Department for
Business, Energy
& Industrial Strategy

Digest of United Kingdom Energy Statistics 2018

Annexes E – J and long-term trends tables

Contents

Long term trends tables:

Annex E

Energy and the environment

Carbon dioxide emissions

E.1 Provisional 2017 results for UK Greenhouse Gas emissions and progress towards targets were published on 29 March 2018. A copy of the statistical release and associated data tables are available on the BEIS section of the GOV.UK website at:
www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2017

Oil pollution, oil releases and gas flaring

E.2 The amounts of oil released around the coasts of the United Kingdom and offshore (North Sea) are small in relation to total oil production, with the amounts discharged on drill cuttings, and with produced water generally much larger than from offshore installation releases. The total amount of oil released offshore during 2017 was approximately 23 tonnes.

E.3 The number of oil release reports recorded in 2017 amounts to 220, which is slightly lower than the 238 reported during 2016. 2016 had only one incident where oil exceeded 1 tonne of oil released but 2017 had 6. These 6 reports account for 16 tonnes of oil released and one single incident in April accounted for 8 tonnes.

E.4 The Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 (OPPC) came into effect in August 2005. Under OPPC installations are granted a permit for activities discharging oil-contaminated water to sea, but the oil content must not exceed 30 milligrams per litre. The average content of oil in produced water for 2017, for the UKCS as a whole, was 20.41 milligrams per litre compared to 16.99 milligrams per litre in the previous year.

E.5 Under the terms of petroleum production licences, gas may be flared only with the consent of the Secretary of State. Flaring at offshore installations in 2017 was estimated to be 3.82 million cubic metres of gas per day, 25 per cent higher than in 2016. In 2017 gas flared was equivalent to about 3 per cent of UK production.

Data sources

E.6 Figures for the total number of oil releases reported are collected by the Advisory Committee on Protection of the Sea Annual Surveys of Oil Pollution around the Coasts of the United Kingdom.

E.7 Further information on oil spills and discharges including historical data is available on the oil and gas section of the GOV.UK website at: www.gov.uk/oil-and-gas-environmental-alerts-and-incident-reporting.

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Annex F

United Kingdom oil and gas resources

Introduction

F.1 This section provides background information on the United Kingdom's crude oil, natural gas liquids and natural gas production, disposal and operations. This information is intended as a supplement to that in the commodity balances included in Chapter 3. Most of the data (including those on gas) are obtained from the Oil and Gas Authority's (OGA) Petroleum Production Reporting System (PPRS). Further information can be obtained from OGA's website at www.ogauthority.co.uk/. Oil tables F.1, F.3 & F.4 are available at: www.gov.uk/government/statistics/petroleum-chapter-3-digest-of-united-kingdom-energy-statistics-dukes, and gas table F.2 is available at: www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes

F.2 The annual statistics relate to calendar years, or the ends of calendar years, and the data cover the United Kingdom Continental Shelf [UKCS] (both onshore and offshore).Annual data for production, imports and exports of crude oil during the period 1970 to 2017 are given in Chapter 3, long term trends, Table 3.1.1 (www.gov.uk/government/statistics/petroleum-chapter-3-digest-of-united-kingdom-energy-statistics-dukes). The equivalent for natural gas production is Chapter 4, long term trends, Table 4.1.1 (www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes).

Oil and gas reserves

F.3 Information on oil and gas reserves can be found on the Oil and Gas Authority's (OGA) data section of their website at: www.ogauthority.co.uk/data-centre/data-downloads-and-publications/reserves-and-resources/.

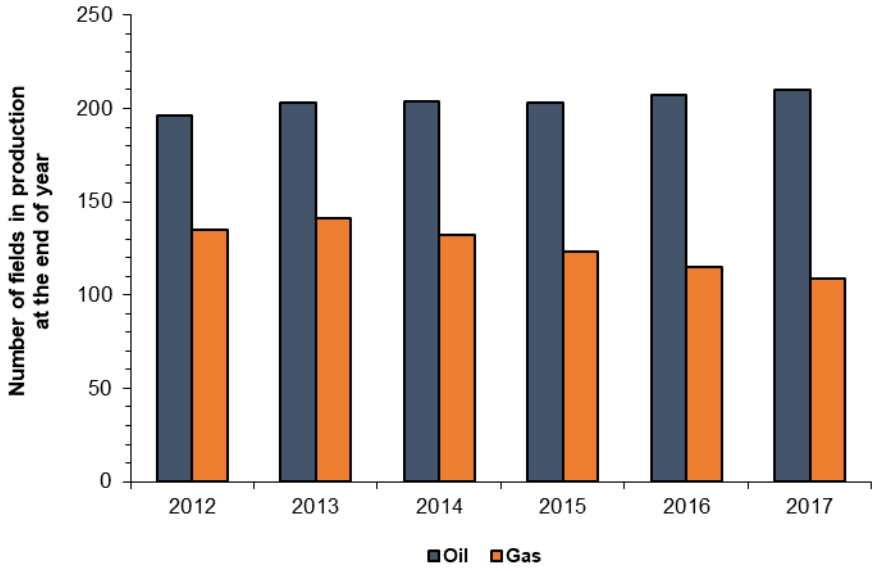
Offshore oil and gas fields and associated facilities

