86 $MtCO_2$), over the past three years (2009-2011), absolute CO_2 savings ($MtCO_2$) against the total basket remained approximately the same.

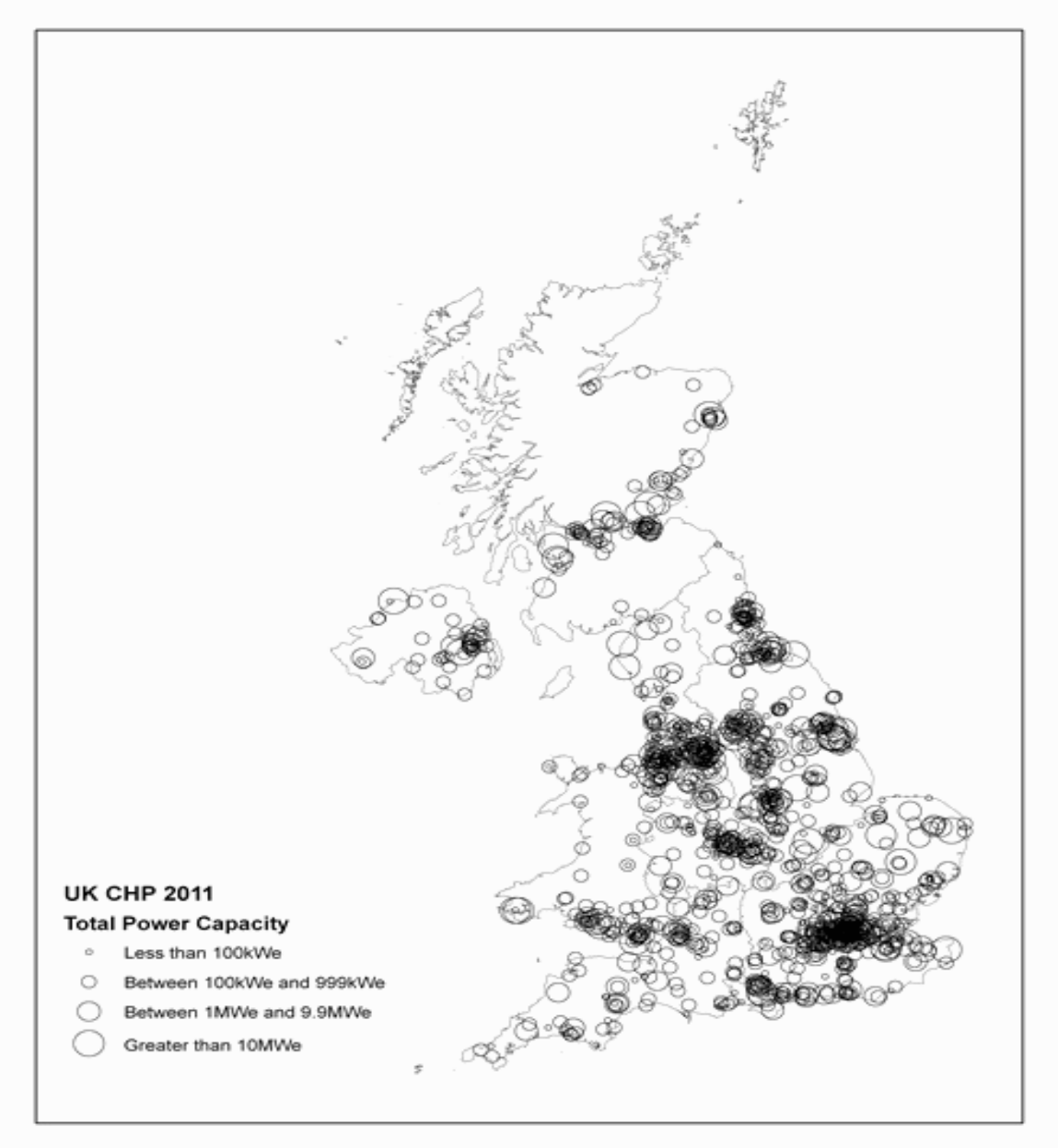
Table 7H: Carbon dioxide savings due to CHP, absolute and per 1,000 MWe of installed good quality CHP capacity

	2009		2010		2011	
	$MtCO_2$	$MtCO_2$/1000 MWe	$MtCO_2$	$MtCO_2$/1000 MWe	$MtCO_2$	$MtCO_2$/1000 MWe
Carbon savings against all fossil fuels	13.21	2.37	12.96	2.14	13.97	2.29
Carbon savings against all fuels (including nuclear and renewables)	9.13	1.64	9.21	1.52	9.10	1.49

Note: (1) The CO2 savings in Table 7H 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 CO2 savings quoted above for 2011 are based on preliminary CO2 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 CO2 savings quoted above for 2009 and 2010 have also been revised in response to changes in the CO2 intensity factors for electricity for these years since reporting in DUKES 2011.

CHP schemes in the United Kingdom by power capacity, 2011



Combined Heat and Power in the EU

7.25 Data in CHP activity is submitted to Eurostat annually in line with the EU Cogeneration Directive. This is calculated on a different basis to the data in this chapter (supplementary boilers, supplementary firing and auxiliary firing are removed for the EU data submission) and the latest available data is for 2010. It should be noted that there is no agreed methodology within the EU Cogeneration Directive for defining CHP capacity. This means that countries will report EUROSTAT CHP capacities calculated on differing bases.

7.26 Based on 2010 data, in total the EU has around 105 GW of installed CHP capacity, of which 21 per cent is in Germany[5], followed by the Netherlands (9 per cent) and Poland (8 per cent). The UK has 6 per cent of the total installed capacity (the 6th highest of the 27 countries).

7.27 Germany also produces the most electricity from CHP but, as they also have high overall electricity consumption, this only equates to 13.2 per cent of their overall electricity generation (the 12th highest in the EU). Denmark has the highest proportion of electricity produced by CHP (49.2 per cent) and Latvia, Finland, Lithuania and the Netherlands all produce more than 30 per cent of their electricity from CHP.

7.28 Around 840TWh of heat was produced by CHP in the EU in 2010, of which 22 per cent was contributed by Germany, followed by Finland (9 per cent), Poland (9 per cent), the Netherlands (8 per cent), Italy (7 per cent), France (6 per cent), Sweden (6 per cent) and the UK (5 per cent).

Government policy towards CHP

7.29 Good Quality CHP denotes schemes that have been certified as being highly efficient through the UK's CHP Quality Assurance (CHPQA) programme. The criteria used are in line with the requirements for high efficiency CHP set down in the EU Cogeneration Directive (2004/8/EC). Good Quality CHP schemes, with an 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.

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

- Exemption from the Climate Change Levy (CCL) of all fuel inputs to, and electricity outputs from, Good Quality CHP.
- Eligibility to Enhanced Capital Allowances for Good Quality CHP plant and machinery for companies whose main business is not the generation of electricity.
- Favourable allocations of carbon allowances under Phase II of the EU Emissions Trading Scheme (EU ETS)
- Preferential treatment under the Business Rates for certain 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 electricity output of Good Quality CHP fuelled by biomass.
- In April 2010 the Carbon Reduction Commitment (CRC) came into force. The 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 other fuel types such as gas oil and kerosene. However, under CRC heat is zero-rated, meaning that allowances will not have to be purchased by a site to cover any imported heat.

[5] *Germany did not submit a capacity figure for 2010, therefore it has been assumed that it was equal to their 2009 figure.*

7.31 A recent announcement by the Government stated that, from April 2013, the Carbon Price Floor (CPF) will come into force. The exemption from CCL for solid fuels, gas and LPG used to generate electricity that is exported to unknown third parties via the grid will be removed, but electricity generated for own use onsite will still be exempt from CCL. These commodities will become liable for new 'carbon price support rates' for CCL and will take into account the commodities' average carbon content. Supplies of fossil fuels used to generate heat in a CHP plant registered under the CHP Quality Assurance (CHPQA) programme will be exempt from the carbon price support (CPS) rates for CCL and fuel duty, subject to State aid approval.

International context

7.32 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 Good Quality CHP (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.

7.33 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 tCO2[6].

7.34 The value of the current CCL exemption on Good Quality CHP electricity outputs, which can be realised by the sale of Levy Exemption Certificates (LECs) issued against CHP electricity outputs exported to the grid and consumed in the UK, has encouraged CHP operators in France, Denmark, Holland and Germany to generate and export Good Quality CHP electricity to the UK. In 2011 LECs were issued in respect of 2,993 GWh of Good Quality CHP electricity generated by 84 overseas CHP schemes. This represents approximately 11 per cent of Good Quality CHP electricity consumed in the UK in 2011.

[6] *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

7.35 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 1.58.

Data for 2011

7.36 The data are summarised from the results of a long-term project undertaken by AEA on behalf of the Department of Energy & Climate Change (DECC). Data are included for CHP schemes installed in all sectors of the UK economy.

7.37 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.

7.38 Statistics for 2011 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) and on a survey of anaerobic digestion sites (AD survey). Approximately 95 per cent of the total capacity is from schemes certified under the CHPQA programme, while around 3 per cent is from schemes covered by ISSB sources. 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 1 per cent of total electrical capacity. The balance of the capacity (about 1 per cent) is for schemes included in the AD survey, for schemes not applying to CHPQA but form a part of data collected from CHP suppliers.

Definitions of schemes

7.39 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

7.40 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.

7.41 The convention used to allocate the fuels to heat and electricity relates the split of fuels to the relative efficiency of heat and electricity supply. The efficiency of utility plant varies widely: electricity generation from as little as 25 per cent to more than 50 per cent and boilers from 50 per cent to more than 90 per cent. Thus it is around twice as hard to generate a unit of electricity as it is to generate a unit of heat. Accordingly a simple convention can be implemented whereby twice as many units of fuel are allocated to each unit of electricity generated, as to each unit of heat supplied. This approach is consistent with the Defra Guidelines for Company Reporting on greenhouse gas emissions and for Negotiated Agreements on energy efficiency agreed between Government and industry as part of the Climate Change Levy (CCL) package. It recognises that, in developing a CHP scheme, both the heat customer(s) and the electricity generator share in the savings, reflecting the fact that more than three-quarters of CHP build in the last few years has been supplied under an energy services arrangement.

7.42 The assumption in this convention that it is twice as hard to generate a unit of electricity as heat, is appropriate for the majority of CHP schemes. However, for some types of scheme (for example in the iron and steel sector) this allocation is less appropriate and can result in very high apparent heat efficiencies. These, however, are only notional efficiencies.

The effects on the statistics of using CHPQA

7.43 Paragraph 7.11 described how schemes were scaled back so that only CHP_{QPC} and CHP_{QPO} are included in the CHP statistics presented in this Chapter. This is illustrated in Table 7I which shows that 244 schemes were scaled back in 2011. For information, in 2010, 208 (revised) schemes were scaled back. In 2010, the power output from these schemes was scaled back from a total of 33,396 GWh to 13,300 GWh. The total fuel input to these schemes was 99,190 GWh of which 48,216 GWh was regarded as being for power only. For 2011, the total power output is scaled back from 36,059 GWh to 16,608 GWh. Only 42 per cent of the total fuel input was regarded as 'for power only'.

Table 7I: CHP capacity, output and fuel use which has been scaled back in 2011

	Units	
Number of schemes requiring scaling back		244
Total Power Capacity of these schemes (CHP_{TPC})	MWe	7,531
Qualifying Power Capacity of these schemes (CHP_{QPC})	MWe	3,889
Total power output of these schemes (CHP_{TPO})	GWh	36,059
Qualifying Power Output of these schemes (CHP_{QPO})	GWh	16,608
Electricity regarded as "Power only" not from CHP (CHP_{TPO} - CHP_{QPO})	GWh	19,452
Total Fuel Input of these schemes (CHP_{TFI})	GWh	112,736
Fuel input regarded as being for "Power only" use i.e. not for CHP	GWh	47,222

**This figure includes generation from major power producers*

Exports of electricity and heat

7.44 The figures quoted in Tables 7E and 7F 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 7E. 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 7E.

7.45 This approach for Table 7E 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 2011. Exports of heat, quoted in Table 7F, continue to be compiled on the basis of volunteered data only.

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

7.46 The figures quoted above in Table 7D are for CHP schemes which 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.

Contacts:
Naser Odeh
AEA
naser.odeh@aeat.co.uk
0870 190 6811

Laura Williams
DECC Energy Statistics Team
laura.williams@decc.gsi.gov.uk
0300 068 5045

7.1 CHP installations by capacity and size range

	2007	2008	2009	2010	2011
Number of schemes *(1)*	**1,407r**	**1,427r**	**1,485r**	**1,577r**	**1,880**
Less than 100 kWe	455r	455r	445r	453r	535
100 kWe to 999 kWe	680r	700r	760r	821r	1,024
1 MWe to 9.9 MWe	202	201	208r	232r	252
10.0 MWe and above	70	71	72	71r	69
					MWe
Total capacity	**5,398r**	**5,410r**	**5,573r**	**6,053r**	**6,111**
Less than 100 kWe	28r	28r	28r	28r	33
100 kWe to 999 kWe	176r	180r	193r	208r	250
1 MWe to 9.9 MWe	733	709	723r	795r	828
10.0 MWe and above	4,460r	4,493r	4,629r	5,022r	5,000

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

7.2 Fuel used to generate electricity and heat in CHP installations

GWh

	2007	2008	2009	2010	2011
Fuel used to generate electricity *(1)*					
Coal *(2)*	1,750	1,856	1,545	1,484r	1,468
Fuel oil	892	887	880	694r	541
Natural gas	46,492r	45,411r	42,857r	43,249r	43,579
Renewable fuels *(3)*	1,731r	2,313r	2,844r	3,419r	3,691
Other fuels *(4)*	10,300	10,100	9,520r	9,674r	9,474
Total all fuels	**61,166r**	**60,567r**	**57,646r**	**58,519r**	**58,753**
Fuel used to generate heat					
Coal *(2)*	2,369	2,418	2,134	2,061r	2,066
Fuel oil	1,248	1,178	1,265	887r	693
Natural gas	38,506r	38,671r	34,990r	35,265r	35,372
Renewable fuels *(3)*	1,469r	2,281r	2,491r	3,115r	3,312
Other fuels *(4)*	13,842	13,574	12,772r	12,723r	12,662
Total all fuels	**57,435r**	**58,122r**	**53,653r**	**54,051r**	**54,105**
Overall fuel use					
Coal *(2)*	4,120	4,274	3,679	3,544r	3,534
Fuel oil	2,140	2,065	2,146	1,581r	1,234
Natural gas	84,999r	84,082r	77,847r	78,514r	78,951
Renewable fuels *(3)*	3,200r	4,594r	5,334r	6,534r	7,003
Other fuels *(4)*	24,142	23,674	22,293r	22,397r	22,135
Total all fuels	**118,601r**	**118,689r**	**111,298r**	**112,570r**	**112,858**

(1) See paragraphs 7.40 to 7.42 for an explanation of the method used to allocate fuel use between heat generatior 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

	2007	2008	2009	2010	2011
Coal					
Back pressure steam turbine	592	521	513	549	573
Gas turbine	43	29	-	-	-
Combined cycle	568	834	327	193r	192
Reciprocating engine	-	8	1	-	4
Pass out condensing steam turbine	2,916	2,881	2,838	2,802	2,765
Total coal	**4,120**	**4,274**	**3,679**	**3,544r**	**3,534**
Fuel oil					
Back pressure steam turbine	138	140	185	142	159
Gas turbine	3	1	1	5	2
Combined cycle	1,629	1,474	1,466	1,141r	803
Reciprocating engine	139	153	131	119r	118
Pass out condensing steam turbine	232	297	362	174	152
Total fuel oil	**2,140**	**2,065**	**2,146**	**1,581r**	**1,234**
Natural gas					
Back pressure steam turbine	1,855	1,694	1,730	1,661r	1,597
Gas turbine	11,763	10,809	10,636	10,649r	11,035
Combined cycle	63,719	63,907	57,079	56,615r	56,473
Reciprocating engine	6,696r	6,811r	7,538r	8,605r	8,888
Pass out condensing steam turbine	966	861	864	983	958
Total natural gas	**84,999r**	**84,082r**	**77,847r**	**78,514r**	**78,951**
Renewable fuels *(1)*					
Back pressure steam turbine	525	1,521	1,339	1,507r	1,453
Gas turbine	10	-	1	2r	7
Combined cycle	611	520	562	584r	513
Reciprocating engine	1,443r	1,507r	1,728r	2,125r	2,614
Pass out condensing steam turbine	611	1,046r	1,704r	2,315r	2,418
Total renewable fuels	**3,200r**	**4,594r**	**5,334r**	**6,534r**	**7,003**
Other fuels *(2)*					
Back pressure steam turbine	5,090	5,089	4,932	4,564r	4,565
Gas turbine	4,024	3,514	3,695	3,497r	3,325
Combined cycle	10,837	11,274	9,911	10,440r	10,922
Reciprocating engine	51	36	49	98r	83
Pass out condensing steam turbine	4,141	3,761	3,705	3,797	3,241
Total other fuels	**24,142**	**23,674**	**22,293**	**22,397r**	**22,135**
Total - all fuels					
Back pressure steam turbine	8,199	8,966	8,699	8,424r	8,346
Gas turbine	15,843	14,353	14,333	14,153r	14,369
Combined cycle	77,363	78,009	69,346	68,973r	68,902
Reciprocating engine	8,328r	8,515r	9,448r	10,948r	11,706
Pass out condensing steam turbine	8,867	8,845r	9,472r	10,072r	9,534
Total all fuels	**118,601r**	**118,689r**	**111,298r**	**112,570r**	**112,858**

(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

	2007	2008	2009	2010	2011
Coal					
Back pressure steam turbine	63	57	52	64	66
Gas turbine	7	5	-	-	-
Combined cycle	120	172	56	31	30
Reciprocating engine	-	1	0	-	1
Pass out condensing steam turbine	514	501	501	509	502
Total coal	**704**	**736**	**610**	**604**	**599**
Fuel oil					
Back pressure steam turbine	16	16	20	18	19
Gas turbine	1	0	0	1	0
Combined cycle	316	303	285	235r	173
Reciprocating engine	47	51	45	41r	41
Pass out condensing steam turbine	36	44	58	30	27
Total fuel oil	**417**	**413**	**408**	**325r**	**260**
Natural gas					
Back pressure steam turbine	142	122	125	126r	112
Gas turbine	2,701	2,369	2,407	2,480r	2,600
Combined cycle	16,952	16,715	15,482	15,299r	15,440
Reciprocating engine	1,681r	1,700r	1,950r	2,196r	2,321
Pass out condensing steam turbine	144	131	135	155	149
Total natural gas	**21,619r**	**21,037r**	**20,099r**	**20,255r**	**20,622**
Renewable fuels *(1)*					
Back pressure steam turbine	71	215	201	214r	213
Gas turbine	1	-	0	0	1
Combined cycle	21	10	16	11r	4
Reciprocating engine	440r	460	527	603r	758
Pass out condensing steam turbine	115	200r	327r	442r	459
Total renewable fuels	**648r**	**886r**	**1,071r**	**1,270r**	**1,434**
Other fuels *(2)*					
Back pressure steam turbine	593	628	604	556r	556
Gas turbine	608	540	572	503r	474
Combined cycle	2,800	2,899	2,567	2,745r	2,869
Reciprocating engine	12	8	12	25r	21
Pass out condensing steam turbine	432	383	484	488	355
Total other fuels	**4,445**	**4,458**	**4,240**	**4,317r**	**4,277**
Total - all fuels					
Back pressure steam turbine	884	1,037	1,003	979r	965
Gas turbine	3,318	2,915	2,980	2,984r	3,076
Combined cycle	20,209	20,098	18,406	18,320r	18,516
Reciprocating engine	2,180r	2,220r	2,535r	2,865r	3,143
Pass out condensing steam turbine	1,241	1,259r	1,504r	1,624r	1,492
Total all fuels	**27,833r**	**27,529r**	**26,428r**	**26,772r**	**27,191**

(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

	2007	2008	2009	2010	2011
Coal					
Back pressure steam turbine	28	20	19	20	20
Gas turbine	1	1	-	-	-
Combined cycle	20	26	21	13	13
Reciprocating engine	-	1	0	-	0
Pass out condensing steam turbine	145	145	144	143	143
Total coal	**194**	**193**	**184**	**176**	**176**
Fuel oil					
Back pressure steam turbine	7	7	7	6	6
Gas turbine	0	0	0	10	10
Combined cycle	68	60	63	48r	34
Reciprocating engine	16	16	15	14	11
Pass out condensing steam turbine	10	12	12	8	8
Total fuel oil	**101**	**94**	**97**	**87r**	**70**
Natural gas					
Back pressure steam turbine	47	37	39	36r	36
Gas turbine	502	488	501	482r	486
Combined cycle	3,004r	2,978r	3,081r	3,413r	3,393
Reciprocating engine	520r	537r	584r	641r	680
Pass out condensing steam turbine	39	39	39	41	40
Total natural gas	**4,113r**	**4,079r**	**4,244r**	**4,613r**	**4,635**
Renewable fuels *(1)*					
Back pressure steam turbine	16	37	35	37r	38
Gas turbine	0	-	0	0	0
Combined cycle	8	3	3	3	3
Reciprocating engine	115r	119	131	135r	175
Pass out condensing steam turbine	23	45	71	85r	85
Total renewable fuels	**162r**	**203**	**240**	**260r**	**300**
Other fuels *(2)*					
Back pressure steam turbine	109	109	109	109	109
Gas turbine	119	114	117	123	112
Combined cycle	497r	522r	483r	558r	580
Reciprocating engine	4	3	5	24r	23
Pass out condensing steam turbine	99	93	93	102	104
Total other fuels	**828r**	**842r**	**807r**	**917r**	**929**
Total - all fuels					
Back pressure steam turbine	207	210	210	209	209
Gas turbine	623	604	618	616r	609
Combined cycle	3,598r	3,588r	3,650r	4,035r	4,024
Reciprocating engine	655r	676r	735r	814r	889
Pass out condensing steam turbine	315	333	359	379r	380
Total all fuels	**5,398r**	**5,410r**	**5,573r**	**6,053r**	**6,111**