F.4 Table F.A below shows that the number of offshore oil fields in production or under development rose from 198 at the end of 2010 to 225 at the end of 2017. For offshore gas fields the equivalent change between the end of 2010 and 2016 was from 137 to 115 with a few older gas fields closing and not many being added into production. Most oil fields also produce gas: these are not double-counted. The changes in the number of fields in production are shown in Chart F.1 (offshore fields in production). Throughout the period since 2010 there have been 5 onshore oil terminals. In 2007 there were 5 onshore associated sub-gas terminals and 9 other (dry) sub-gas terminals. However, during 2010 the three (dry) sub terminals at Easington were combined into a single terminal. In 2011 two (dry) sub-gas terminals at Bacton were combined into a single sub-gas terminal. While there are significant numbers of oil and gas fields onshore, total onshore production is less than 2 per cent of the UK total.

Table F.A: Offshore oil and gas fields and facilities

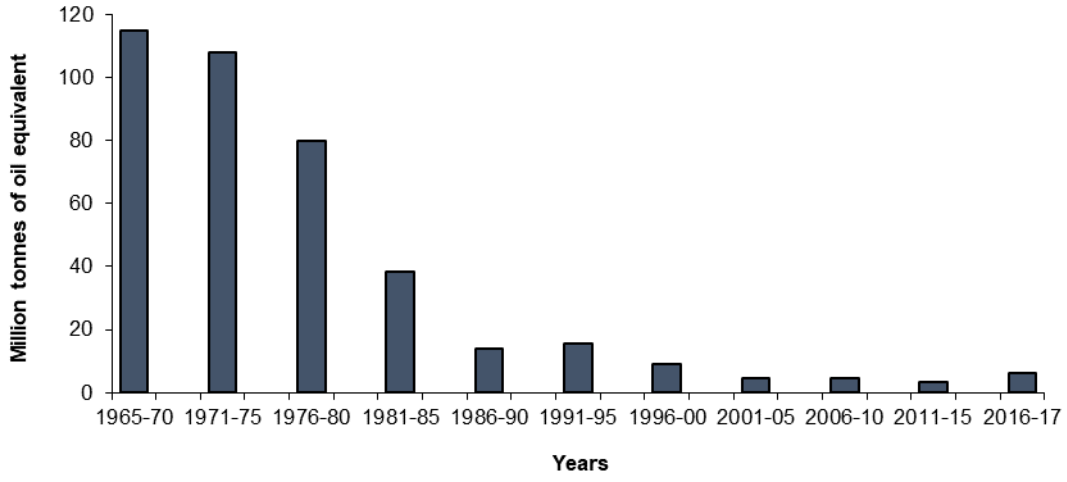
	2012	2013	2014	2015	2016	2017
Offshore oil fields in production	196	203	204	203	207	210
Offshore oil fields under development	23	25	30	27	22	15
Offshore gas fields in production	135	141	132	123	115	109
Offshore gas fields under development	8	3	2	2	0	0

Chart F.1: Number of offshore oil and gas fields in production, 2012 to 2017



The average size of fields commencing production in the years 2016 was 6.3 million tonnes of oil equivalent (see Chart F.2). The general fall in average field size reflects a decline in the size of fields discovered compared with the early period of the development of the North Sea and the effect of improved technology providing cost-effective means of extracting oil and gas from smaller fields and hitherto unpromising locations. The industry continues to face a range of challenges in order to realise fully the North Sea's potential. Alongside other initiatives, government and industry are tackling these challenges via a number of working boards reporting to the MER UK Forum.