(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

	2007	2008	2009	2010	2011
Coal					
Back pressure steam turbine	442	373	367	421	443
Gas turbine	24	19	-	-	-
Combined cycle	155	237	72	45r	44
Reciprocating engine	-	4	0	-	2
Pass out condensing steam turbine	1,380	1,396	1,336	1,311	1,309
Total coal	**2,002**	**2,028**	**1,775**	**1,777r**	**1,799**
Fuel oil					
Back pressure steam turbine	122	117	136	117r	134
Gas turbine	2	1	1	2	1
Combined cycle	901	789	822	607r	434
Reciprocating engine	44	49	40	36r	35
Pass out condensing steam turbine	101	131	162	74	63
Total fuel oil	**1,169**	**1,086**	**1,160**	**835r**	**667**
Natural gas					
Back pressure steam turbine	1,444	1,278	1,284	947r	889
Gas turbine	5,679	5,432	5,135	5,222r	5,724
Combined cycle	25,396	25,751	22,557	22,269r	22,180
Reciprocating engine	2,933r	3,059r	3,301r	3,861r	3,991
Pass out condensing steam turbine	507	402	417	524	531
Total natural gas	**35,959r**	**35,921r**	**32,694r**	**32,824r**	**33,316**
Renewable fuels *(1)*					
Back pressure steam turbine	176	755	745	728r	708
Gas turbine	5	-	0	1	0
Combined cycle	85	82	77	79r	56
Reciprocating engine	509r	493r	511r	614r	751
Pass out condensing steam turbine	141	231r	432r	701r	728
Total renewable fuels	916r	1,560r	1,766r	2,123r	**2,244**
Other fuels *(2)*					
Back pressure steam turbine	2,911	3,079	2,879	2,754r	2,754
Gas turbine	1,891	1,734	1,830	1,790r	1,694
Combined cycle	4,562	4,811	4,319	4,415r	4,702
Reciprocating engine	22	11	15	24r	19
Pass out condensing steam turbine	1,867	1,681	1,658	1,731	1,431
Total other fuels	**11,253**	**11,317**	**10,701**	**10,714r**	**10,600**
Total - all fuels					
Back pressure steam turbine	5,094	5,602	5,411	4,967r	4,929
Gas turbine	7,601	7,185	6,966	7,016r	7,420
Combined cycle	31,100	31,669	27,847	27,414r	27,417
Reciprocating engine	3,508	3,617	3,867	4,535r	4,798
Pass out condensing steam turbine	3,995	3,840	4,005	4,341r	4,063
Total all fuels	**51,298**	**51,913**	**48,096**	**48,273r**	**48,627**

(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

	2007	2008	2009	2010	2011
Coal					
Back pressure steam turbine	160	127	122	128	128
Gas turbine	3	4	-	-	-
Combined cycle	16	19	15	10	10
Reciprocating engine	-	1	0	-	1
Pass out condensing steam turbine	424	444	432	412	410
Total coal	**604**	**595**	**570**	**550**	**548**
Fuel oil					
Back pressure steam turbine	42	39	41	36	36
Gas turbine	0	0	0	56	56
Combined cycle	119	102	111	82r	59
Reciprocating engine	18	18	14	13r	13
Pass out condensing steam turbine	28	36	39	22	20
Total fuel oil	**207**	**195**	**205**	**210r**	**185**
Natural gas					
Back pressure steam turbine	348	289	295	266r	265
Gas turbine	1,402	1,381	1,257	1,207	1,193
Combined cycle	4,431	4,391	4,437	4,276r	4,176
Reciprocating engine	659r	640r	631r	624r	662
Pass out condensing steam turbine	159	130	140	161	162
Total natural gas	**6,999r**	**6,831r**	**6,760r**	**6,533r**	**6,458**
Renewable fuels *(1)*					
Back pressure steam turbine	45	45	40	46r	48
Gas turbine	2	-	-	0	-
Combined cycle	16	16	17	17r	18
Reciprocating engine	110r	110	111	94r	89
Pass out condensing steam turbine	43	43	43	43	43
Total renewable fuels	**217r**	**215**	**211**	**202r**	**198**
Other fuels *(2)*					
Back pressure steam turbine	380	380	381	380	380
Gas turbine	1,572	1,536	1,577	1,556	1,529
Combined cycle	740	795	700	715r	753
Reciprocating engine	4	4	6	6r	6
Pass out condensing steam turbine	342	329	328	345	347
Total other fuels	**3,039**	**3,044**	**2,992**	**3,002r**	**3,015**
Total - all fuels					
Back pressure steam turbine	975	879	879	857	857
Gas turbine	2,980	2,921	2,834	2,819	2,778
Combined cycle	5,323	5,323	5,280	5,099	5,015
Reciprocating engine	791r	773r	762r	738r	771
Pass out condensing steam turbine	996	983	983	983	983
Total all fuels	**11,065r**	**10,880r**	**10,738r**	**10,496r**	**10,405**

(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	2007	2008	2009	2010	2011
Iron and steel and non ferrous metals						
Number of sites		8	8	8	8	8
Electrical capacity	MWe	80	78	78	82	83
Heat capacity	MWth	285	285	285	285	285
Electrical output	GWh	367	349	467	441	315
Heat output	GWh	1,718	1,592	1,589	1,576r	1,268
Fuel use	GWh	3,812	3,593	3,569	3,462	2,910
of which : for electricity	GWh	1,096	1,024	1,232	1,203r	868
for heat	GWh	2,716	2,569	2,337	2,259r	2,042
Chemicals						
Number of sites		49r	46r	47r	53r	55
Electrical capacity	MWe	1,789r	1,771r	1,802r	1,829r	1,880
Heat capacity	MWth	3,818	3,779	3,756	3,734	3,734
Electrical output	GWh	9,398r	9,284r	7,204r	7,486r	7,829
Heat output	GWh	17,111r	17,121r	14,173r	14,944r	15,219
Fuel use	GWh	40,522r	41,002r	33,401r	34,717r	35,398
of which : for electricity	GWh	21,343r	21,463r	17,093r	17,563r	18,129
for heat	GWh	19,178r	19,539r	16,308r	17,154r	17,270
Oil and gas terminals and oil refineries						
Number of sites		9	9	9	11r	11
Electrical capacity	MWe	1,728r	1,726r	1,864r	2,293r	2,293
Heat capacity	MWth	3,677	3,677	3,677	3,677	3,677
Electrical output	GWh	9,940	9,823	10,672	10,999r	11,083
Heat output	GWh	16,894	17,244	16,727	16,903r	17,051
Fuel use	GWh	40,068	39,543	39,766	40,536r	40,561
of which : for electricity	GWh	21,429	20,884	21,898	22,501r	22,543
for heat	GWh	18,639	18,659	17,868	18,035r	18,018
Paper, publishing and printing						
Number of sites		26	26	24	23	22
Electrical capacity	MWe	535	556	509	478	420
Heat capacity	MWth	1,182	1,169	1,106	975	891
Electrical output	GWh	3,062	3,074	2,710	2,255r	2,190
Heat output	GWh	6,137	6,386	5,966	5,102r	5,065
Fuel use	GWh	12,865	13,126	12,179	10,417r	10,160
of which : for electricity	GWh	6,388	6,374	5,769	4,871r	4,698
for heat	GWh	6,477	6,752	6,409	5,546r	5,462
Food, beverages and tobacco						
Number of sites		39	36	38	40r	44
Electrical capacity	MWe	423	404	406	409r	414
Heat capacity	MWth	911	814	814	763	748
Electrical output	GWh	2,100	1,961	2,103	2,102r	2,156
Heat output	GWh	4,214	4,349	4,355	3,761r	3,961
Fuel use	GWh	8,536	8,359	8,712	8,278r	8,511
of which : for electricity	GWh	4,251	3,975	4,241	4,388r	4,452
for heat	GWh	4,285	4,384	4,472	3,890r	4,060
Metal products, machinery and equipment						
Number of sites		18	17	17	17r	20
Electrical capacity	MWe	69	68	68	68	70
Heat capacity	MWth	57	56	56	56	57
Electrical output	GWh	174	206	172	174r	160
Heat output	GWh	211	221	196	206r	200
Fuel use	GWh	609	619	558	634r	607
of which : for electricity	GWh	370	389	342	383r	341
for heat	GWh	239	229	216	251r	265

For footnotes see page 212

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

	Unit	2007	2008	2009	2010	2011
Mineral products, extraction, mining and agglomeration of solid fuels						
Number of sites		9r	9r	8r	8r	8
Electrical capacity	MWe	54r	65r	57r	57r	57
Heat capacity	MWth	215r	205r	178r	178r	178
Electrical output	GWh	182r	156r	137r	134r	109
Heat output	GWh	714r	602r	502r	577r	540
Fuel use	GWh	1,188r	1,059r	915r	971r	886
of which : for electricity	GWh	403r	369r	325r	318r	254
for heat	GWh	785r	690r	590r	653r	632
Sewage treatment						
Number of sites		157r	159r	171r	177r	198
Electrical capacity	MWe	144r	147r	151r	156r	166
Heat capacity	MWth	137r	137r	137r	119r	111
Electrical output	GWh	494r	532r	598r	644r	699
Heat output	GWh	575r	579r	593r	672r	763
Fuel use	GWh	1,631r	1,765r	1,981r	2,296r	2,522
of which : for electricity	GWh	1,032r	1,154r	1,341r	1,523r	1,637
for heat	GWh	599r	611r	640r	774r	885
Other industrial branches *(2)*						
Number of sites		7r	8r	8r	10r	11
Electrical capacity	MWe	41r	41r	41r	42r	42
Heat capacity	MWth	74r	74r	74r	74r	74
Electrical output	GWh	259r	247r	245r	223r	215
Heat output	GWh	387r	348r	340r	358r	375
Fuel use	GWh	936r	884r	862r	836r	795
of which : for electricity	GWh	545r	527r	516r	469r	425
for heat	GWh	390r	357r	346r	367r	370
Total industry						
Number of sites		322	318r	330r	347r	377
Electrical capacity	MWe	4,863r	4,856r	4,976r	5,415r	5,425
Heat capacity	MWth	10,356r	10,197r	10,083r	9,861r	9,756
Electrical output	GWh	25,976r	25,632r	24,308r	24,459r	24,755
Heat output	GWh	47,961r	48,443r	44,441r	44,099r	44,441
Fuel use	GWh	110,167r	109,950r	101,944r	102,147r	102,350
of which : for electricity	GWh	56,857r	56,160r	52,758r	53,218r	53,346
for heat	GWh	53,309r	53,790r	49,186r	48,929r	49,004
Transport, commerce and administration						
Number of sites		592r	602r	645r	712r	895
Electrical capacity	MWe	280r	276r	301r	335r	355
Heat capacity	MWth	401r	377r	351r	333r	335
Electrical output	GWh	1,094r	1,080r	1,185r	1,330r	1,402
Heat output	GWh	2,116r	2,109r	2,177r	2,595r	2,623
Fuel use	GWh	4,684r	4,613r	4,915r	5,722r	5,821
of which : for electricity	GWh	2,364r	2,316r	2,537r	2,881r	2,976
for heat	GWh	2,320r	2,297r	2,378r	2,841r	2,845
Other *(3)*						
Number of sites		493	507r	510r	518r	608
Electrical capacity	MWe	256	278	296	303r	331
Heat capacity	MWth	308	305	304	302	314
Electrical output	GWh	764	817r	935r	982r	1,034
Heat output	GWh	1,221	1,361r	1,477r	1,579r	1,562
Fuel use	GWh	3,750	4,126r	4,439r	4,700r	4,687
of which : for electricity	GWh	1,945	2,091r	2,350r	2,420r	2,430
for heat	GWh	1,805	2,035r	2,089r	2,280r	2,257
Total CHP usage by all sectors						
Number of sites		1,407r	1,427r	1,485r	1,577r	1,880
Electrical capacity	MWe	5,398r	5,410r	5,573r	6,053r	6,111
Heat capacity	MWth	11,065r	10,880r	10,738r	10,496r	10,405
Electrical output	GWh	27,833r	27,529r	26,428r	26,772r	27,191
Heat output	GWh	51,298r	51,913r	48,096r	48,273r	48,627
Fuel use	GWh	118,601r	118,689r	111,298r	112,570r	112,858
of which : for electricity	GWh	61,166r	60,567r	57,646r	58,519r	58,753
for heat	GWh	57,435r	58,122r	53,653r	54,051r	54,105

(1) The allocation of fuel use between electricity and heat is largely notional and the methodology is outlined in paragraphs 7.40 to 7.42.
(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

	2007	2008	2009	2010	2011
Iron and steel and non ferrous metals					
Coal	-	-	-	-	-
Fuel oil	105	170	235	47	25
Natural gas	195	313	277	274	266
Blast furnace gas	2,885	2,490	2,232	1,920	1,896
Coke oven gas	628	621	826	1,221	723
Other fuels *(1)*	-	-	-	-	-
Total iron and steel and non ferrous metals	**3,812**	**3,593**	**3,569**	**3,462**	**2,910**
Chemicals					
Coal	3,372	3,653	3,103	3,016	3,016
Fuel oil	153	137	132	132	131
Gas oil	28	21	11	189r	43
Natural gas	33,359r	33,593r	26,487r	27,230r	28,059
Refinery gas	1,181	1,181	1,181	1,181	1,181
Renewable fuels *(2)*	10	-	3	81	81
Other fuels *(1)*	2,420	2,417	2,485	2,888r	2,888
Total chemical industry	**40,522r**	**41,002r**	**33,401r**	**34,717r**	**35,398**
Oil and gas terminals and oil refineries					
Fuel oil	1,606	1,466	1,464	1,140r	803
Gas oil	122	112	159	141r	141
Natural gas	22,045	21,618	23,240	25,008r	24,865
Refinery gas	5,583	5,703	5,795	7,335r	7,841
Other fuels *(1)*	10,711	10,644	9,108	6,912r	6,912
Total oil refineries	**40,068**	**39,543**	**39,766**	**40,536r**	**40,561**
Paper, publishing and printing					
Coal	437	402	359	323	286
Fuel oil	0	12	0	-	-
Gas oil	22	20	23	13r	1
Natural gas	12,255	11,552	10,124	8,024r	7,795
Renewable fuels *(2)*	-	1,032	1,590	1,905	1,905
Other fuels *(1)*	151	108	83	151	172
Total paper, publishing and printing	**12,865**	**13,126**	**12,179**	**10,417r**	**10,160**
Food, beverages and tobacco					
Coal	238	156	194	186	209
Fuel oil	137	127	183	142	158
Gas oil	59	26	44	93r	35
Natural gas	8,094	8,043	8,272	7,792r	8,020
Renewable fuels *(2)*	2	7	18	66r	88
Other fuels *(1)*	5	-	2	0r	2
Total food, beverages and tobacco	**8,536**	**8,359**	**8,712**	**8,278r**	**8,511**
Metal products, machinery and equipment					
Coal	-	-	-	-	-
Fuel oil	89	89	89	89	89
Gas oil	0	0	0	0	0
Natural gas	455	504	434	478r	438
Renewable fuels *(2)*	65	26	34	67	80
Other fuels *(1)*	-	-	-	-	-
Total metal products, machinery and equipment	**609**	**619**	**558**	**634r**	**607**

For footnotes see page 214

7.9 CHP - use of fuels by sector (continued)

GWh

	2007	2008	2009	2010	2011
Mineral products, extraction, mining and agglomeration of solid fuels					
Coal	-	-	-	-	-
Fuel oil	-	-	-	-	-
Gas oil	0	0	3	1	-
Natural gas	919r	767r	624r	707r	657
Coke oven gas	269	291	288	264	229
Total mineral products, extraction, mining and agglomeration of solid fuels	**1,188r**	**1,059r**	**915r**	**971r**	**886**
Sewage treatment					
Fuel oil	48	62	30	29r	29
Gas oil	23	17	27	40r	37
Natural gas	118	179	215	189r	184
Renewable fuels *(2)*	1,443r	1,507r	1,709r	2,039r	2,272
Total sewage treatment	**1,631r**	**1,765r**	**1,981r**	**2,296r**	**2,522**
Other industrial branches					
Fuel oil	-	-	-	-	-
Gas oil	13	3	0	0	0
Natural gas	923r	881r	862r	836r	795
Total other industrial branches	**936r**	**884r**	**862r**	**836r**	**795**
Transport, commerce and administration					
Coal	43	29	-	-	-
Fuel oil	0	0	11	1	0
Gas oil	32	7	16	18	2
Natural gas	4,433r	4,446r	4,718r	5,276r	5,334
Refinery gas	-	-	-	-	-
Renewable fuels *(2)*	176	131	170	421r	477
Other fuels *(1)*	-	-	-	7r	8
Total transport, commerce and administration	**4,684r**	**4,613r**	**4,915r**	**5,722r**	**5,821**
Other *(3)*					
Coal	29	33	24	19r	23
Fuel oil	1	1	1	1	-
Gas oil	12	13	9	18r	19
Natural gas	2,203	2,186r	2,594r	2,700r	2,539
Renewable fuels *(2)*	1,504	1,892r	1,810r	1,955r	2,100
Other fuels *(1)*	1	1	1	6	6
Total other	**3,750**	**4,126r**	**4,439r**	**4,700r**	**4,687**
Total - all sectors					
Coal	4,120	4,274	3,679	3,544r	3,534
Fuel oil	2,140	2,065	2,146	1,581r	1,234
Gas oil	309	218	292	514r	279
Natural gas	84,999r	84,082r	77,847r	78,514r	78,951
Blast furnace gas	2,885	2,490	2,232	1,920	1,896
Coke oven gas	897	912	1,114	1,484	952
Refinery gas	6,764	6,884	6,976	8,515r	9,021
Renewable fuels *(2)*	3,200r	4,594r	5,334r	6,534r	7,003
Other fuels *(1)*	13,287	13,170	11,680	9,963r	9,987
Total CHP fuel use	**118,601r**	**118,689r**	**111,298r**	**112,570r**	**112,858**

(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 2012

Annexes

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

Annex B: Glossary and acronyms

Annex C: Further sources of UK energy publications

Annex D: Major events in the Energy Industry, 2010-2012

Department of Energy and Climate Change

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

Balance principles

A.1 This Annex outlines the principles behind the balance presentation of energy statistics. It covers these in general terms. Fuel specific details are given in the appropriate chapters of this publication.

A.2 Balances are divided into two types, each of which performs a different function.

a) *commodity balance* – a balance for each energy commodity that uses the units usually associated with that commodity. By using a single column of figures, it shows the flow of the commodity from its sources of supply through to its final use. Commodity balances are presented in the individual fuel chapters of this publication.

b) energy balance - presents the commodity balances in a common unit and places them alongside one another in a manner that shows the dependence of the supply of one commodity on another. This is useful as some commodities are manufactured from others. The layout of the energy balance also differs slightly from the commodity balance. The energy balance format is used in Chapter 1.

A.3 Energy commodities can be either primary or secondary. Primary energy commodities are drawn (extracted or captured) from natural reserves or flows, whereas secondary commodities are produced from primary energy commodities. Crude oil and coal are examples of primary commodities, whilst petrol and coke are secondary commodities manufactured from them. For balance purposes, electricity may be considered to be both primary electricity (for example, hydro, wind) or secondary (produced from steam turbines using steam from the combustion of fuels).

A.4 Both commodity and energy balances show the flow of the commodity from its production, extraction or import through to its final use.

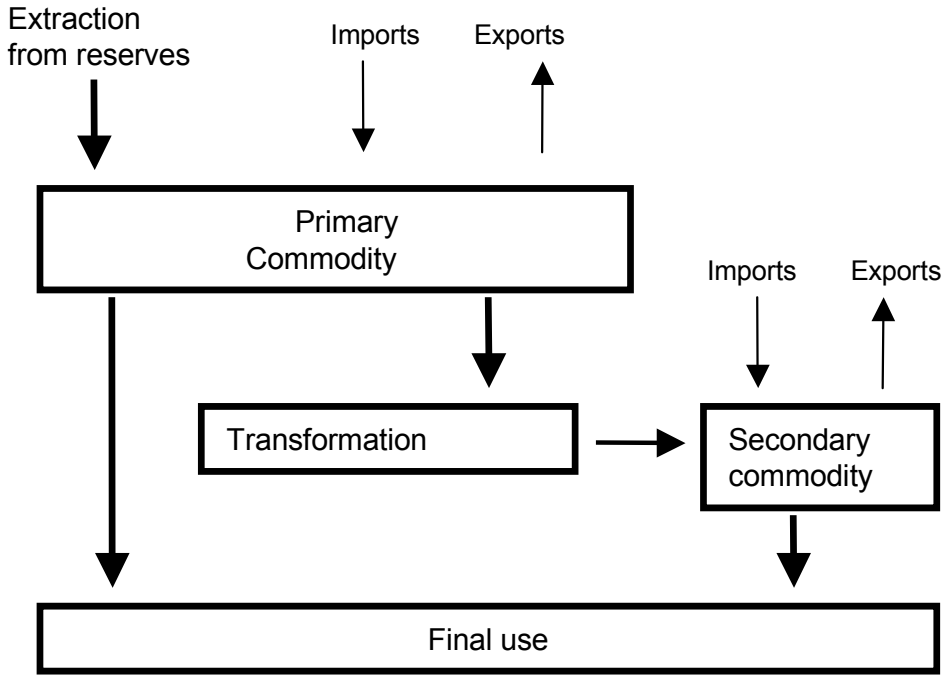
A.5 A simplified model of the commodity flow underlying the balance structure is given in Chart A.1. It illustrates how primary commodities may be used directly and/or be transformed into secondary commodities. The secondary fuels then enter final consumption or may also be transformed into another energy commodity (for example, electricity produced from fuel oil). To keep the diagram simple these “second generation” flows have not been shown.

A.6 The arrows at the top of the chart represent flows to and from the “pools” of primary and secondary commodities, from imports and exports and, in the case of the primary pool, extraction from reserves (eg the production of coal, gas and crude oil).

Commodity balances (Tables 2.1 to 2.6, 3.1 to 3.4, 4.1, 5.1, 5.3 and 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 38.0 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: $^oC = 5/9 (^oF - 32)$; $^oF = 9/5\ ^oC + 32$

Average conversion factors for petroleum 2011

	Imperial gallons per tonne	Litres per tonne
Crude oil:		
Indigenous	264	1,199
Imported	260	1,181
Average of refining throughput	262	1,192
Ethane	601	2,730
Propane	435	1,980
Butane	382	1,736
Naphtha	322	1,464
Aviation gasoline	310	1,411
Motor spirit:		
All grades	300	1,362
Super	298	1,355
Premium	300	1,363
Middle distillate feedstock	245	1,116
Kerosene:		
Aviation turbine fuel	275	1,252
Burning oil	274	1,247

	Imperial gallons per tonne	Litres per tonne
DERV fuel:		
0.005% or less sulphur	263	1,194
Gas /Marine diesel oil	257	1,168
Fuel oil (1% or less sulphur)		
All grades:	223	1,015
Light:	234	1,063
Medium	225	1,024
Heavy:	222	1,011
Lubricating oils:		
White	244	1,108
Greases	241	1,094
Bitumen	215	997
Petroleum coke	186	843
Petroleum waxes	260	1,184
Industrial spirit	274	1,247
White spirit	280	1,275

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 2011, and are only approximate for other years.