Chart F.2: Average size[(1)] of offshore oil and gas fields commencing production



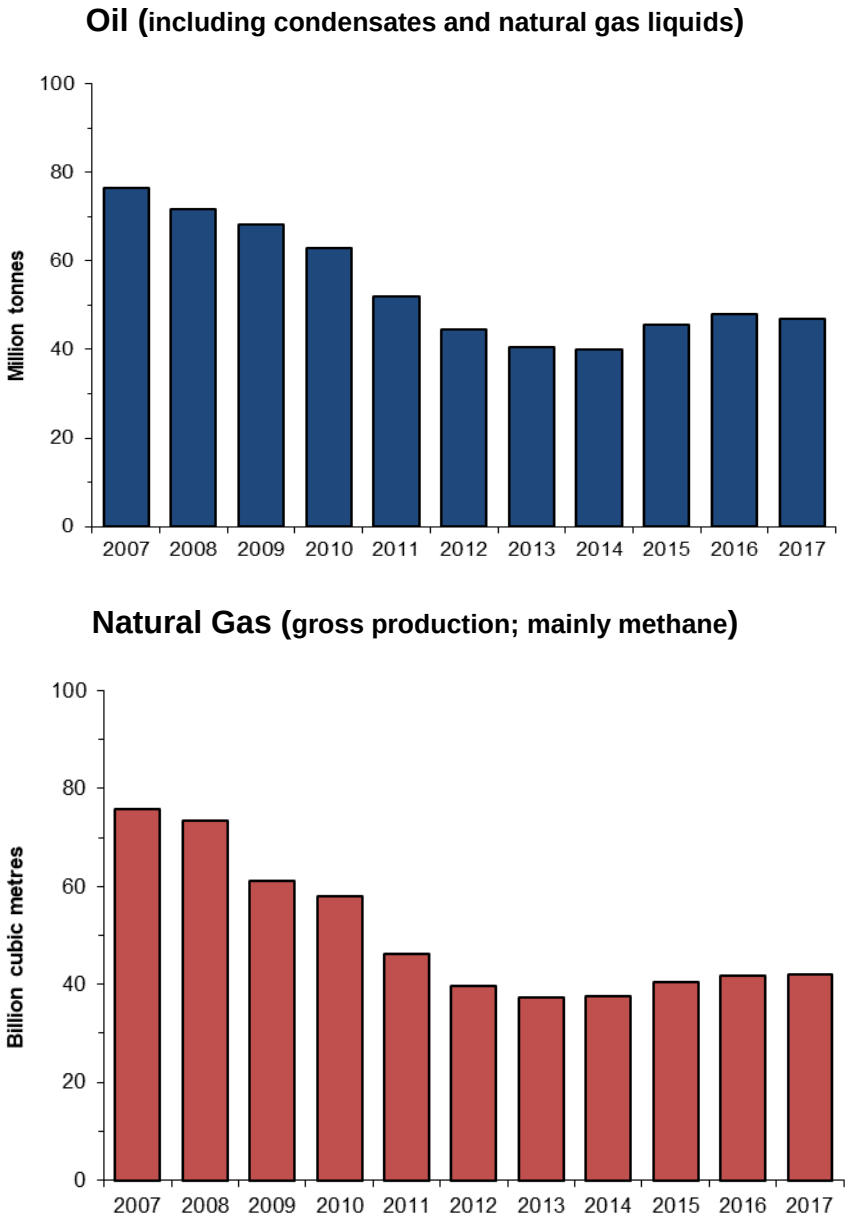
(1) Recoverable reserves originally present based on the operators' best estimate at the time production commenced. Please note that the start-up of the very large Buzzard field in 2007 does not stand out in this table because of the start-up of a significant number of fields with much smaller reserves.

Production of oil and gas (Tables F.1, F.2 and F.3)

F.6 These tables show production of crude oil, natural gas (mainly methane) and natural gas liquids. Before 2001, oil and gas production were reported based on field level data on well-head production, but aggregate figures are now based on terminal receipts following the introduction in January 2001 of a simplified Petroleum Production Reporting System and subsequent in-house changes to the data collection system. These new data are more accurate measures of production because the oil that leaves a terminal has been stabilised (that is any water, natural gas liquids or other organic compounds have been removed from the crude oil). Gross gas production includes gas used at terminals but excludes any flaring or venting at the terminals (not available before 2001).Field level data can still be found at OGA's data section of their website at: www.ogauthority.co.uk/data-centre/data-downloads-and-publications/production-data/

F.7 Chart F.3 shows the trend in total oil production from 2005 to 2017. After reaching a record level of 137 million tonnes in 1999, production has generally declined each year with the exception of 2015 and 2016. In 2017 production reached 46.9 million tonnes, 34 per cent of the peak level. Gross natural gas production (mainly methane) peaked in 2000 at 115 billion cubic metres, similarly to oil production this has been on a steady decline with the exception of the last three years with production at 42 billion cubic metres in 2017, 36 per cent of the peak level.