* 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, 2010

	kg CO_2 per tonne	kg CO_2 per kWh	kg CO_2 per litre
Gases			
Natural Gas		0.185	
Liquid fuels			
LPG		0.214	1.530
Gas oil	3190	0.254	2.760
Fuel oil	3216	0.267	3.168*
Burning oil	3150	0.246	2.532
Naptha	3131	0.236	2.124*
Petrol	3135	0.240	2.305
Diesel	3164	0.252	2.657
Aviation spirit	3133	0.238	2.221
Aviation turbine fuel	3150	0.246	2.526
Solid fuels			
Industrial coal	2139	0.285	
Domestic coal	2449	0.296	
Coking coal	3125	0.369	

All emission factors are based on a Gross Calorific Value basis

*DECC estimates

The information above is based on the 2010 Greenhouse gas conversion factors for company reporting, available at: www.defra.gov.uk/environment/economy/business-efficiency/reporting/ . 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 2011 edition of this Digest, available at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx, together with information from the National Atmospheric Emissions Inventory. More information on the Inventory is available at: http://naei.defra.gov.uk/reports.php. For liquid fuels, the "kg CO_2 per tonne" figure remains fairly constant on a year to year basis, so it is possible to derive "kg CO_2 per kWh" and "kg CO_2 per litre" figures for other years using the average conversion factors for petroleum data contained annually in Annex A of the Digest.

Conversion factors for 2011 will be available in Summer 2012.

A.1 Estimated average calorific values of fuels 2011

	GJ per tonne net	GJ per tonne gross
Coal:		
All consumers (weighted average) *(1)*	25.6	26.9
Power stations *(1)*	24.0	25.2
Coke ovens *(1)*	30.4	32.0
Low temperature carbonisation plants and manufactured fuel plants	27.0	28.4
Collieries	27.5	29.0
Agriculture	28.0	29.5
Iron and steel	29.8	31.4
Other industries (weighted average)	25.5	26.8
Non-ferrous metals	23.8	25.1
Food, beverages and tobacco	28.0	29.5
Chemicals	25.4	26.7
Textiles, clothing, leather etc.	28.0	29.5
Pulp, paper, printing etc.	23.0	24.2
Mineral products	26.3	27.6
Engineering (mechanical and electrical engineering and vehicles)	28.0	29.5
Other industries	31.0	32.6
Domestic		
House coal	28.7	30.2
Anthracite and dry steam coal	32.9	34.6
Other consumers	25.1	26.4
Imported coal (weighted average)	26.1	27.5
Exports (weighted average)	30.7	32.3
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 *(2)*	12.3	13.9
Industrial wood *(3)*	12.1	13.7
Straw	13.4	15.8
Poultry litter	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 *(4)*	6.7	9.5
Refuse derived waste *(4)*	13.0	18.5
Short rotation coppice *(5)*	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)	43.9	46.2
Ethane	46.6	50.7
Butane and propane (LPG)	46.0	49.3
Light distillate feedstock for gasworks	45.3	47.7
Aviation spirit and wide cut gasoline	45.1	47.4
Aviation turbine fuel	43.9	46.2
Motor spirit	44.7	47.1
Burning oil	44.1	46.4
Gas/diesel oil	42.7	45.4
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 *(6)*	35.8	39.8
Natural gas consumed *(7)*	35.6	39.5
Coke oven gas	16.2	18.0
Blast furnace gas	3.0	3.0
Landfill gas *(8)*	19-23	21-25
Sewage gas *(8)*	19-23	21-25

(1) Applicable to UK consumption - based on calorific value for home produced coal plus imports and, for "All consumers" net of exports.

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

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

(4) Average figure based on survey returns.

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

(6) The gross calorific value of natural gas can also be expressed as 11.066 kWh per cubic metre. This value represents the average calorific value seen for gas when extracted. At this point it contains not just methane, but also some other hydrocarbon gases (ethane, butane, propane). These gases are removed before the gas enters the National Transmission System for sale to final consumers.

(7) UK produced and imported gas. This weighted average of calorific values will approximate the average for the year of entering the National Transmission System. It can also be expressed as 10.978 kWh per cubic metre.

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

Note: The above estimated average calorific values apply only to the year 2011. 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 2008 to 2011

GJ per tonne (gross)

	1980	1990	2000	2008	2009	2010	2011
Coal							
All consumers *(1)(2)*	25.6	25.5	26.2	26.1	25.7	25.8	25.9
All consumers - home produced plus imports minus exports *(1)*	..	..	27.0	26.9	26.8	27.1r	26.9
Power stations *(2)*	23.8	24.8	25.6	25.4	24.9	24.9	25.2
Power stations - home produced plus imports *(1)*	..	..	26.0	26.2	26.0	25.8	26.0
Coke ovens *(2)*	30.5	30.2	31.2	32.6	32.6	30.5	32.0
Coke ovens - home produced plus imports *(1)*	..	..	30.4	30.5	32.6	30.5	32.0
Low temperature carbonisation plants and manufactured fuel plants	19.1	29.2	30.3	30.5	28.8	30.2	28.4
Collieries	27.0	28.6	29.6	29.7	29.4	29.3	29.0
Agriculture	30.1	28.9	29.2	28.0	28.0	28.0	29.5
Iron and steel industry *(3)*	29.1	28.9	30.7	30.4	30.4	30.4	31.4
Other industries *(1)*	27.1	27.8	26.7	27.0	27.5	27.7	26.8
Non-ferrous metals	..	23.1	25.1	25.4	25.0	25.4	25.1
Food, beverages and tobacco	28.6	28.1	29.5	30.4	28.7	28.6	29.5
Chemicals	25.8	27.3	28.7	26.7	26.7	26.7	26.7
Textiles, clothing, leather and footwear	27.5	27.7	30.4	29.5	29.5	29.5	29.5
Pulp, paper, printing, etc.	26.5	27.9	28.7	29.4	23.9	24.1	24.2
Mineral products *(4)*	..	28.2	27.0	27.6	27.6	27.6	27.6
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	26.1	31.6	32.6r	32.6
Domestic							
House coal	30.1	30.2	30.9	30.5	29.7	29.8	30.2
Anthracite and dry steam coal	33.3	33.6	33.5	34.7	34.7	34.7	34.6
Other consumers	27.5	27.5	29.2	29.3	26.4	25.5	26.4
Transport - Rail	..	..	..	30.1	30.0	30.3	30.3
Imported coal *(1)*	..	28.3	28.0	27.2	27.3	27.9	27.5
of which Steam coal	..	..	26.6	26.5	26.5	25.8r	26.5
Coking coal	..	..	30.4	30.4	30.4	30.4	32.0
Anthracite	..	..	31.2	30.9	31.0	31.0	31.2
Exports *(1)*	..	29.0	32.0	33.0	32.7	32.3	32.3
of which Steam coal	..	..	31.0	32.2	31.4	31.2	31.2
Anthracite	..	..	32.6	33.0	33.2	33.2	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	24.8	29.8r	29.8r	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	49.3	49.2	49.2	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	47.7	47.5	47.8	47.7
Aviation spirit and wide-cut gasoline (AVGAS and AVTAG)	47.2	47.3	47.3	47.4	47.4	47.4	47.4
Aviation turbine fuel (AVTUR)	46.4	46.2	46.2	46.2	46.2	46.2	46.2
Motor spirit	47.0	47.0	47.0	47.1	47.1	47.1	47.1
Burning oil	46.5	46.2	46.2	46.2	46.2	46.2	46.4
Vaporising oil	45.9	45.9	..	..	..	..	..
Gas/diesel oil (9)	45.5	45.4	45.6	45.3	45.2	45.3	45.4
DERV (9)	..	..	..	45.6	45.7	45.6	45.7
Fuel oil	42.8	43.2	43.1	43.6	43.5	43.3	43.3
Power station oil	42.8	43.2	43.1	43.6	43.5	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)	..	..	..	31.4	31.0	30.9r	30.3
Petroleum coke (Other)	..	39.5	35.8	35.8	35.8	35.8	35.8
Natural Gas *(8)*	..	38.4	39.4	39.7	40.0	40.1	39.8

(1) Weighted averages.
(2) Home produced coal only.
(3) From 2001 onwards almost entirely sourced from imports.
(4) Based on information provided by the British Cement Industry Association; almost all coal used by this sector in the latest 4 years was imported.
(5) Mechanical engineering and metal products, electrical and instrument engineering and vehicle manufacture.
(6) Includes construction.
(7) Since 1995 the source of these figures has been the ISSB.
(8) Natural Gas figures are shown in MJ per cubic metre
(9) DERV included within gas/diesel oil until 2005

A.3 Estimated average net calorific values of fuels 1980, 1990, 2000 and 2008 to 2011

GJ per tonne (net)

	1980	1990	2000	2008	2009	2010	2011
Coal							
All consumers *(1)(2)*	24.3	24.2	24.9	24.8	24.4	24.5	24.6
All consumers - home produced plus imports minus exports *(1)*	..	..	25.6	25.6	25.4	25.7	25.6
Power stations *(2)*	22.6	23.6	24.3	24.1	23.7	23.6r	24.0
Power stations - home produced plus imports *(1)*	..	..	24.7	24.9	24.7	24.5	24.7
Coke ovens *(2)*	29.0	28.7	29.6	31.0	31.0	29.0	30.4
Coke ovens - home produced plus imports *(1)*	..	..	28.9	29.0	31.0	29.0	30.4
Low temperature carbonisation plants and manufactured fuel plants	18.1	27.7	28.8	29.0	27.4	28.7	27.0
Collieries	25.7	27.2	28.1	28.2	27.9	27.9r	27.5
Agriculture	28.6	27.5	27.8	26.6	26.6	26.6	28.0
Iron and steel industry *(3)*	27.6	27.5	29.2	28.9	28.9	28.9	29.8
Other industries *(1)*	25.7	26.4	25.4	25.6	26.1	26.3	25.5
Non-ferrous metals	..	21.9	23.8	24.2	23.8	24.1	23.8
Food, beverages and tobacco	27.2	26.7	28.0	28.9	27.3	27.2	28.0
Chemicals	24.5	25.9	27.2	25.4	25.4	25.4	25.4
Textiles, clothing, leather and footwear	26.1	26.3	28.9	28.0	28.0	28.0	28.0
Pulp, paper, printing, etc.	25.2	26.5	27.3	27.9	22.7	22.9	23.0
Mineral products *(4)*	..	26.8	25.7	26.3	26.3	26.3r	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	24.8	30.1	31.0r	31.0
Domestic							
House coal	28.6	28.7	29.4	29.0	28.2	28.3	28.7
Anthracite and dry steam coal	31.6	31.9	31.9	33.0	32.9	32.9r	32.9
Other consumers	26.1	26.1	27.7	27.8	25.1	24.3r	25.1
Transport - Rail	..	..	..	28.6	28.5	28.8	28.8
Imported coal *(1)*	..	26.9	26.6	25.9	25.9	26.5	26.1
of which Steam coal	..	..	25.3	25.2	25.2	24.5r	25.2
Coking coal	..	..	28.9	28.9	28.9	28.9	30.4
Anthracite	..	..	29.6	29.3	29.4	29.5	29.7
Exports *(1)*	..	27.6	30.4	31.3	31.0	30.7	30.7
of which Steam coal	..	..	29.4	30.6	29.8	29.6	29.6
Anthracite	..	..	30.9	31.3	31.6	31.6r	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	24.8	29.8r	29.8r	29.8
Other manufactured solid fuels *(1)*	26.2	26.2	29.3	30.9	31.0	31.0	31.0
Petroleum							
Crude oil *(1)*	42.9	43.3	43.4	43.4	43.4	43.4	43.4
Liquified petroleum gas	46.2	46.0	46.0	45.9	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	45.3	45.2	45.4	45.3
Aviation spirit and wide-cut gasoline (AVGAS and AVTAG)	44.8	44.9	44.9	45.0	45.1	45.0	45.1
Aviation turbine fuel (AVTUR)	44.1	43.9	43.9	43.9	43.9	43.9	43.9
Motor spirit	44.7	44.7	44.7	44.7	44.7	44.7	44.7
Burning oil	44.2	43.9	43.9	43.9	43.9	43.9	44.1
Vaporising oil	43.6	43.6	..	..	..	..	..
Gas/diesel oil (9)	42.8	42.7	42.9	42.5	42.5	42.5	42.7
DERV (9)	..	..	..	42.9	42.9	42.9	42.9
Fuel oil	40.2	40.6	40.5	41.0	40.8	40.7	40.7
Power station oil	40.2	40.6	40.5	41.0	40.8	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)	..	..	..	29.8	29.5	29.3r	28.8
Petroleum coke (Other)	..	37.5	34.0	34.0	34.0	34.0	34.0
Natural Gas *(8)*	..	34.6	35.5	35.7	36.0	36.1	35.8

For footnotes see table A.2
The net calorific values of natural gas and coke oven gas are the gross calorific values x 0.9.

Annex B
Glossary and Acronyms

Advanced gas-cooled reactor (AGR)	A type of nuclear reactor cooled by carbon dioxide gas.
AEA Energy & Environment	Part of the AEA Group, comprising the former Future Energy Solutions and NETCEN.
AEP	Association of Electricity Producers
Anthracite	Within this publication, anthracite is coal classified as such by UK coal producers and importers of coal. Typically it has a high heat content making it particularly suitable for certain industrial processes and for use as a domestic fuel.
Anthropogenic	Produced by human activities.
Associated Gas	Natural gas found in association with crude oil in a reservoir, either dissolved in the oil or as a cap above the oil.
Autogeneration	Generation of electricity by companies whose main business is not electricity generation, the electricity being produced mainly for that company's own use.
Aviation spirit	A light hydrocarbon oil product used to power piston-engined aircraft power units.
Aviation turbine fuel	The main aviation fuel used for powering aviation gas-turbine power units (jet aircraft engine).
BE	British Energy
Benzole	A colourless liquid, flammable, aromatic hydrocarbon by-product of the iron and steel making process. It is used as a solvent in the manufacture of styrenes and phenols but is also used as a motor fuel.
BERR	Department for Business, Enterprise and Regulatory Reform
BETTA	British Electricity Trading and Transmission Arrangements (BETTA) refer to changes to electricity generation, distribution and supply licences. On 1 April 2005, the England and Wales trading arrangements were extended to Scotland by the British Electricity Trading and Transmission Arrangements creating a single GB market for trading of wholesale electricity, with common arrangements for access to and use of GB transmission system. From 1 April 2005, NGC has become the System Operator for the whole of GB. BETTA replaced NETA 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 per unit volume of the fuel and is often measured in GJ per tonne. The energy content can be expressed as an upper (or gross) value and a lower (or net) value. The difference between the two values is due to the release of energy from the condensation of water in the products of combustion. Gross calorific values are used throughout this publication.
CCA	Climate Change Agreement. Climate Change Agreements allow energy intensive business users to receive an 80 per cent discount from the Climate Change Levy (CCL), in return for meeting energy efficiency or carbon saving targets. The CCL is a tax on the use of energy in industry, commerce and the public sector. The aim of the levy is to encourage users to improve energy efficiency and reduce emissions of greenhouse gases.

CCL	Climate Change Levy. The Climate Change Levy is a tax on the use of energy in industry, commerce and the public sector, with offsetting cuts in employers' National Insurance Contributions and additional support for energy efficiency schemes and renewable sources of energy. The aim of the levy is to encourage users to improve energy efficiency and reduce emissions of greenhouse gases.
CO_2	Carbon dioxide. Carbon dioxide contributes about 60 per cent of the potential global warming effect of man-made emissions of greenhouse gases. Although this gas is naturally emitted by living organisms, these emissions are offset by the uptake of carbon dioxide by plants during photosynthesis; they therefore tend to have no net effect on atmospheric concentrations. The burning of fossil fuels, however, releases carbon dioxide fixed by plants many millions of years ago, and thus increases its concentration in the atmosphere.
Co-firing	The burning of biomass products in fossil fuel power stations
Coke oven coke	The solid product obtained from carbonisation of coal, principally coking coal, at high temperature, it is low in moisture and volatile matter. Used mainly in iron and steel industry.
Coke oven gas	Gas produced as a by-product of solid fuel carbonisation and gasification at coke ovens, but not from low temperature carbonisation plants. Synthetic coke oven gas is mainly natural gas which is mixed with smaller amounts of blast furnace and basic oxygen steel furnace gas to produce a gas with almost the same quantities as coke oven gas.
Coking coal	Within this publication, coking coal is coal sold by producers for use in coke ovens and similar carbonising processes. The definition is not therefore determined by the calorific value or caking qualities of each batch of coal sold, although calorific values tend to be higher than for steam coal. Not all coals form cokes. For a coal to coke it must exhibit softening and agglomeration properties, ie the end product must be a coherent solid.
Colliery methane	Methane released from coal seams in deep mines which is piped to the surface and consumed at the colliery or transmitted by pipeline to consumers.
Combined Cycle Gas Turbine (CCGT)	Combined cycle gas turbine power stations combine gas turbines and steam turbines which are connected to one or more electrical generators in the same plant. The gas turbine (usually fuelled by natural gas or oil) produces mechanical power (to drive the generator) and heat in the form of hot exhaust gases. These gases are fed to a boiler, where steam is raised at pressure to drive a conventional steam turbine, which is also connected, to an electrical generator.
Combined Heat and Power (CHP)	CHP is the simultaneous generation of usable heat and power (usually electricity) in a single process. The term CHP is synonymous with cogeneration and total energy, which are terms often used in the United States or other Member States of the European Community. The basic elements of a CHP plant comprise one or more prime movers driving electrical generators, where the steam or hot water generated in the process is utilised via suitable heat recovery equipment for use either in industrial processes, or in community heating and space heating.
CHPQA	Combined Heat and Power Quality Assurance Scheme

Conventional thermal power stations	These are stations which generate electricity by burning fossil fuels to produce heat to convert water into steam, which then powers steam turbines.
Cracking/conversion	A refining process using combinations of temperature, pressure and in some cases a catalyst to produce petroleum products by changing the composition of a fraction of petroleum, either by splitting existing longer carbon chain or combining shorter carbon chain components of crude oil or other refinery 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 Carbon Reduction Commitment is a proposed mandatory cap and trade scheme that will apply to large non energy-intensive organisations in the public and private sectors.
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.
DTI	Department of Trade and Industry
DUKES	Digest of United Kingdom Energy Statistics, the Digest provides essential information for everyone, from economists to environmentalists and from energy suppliers to energy users.
ECA	Enhanced Capital Allowances
EEC	The Energy Efficiency Commitment (formerly known as Energy Efficiency Standards of Performance) is an obligation placed on all energy suppliers to offer help and advice to their customers to improve the energy efficiency of their homes.
EHCS	English House Condition Survey

Embedded Generation Embedded generation is electricity generation by plant which has been connected to the distribution networks of the public electricity distributors rather than directly to the National Grid Company's transmission systems. Typically they are either smaller stations located on industrial sites, or combined heat and power plant, or renewable energy plant such as wind farms, or refuse burner generators. The category also includes some domestic generators such as those with electric solar panels.

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.

FES Future Energy Solutions, now known as AEA Energy & Environment, part of the AEA Group.

Final energy consumption Energy consumption by final user – ie which is not being used for transformation into other forms of energy.

Fossil fuels Coal, natural gas and fuels derived from crude oil (for example petrol and diesel) are called fossil fuels because they have been formed over long periods of time from ancient organic matter.

Fuel oils The heavy oils from the refining process; used as fuel in furnaces and boilers of power stations, industry, in domestic and industrial heating, ships, locomotives, metallurgic operations, and industrial power plants etc.

Fuel oil - Light Fuel oil made up of heavier straight-run or cracked distillates and used in commercial or industrial burner installations not equipped with pre-heating facilities.

Fuel oil - Medium Other fuel oils, sometimes referred to as bunker fuels, which generally require pre-heating before being burned, but in certain climatic conditions do not require pre-heating.

Fuel oil - Heavy Other heavier grade fuel oils which in all situations require some form of pre-heating before being burned.

Fuel poverty The common definition of a fuel poor household is one needing to spend in excess of 10 per cent of household income to achieve a satisfactory heating regime (21ºC in the living room and 18ºC in the other occupied rooms).

Gas Diesel Oil The medium oil from the refinery process; used as a fuel in diesel engines (ie internal combustion engines that are compression-ignited), burned in central heating systems and used as a feedstock for the chemical industry.

GDP Gross Domestic Product.

GDP deflator An index of the ratio of GDP at current prices to GDP at constant prices. It provides a measure of general price inflation within the whole economy.

Gigajoule (GJ) A unit of energy equal to 10^9 joules.

Gigawatt (GW) A unit of electrical power, equal to 10^9 watts.

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	Iron and Steel Statistics Bureau
ITF	Industry Technology Facilitator
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 allocate, effectively stating how much that sector can emit over the trading period of the scheme
Natural gas	Natural gas is a mixture of naturally occurring gases found either in isolation, or associated with crude oil, in underground reservoirs. The main component is methane; ethane, propane, butane, hydrogen sulphide and carbon dioxide may also be present, but these are mostly removed at or near the well head in gas processing plants.
Natural gas - compressed	Natural gas that has been compressed to reduce the volume it occupies to make it easier to transport other than in pipelines. Whilst other petroleum gases can be compressed such that they move into liquid form, the volatility of natural gas is such that liquefaction cannot be achieved without very high pressures and low temperatures being used. As such, the compressed form is usually used as a "half-way house".
Natural gas liquids (NGLs)	A mixture of liquids derived from natural gas and crude oil during the production process, including propane, butane, ethane and gasoline components (pentanes plus).
NDA	Nuclear Decommissioning Authority
NETA	New Electricity Trading Arrangements - In England and Wales these arrangements replaced "the pool" from 27 March 2001. The arrangements are based on bi-lateral trading between generators, suppliers, traders and customers and are designed to be more efficient, and provide more market choice.
NETCEN	National Environment Technology Centre, now known as AEA Energy & Environment, part of the AEA Group.
NFFO	Non Fossil Fuel Obligation. The 1989 Electricity Act empowers the Secretary of State to make orders requiring the Regional Electricity Companies in England and Wales to secure specified amounts of electricity from renewable sources.
NFPA	Non Fossil Purchasing Agency
NIE	Northern Ireland Electricity
NI NFFO	Northern Ireland Non Fossil Fuel Obligation
Non-energy use	Includes fuel used for chemical feedstock, solvents, lubricants, and road making material.
NO_X	Nitrogen oxides. A number of nitrogen compounds including nitrogen dioxide are formed in combustion processes when nitrogen in the air or the fuel combines with oxygen. These compounds can add to the natural acidity of rainfall.
NUTS	Nonmenclature of Units for Territorial Statistics
OFGEM	The regulatory office for gas and electricity markets
OFT	Office of Fair Trading

ONS	Office for National Statistics
Orimulsion	An emulsion of bitumen in water that was used as a fuel in some power stations until 1997.
OTS	Overseas Trade Statistics of the United Kingdom
OXERA	Oxford Economic Research Association Ltd
Patent fuel	A composition fuel manufactured from coal fines by shaping with the addition of a binding agent (typically pitch). The term manufactured solid fuel is also used.
Petrochemical feedstock	All petroleum products intended for use in the manufacture of petroleum chemicals. This includes middle distillate feedstock of which there are several grades depending on viscosity. The boiling point ranges between 200°C and 400°C.
Petroleum cokes	Carbonaceous material derived from hydrocarbon oils, uses for which include metallurgical electrode manufacture and in the manufacture of cement.
Photovoltaics	The direct conversion of solar radiation into electricity by the interaction of light with the electrons in a semiconductor device or cell.
PILOT	Phase 2 (PILOT) is the successor body to the Oil & Gas Industry Task Force (OGITF) and was established on 1 January 2000, to secure the long-term future of the oil and gas industry in the UK. A forum that brings together Government and industry to address the challenges facing the oil and gas industry. One outcome of PILOT's work is the published Code of Practice on Supply Chain Relationships.
Plant capacity	The maximum power available from a power station at a point in time.
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.

PWR	Pressurised water reactor. A nuclear fission reactor cooled by ordinary water kept from boiling by containment under high pressure.
RD	Renewables Directive – this proposes that EU Member States adopt national targets that are consistent with the overall EU target of 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.
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
UKOOA	United Kingdom Offshore Operators Association

UKPIA	UK Petroleum Industry Association. The trade association for the UK petroleum industry.
UKSA	UK Statistics Authority
Ultra low sulphur Diesel (ULSD)	A grade of diesel fuel which has a much lower sulphur content (less than 0.005 per cent or 50 parts per million) and of a slightly higher volatility than ordinary diesel fuels. As a result it produces fewer emissions when burned, and initially enjoyed a lower rate of hydrocarbon oil duty in the UK than ordinary diesel to promote its use, although duty rates on standard diesel and ULSD have since been equalised. Virtually 100 per cent of sales of DERV fuel in the UK are ULSD.
Ultra low sulphur Petrol (ULSP)	A grade of motor spirit with a similar level of sulphur to ULSD (less than 0.005 per cent or 50 parts per million). ULSP initially enjoyed a lower rate of hydrocarbon oil duty in the UK than ordinary petrol to promote its use, although duty rates on standard petrol and ULSP have since been equalised. It has quickly replaced ordinary premium grade unleaded petrol in the UK market place.
Upstream	A term to cover the activities related to the exploration, production and delivery to a terminal or other facility of oil or gas for export or onward shipment within the UK.
VAT	Value added tax
Watt (W)	The conventional unit to measure a rate of flow of energy. One watt amounts to 1 joule per second.
White spirit	A highly refined distillate with a boiling range of about 150ºC to 200ºC used as a paint solvent and for dry cleaning purposes etc.

Annex C
Further sources of United Kingdom energy publications

Some of the publications listed below give shorter term statistics, some provide further information about energy production and consumption in the United Kingdom and in other countries, and others provide more detail on a country or fuel industry basis. The list also covers recent publications on energy issues and policy, including statistical information, produced or commissioned by DECC. The list is not exhaustive and the titles of publications and publishers may alter. Unless otherwise stated, all titles are available from

Publications Orderline
Web: www.decc.gov.uk/publications
Phone: 0845 504 9188
Email: deccteam@decc.ecgroup.net

and can also be found on the DECC website at: www.decc.gov.uk/.

Department of Energy and Climate Change publications on energy statistics

Energy Statistics
Monthly, quarterly and annual statistics on production and consumption of overall energy and individual fuels in the United Kingdom together with energy prices is available in MS Excel format on the Internet at: www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/source.aspx

Energy Trends
A quarterly publication covering all major aspects of energy. It provides a comprehensive picture of energy production and use and contains analysis of data and articles covering energy issues. Available on subscription, with Quarterly Energy Prices (see below). Annual subscriptions run from June to March and are available at £40 to UK subscribers from SSD, 2nd Floor, Foss House, 1-2 Peasholme Green, York YO1 7PX, Tel. 01904 455374. A subscription form is available at: www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx. An electronic version of the latest nine editions can be found at the same address. Single copies are available from the Publications Orderline priced at £6.

Quarterly Energy Prices
A quarterly publication containing tables, charts and commentary covering energy prices to domestic and industrial consumers for all the major fuels as well as presenting comparisons of fuel prices in the European Union and G7 countries. Available on subscription, with Energy Trends, (details given above). An electronic version of the latest nine editions can be found at: www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx. Single copies are available from the Publications Orderline priced at £8.

Energy Flow Chart
An annual publication illustrating the flow of primary fuels from home production and imports to their eventual final uses. They are shown in their original state and after being converted into different kinds of energy by the secondary fuel producers. The 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.decc.gov.uk/en/content/cms/statistics/publications/flow/flow.aspx

UK Energy in Brief

An annual publication summarising the latest statistics on energy production, consumption and prices in the United Kingdom. The figures are taken from "Digest of UK Energy Statistics". Available free from DECC, Energy Statistics Team, 6th Floor, Area B, 3 Whitehall Place, London SW1A 2AW, Tel. 0300 068 5056 and from the Publications Orderline. It is also available on the Internet at: www.decc.gov.uk/en/content/cms/statistics/publications/brief/brief.aspx

UK Energy Sector Indicators

An annual publication designed to show 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.decc.gov.uk/en/content/cms/statistics/publications/indicators/indicators.aspx.

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.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

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.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/regional.aspx

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.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/need/need.aspx

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.decc.gov.uk/en/content/cms/statistics/fuelpov_stats/fuelpov_stats.aspx

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.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/uk_emissions.aspx

UK Energy and CO2 emissions projections

The Updated Energy Projections (UEP) are published annually by DECC. They provide updated projections and analysis of energy use and carbon dioxide emissions in the UK. The UEP exercise incorporates all firm environmental policy measures and is based on updated assumptions consistent with the most recent UK Budget announcements. The latest report is available on the Internet at: www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx

Statutory Security of Supply Report

The Statutory Security of Supply Report, an evolution of the Energy Markets Outlook report, sets down technical information on security of supply. The report is available on the Internet at: www.decc.gov.uk/en/content/cms/meeting_energy/en_security/sec_supply_rep/sec_supply_rep.aspx

Department of Energy and Climate Change policy publications

Energy Bill 2012

On 22 May 2012, the Secretary of State for Energy and Climate Change announced in a Written Ministerial Statement the publication of a draft Energy Bill. This Bill will establish a legislative framework for delivering secure, affordable and low carbon energy, and includes provisions on:

- Electricity Market Reform (EMR);
- Strategy and Policy statement;
- Nuclear regulation, and
- Government pipeline and storage system.

Further information on the Bill is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/energybill2012/energybill2012.aspx

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 Statement is available on the Internet at:
www.decc.gov.uk/en/content/cms/meeting_energy/aes/aes.aspx

Energy Act 2011

The Energy Act 2011 was given Royal Assent on 18 October 2011. The Act is available on the Internet at: www.decc.gov.uk/en/content/cms/legislation/energy_act2011/energy_act2011.aspx

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.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx

Energy Act 2010

The Energy Act 2010 was given Royal Assent on 8 April 2010. The Act is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/energy_act_10/energy_act_10.aspx

UK Low Carbon Transition Plan

The UK Low Carbon Transition Plan was published on 15 July 2009. The Plan is available on the Internet at: www.decc.gov.uk/en/content/cms/tackling/carbon_plan/lctp/lctp.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.decc.gov.uk/en/content/cms/legislation/energy_act_08/energy_act_08.aspx

Climate Change Act 2008

The Climate Change Act 2008 was granted Royal Assent on 26 November 2008. The Act is available on the Internet at: www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx

Energy White Paper, 'Meeting the Energy Challenge'

The Energy White Paper, 'Meeting the Energy Challenge' was published on 23 May 2007. The White Paper is available on the Internet at:
www.decc.gov.uk/en/content/cms/legislation/white_papers/white_paper_07/white_paper_07.aspx

Other publications including energy information

General

Annual Abstract of Statistics (quarterly); *Office for National Statistics*
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 - Seven Year Statement - (annual); *National Grid*

Environment

e-Digest of Environmental Statistics; *Department for Environment, Food and Rural Affairs (Defra).*
Sustainable development indicators; *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 (annual); *International Energy Agency*
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 web sites

The DECC web site can be found at www.decc.gov.uk/, the energy information and statistics website is at www.decc.gov.uk/en/content/cms/statistics/statistics.aspx

Other Government web sites

Department for Communities and Local Government.	www.communities.gov.uk
Department for Environment, Food and Rural Affairs	www.defra.gov.uk
Department for Transport	www.dft.gov.uk
HM Government Online	www.direct.gov.uk
HM Revenue & Customs	www.hmrc.gov.uk
Northern Ireland Executive	www.northernireland.gov.uk
Ofgem (The Office of Gas and Electricity Markets)	www.ofgem.gov.uk
The Scottish Government	www.scotland.gov.uk
The Scottish Parliament	www.scottish.parliament.uk
UK Parliament	www.parliament.uk
UK Statistics Authority	www.statisticsauthority.gov.uk
Welsh Government	http://wales.gov.uk/

Other useful energy related web sites

AEA Energy & Environment	www.aeat.co.uk
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 Focus	www.consumerfocus.org.uk/
Energy Institute	www.energyinst.org
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.bwea.com
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

2012

Energy Policy

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.

The main elements of the Bill are:

- Introducing a system of low-carbon generation revenue support (a feed-in tariff with Contracts for Difference of FiT-CfD). The FiT-CfD would provide more certainty of revenues for low-carbon generation and make investment in clean energy more attractive.

- Introduction of an Emissions Performance Standard (EPS) to provide a regulatory backstop to prevent construction of new coal plants which emit more than 450g/kWh i.e. the most carbon-intensive form of electricity generation.

- Introducing a capacity mechanism to ensure security of supply, ensuring there is sufficient reliable and diverse capacity to meet demand.

- Creating an independent, industry financed statutory regulator, the Office for Nuclear Regulation.

- Enabling the sale of a Ministry of Defence asset, the Government Pipeline and Storage System (GPSS).

- Introducing a Strategy and Policy Statement which would set out the Government's strategic priorities for the energy sector in Great Britain, describe the roles and responsibilities of bodies who implement or are affected by GB energy policy and describe policy outcomes which are to be achieved by the regulator and the Secretary of State when regulating the sector.

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 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.

2012 (continued)

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.

Feed in Tariffs

At the start of April 2012, changes were made to the feed in tariffs for solar installations. This followed a consultation process and subsequent legal challenges.

Fuel Poverty

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.

Green Deal

The secondary legislation underpinning the Green Deal and Energy Company Obligation has been laid in Parliament and is expected to be on the statute books before summer recess. 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.

Oil and Gas

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.

2012 (continued)

In May 2012, an agreement was reached that averted the threat of a national fuel strike. In March the threat of strike action resulted in panic-buying at some forecourts, leading to a number running out of fuel.

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).

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.

2010

Carbon Capture and Storage
Funding was awarded by the Government in March 2010 to E.ON and Scottish Power for design and development studies as part of the competition to build one of the world's first commercial scale carbon capture and storage demonstration plants. The funding will support Front End Engineering and Design studies, which will enable the companies to further their designs for the projects at Kingsnorth and Longannet respectively.

Carbon Emissions Reduction Target
The Government announced in June 2010 that the CERT target will be extended from March 2011 until December 2012 as well as placing new obligations on energy companies to include:

- 68% of energy suppliers' work will now have to be met through professionally installed loft, cavity and solid wall insulation. With DIY insulation added, more than 80% of the scheme will be focused on insulation. Previously just 60% was met through professional and DIY work;

- 15% of homes helped will be the lowest income households more at risk of fuel poverty;

- Energy companies will now be stopped from promoting compact fluorescent lamps in order to prioritise insulation, further to the total ban on light bulb mail-outs.

The changes to CERT will mean some 3.5 million more homes across Great Britain are likely to benefit from insulation, building substantially on the 2.5 million homes treated under the scheme since April 2008.

Climate Change
The United Nations Climate Change conference took place in Cancun, Mexico in November/December 2010. Key outcomes from the agreements at the conference are:

- Objective: agreed to peak emissions and an overall 2 degree target to limit temperature rise.

- Emissions: bringing details of what developed and developing countries are doing to tackle climate change, promised in Copenhagen, into the UN system so they can be assessed.

- MRV: agreed a system so we know how countries are living up to their promises to take action on emissions

- Long-term finance: established the Green Climate Fund and will start to get it ready to help developing countries go low carbon and adapt to climate impacts.

- Deforestation: agreed to slow, halt and reverse destruction of trees and agree the rules for delivering it and for monitoring progress.

- Technology/Adaptation: set up the mechanisms to help developing countries access low carbon technology, and adapt to climate change.

2010 (continued)

In April 2010, the Government launched an incentive scheme, Carbon Reduction Commitment Energy Efficiency Scheme (CRC EES), which aims to save public and private sector organisations around £1billion per year by 2020 through cost effective energy efficiency measures that are not yet being taken up.

Electricity

In December 2010 the Government launched consultations on fundamental reforms to the electricity market to ensure the UK can meet its climate goals and have a secure, affordable supply of electricity in the long term. The key proposals include:

- Four reforms to provide long-term certainty for electricity investors.
- A new market to have built-in level playing field for low carbon .
- Rules for existing investments protected.
- Long term impact on household electricity bills lower than under the current market.

In November 2010, the Government gave approval for the construction of a 900 MW Combined Cycle Gas Turbine (CCGT) power station at West Marsh Road, Spalding, Lincolnshire.

The Government gave consent, in April 2010, for the construction of a 1,520 MW Combined Cycle Gas Turbine (CCGT) power plant in Carrington, Greater Manchester.

Emissions Trading

In January 2010, 4.9 million allowances were auctioned in the eighth auction as part of phase II of the EU ETS. In 2010, the UK plans to auction a total of 35.8 million allowances.

Energy Policy

In December 2010 the Energy Bill 2010, announced in the Queen's Speech in May 2010, was published. The Bill has three principal objectives: tackling barriers to investment in energy efficiency; enhancing energy security; and enabling investment in low carbon energy supplies.

In October 2010 it was announced that the Department of Energy and Climate Change will, over the course of the Spending Review period (2011-2015), reduce resource spending by 18% in real terms, and increase capital spending by 41% in real terms. The Department's administration budget will be reduced by 33%.

2010 (continued)

In the first ever Annual Energy Statement to Parliament in July 2010, the Energy and Climate Change Secretary set out 32 actions being taken to accelerate the transformation of the energy system and wider economy in 4 key areas:

- Saving energy through the Green Deal and supporting vulnerable consumers
- Delivering secure energy on the way to a low carbon energy future
- Managing the UK energy legacy responsibly and cost-effectively
- Driving ambitious action on climate change at home and abroad

Published alongside the Statement was a groundbreaking '2050' analysis, which included 6 illustrative 'pathways' showing that meeting the target of an 80% cut in emissions by 2050 is ambitious but achievable, and compatible with maintaining security of energy supplies. An online '2050 Calculator' was also launched, enabling the public to explore the trade-offs inherent in designing the future secure, low carbon energy system and wider economy.

Major low carbon components of the Budget announced by the Chancellor in June 2010 include:

- An assessment of how the energy tax framework can provide the right incentives for investment, alongside wider market reforms.
- Detailed proposals on the creation of a Green Investment Bank, following the Spending Review, to help the UK meet the low-carbon investment challenge.
- Establishing a Green Deal for households through legislation in the Energy Security and Green Economy Bill, to help individuals invest in home energy efficiency improvements that can pay for themselves from the savings in energy bills.
- Making the tax system fairer by examining options for the design of a fair fuel stabiliser; considering the case for introducing a fuel duty discount in remote rural areas; and exploring changes to the aviation tax system.

2010 (continued)

The Energy Bill received Royal Assent in April 2010, becoming the Energy Act 2010. The main elements of the new Act are:

- Carbon capture and storage (CCS) – delivering a new financial incentive to bring forward four commercial scale demonstration projects on coal-fired power stations and to support the retrofit of additional CCS capacity to those projects should it be required at a later date.

- Mandatory social price support – creating a framework to mandate energy companies to provide support to the fuel poor, including powers to give greater guidance and direction on the types of households eligible for future support and the type of support they should be given.

- Clarifying Ofgem's remit – making it clear that Ofgem must: include the reduction of carbon emissions and the delivery of secure energy supplies in their assessment of the interests of consumers, and step in proactively to protect consumers as well as considering longer term actions to promote competition.

- Tackling market power exploitation – giving Ofgem additional powers to tackle market exploitation where companies might take advantage of constraints in the electricity transmission grid.

Major low carbon components of the Budget announced by the Chancellor in March 2010 include:

- A new Green Investment Bank for Low Carbon Development to assist the finance challenge confronting infrastructure projects in the UK.

- An offshore wind infrastructure competition for up to £60m of funds to develop sites close to ports that will support manufacturing for the offshore wind industry.

- Publication of the initial findings of the Energy Market Assessment, narrowing down the options for market reform to incentivise the necessary investment over the next few decades and to ensure the consumer gets the best deal possible in the long term.

- Government and the financial services industry will undertake detailed work through a joint forum to develop Pay As You Save arrangements. This will enable millions of households to finance the high upfront costs of installations from the savings they make on their energy bills.

- A consultation on proposals to change the way in which electricity from biomass is supported to improve investor certainty and ensure sustainability.

- Government intends to opt nitrous oxide gases from nitric acid production into the EU ETS from 2011.

2010 (continued)

The Government launched in January 2010 a national scheme to upgrade household heating systems to cut carbon, save money on fuel bills and sustain work for the heating industry. Up to 125,000 households in England with working “G-rated” boilers can apply through the Energy Saving Trust for a voucher which will entitle them to £400 off the price of a new, modern “A-rated” boiler or a renewable heating system like a biomass boiler or a heat pump.

Oil and Gas

In October 2010 the Government issued a gas storage licence for ENI’s proposed major new gas storage facility at the Deborah field, under the Southern North Sea near the Bacton terminal, if established the facility will become the first large scale UK depleted offshore field to be used as a gas storage facility in 27 years.

In September 2010, the Government gave approval for WINGAS Storage to convert its Saltfleetby onshore gas field into an underground gas storage facility. As a result the UK’s gas storage capacity is set to rise by 15 per cent with Saltfleetby in Lincolnshire, the UK’s largest onshore gas field, providing between 700 million to 800 million cubic metres of new gas storage capacity.

In June 2010, the Government approved the development of the Bacchus oil and gas field located in the Central North Sea, which has estimated reserves of 18 million barrels of oil equivalent.

In June 2010 the Government announced record levels of interest in new developments in the North Sea. 356 blocks were applied for in the latest licensing round, the largest number of blocks applied for since the first licensing round was launched in 1964.

In April 2010, South Hook, Europe's largest Liquefied Natural Gas (LNG) Terminal, at Milford Haven in South West Wales, successfully completed the build and commissioning of phase 2 and is now complete. The terminal has a total processing capacity of 15.6 million tonnes per annum of LNG and is capable of delivering up to 21 billion cubic metres per annum of gas into the National Transmission System (NTS).

The Government gave consent, in March 2010, for Total and Dong Energy to develop the Laggan and Tormore gas fields, which lie in 600 metres of water and in one of the most hostile environments in the UK. These will be the first gas fields to be developed in UK waters at this depth and will produce more than 1 trillion cubic feet of gas in the course of the field’s life.

The Government issued, in February 2010, the first licence under the Energy Act 2008 to encourage the construction of more gas storage which could see the UK’s gas storage capacity increase by 30%. The Gateway Project, located in the east Irish Sea, will create twenty new salt caverns each the size of the Albert Hall.

A new round of offshore licensing was announced in January 2010. The 26th offshore licensing round will allow for oil and gas exploration in UK waters; for the first time since 1998, this round offers blocks in all areas of the UK seas for new licensing. The blocks offered include a number relinquished under the Government and industry’s 'Fallow Initiative', which stimulates activity on blocks where there had been no significant activity for three years.

2010 (continued)

Renewables

In November 2010, the Government gave approval for a 56MW onshore wind farm on the Ray Estate near Kirkwhelpington, Northumberland.

The world's largest wind farm off the south coast of England was officially opened in September 2010. The Thanet Offshore Windfarm will generate enough electricity to power 200,000 homes. It increases the UK's output by a third and means that the UK now generates more offshore wind than the rest of the world put together.

In April 2010, the Government launched the Feed in tariffs (FITs) scheme, which will allow individuals, organisations or businesses in England, Wales and Scotland who install low carbon electricity generation to be paid for any electricity they generate themselves from low carbon sources and benefit from a cheaper electricity bill.

The Government, in March 2010, gave approval to the construction of a new 100 MW power plant fuelled by biomass at Bristol Port, Avonmouth.

In January 2010 The Crown Estate, owner of the UK's coastal seabeds, granted rights to energy companies to develop wind energy. The announcement has the potential to see an additional 32GW of wind generation into the UK grid, on top of 8GW from previous rounds, and will mean an extra 6,400 turbines.

For major events in earlier years see the DECC website version of this annex at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

DECC news stories including press releases, speeches and statements are available on the Internet at: www.decc.gov.uk/en/news/