Chart F.3: Production of oil and gas, 2007 to 2017

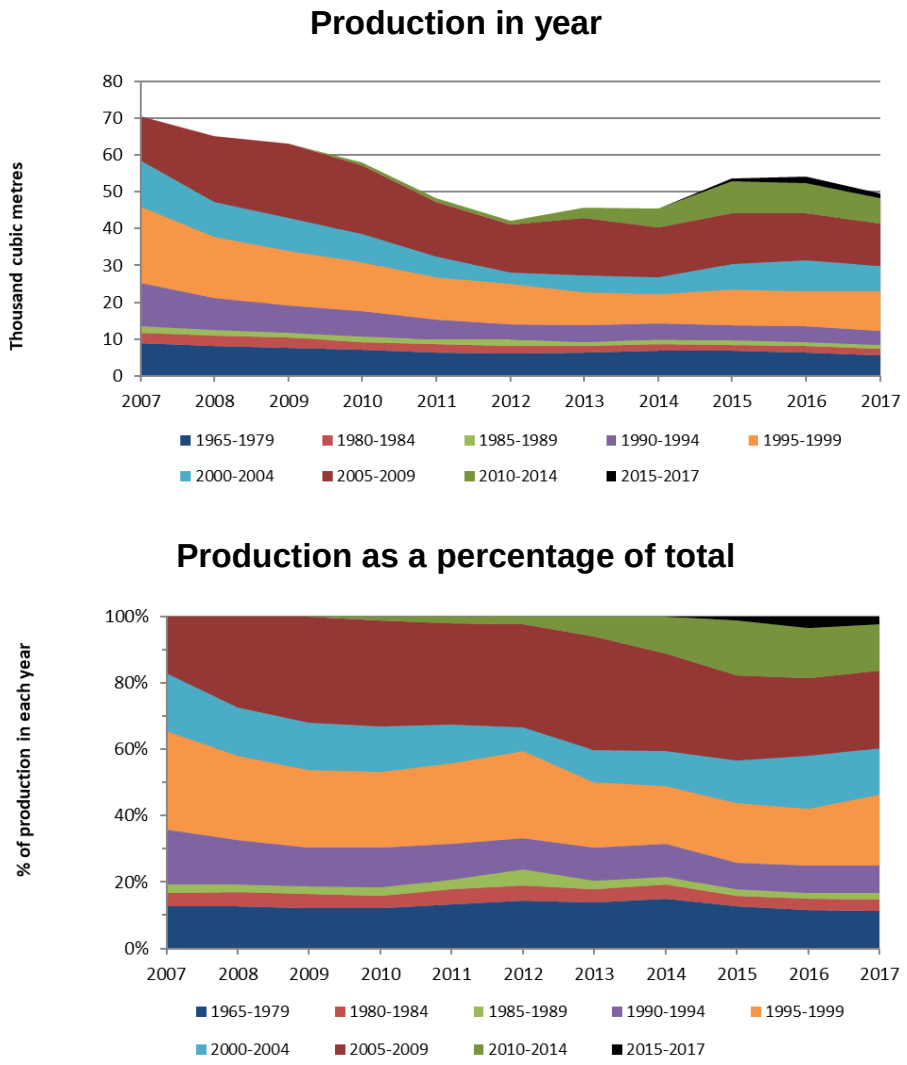


Production of crude oil

F.8 Production from established oil fields has been dropping in recent years. This is illustrated in Chart F.4 below, where oil production in each year from 2007 to 2017 is broken down by the age group of the fields in production during that year. Two charts are shown, the first with the actual amounts of crude oil produced during the year for each age group and the second with the same data transformed to show what percentage of total production each year comes from each field age group. The data used to produce these charts can be found in OGA's data section of their website at: www.ogauthority.co.uk/data-centre/data-downloads-and-publications/production-data/.

F.9 It can be seen from the production chart that during the 2000s the amount of oil produced from older established fields was in general decline. It is also noticeable that the decline for 1995-1999 as well as 2000-2004 developments is greater than for earlier development beginning in the 60s, 70s and 80s. This is because later technology meant crude oil could be extracted at a relatively greater rate leading to a quicker exhaustion of the reserves. Production for fields starting up between 2005-2009 have remained stable since 2011. Production from 2010 to 2014 reached a peak 2015 with some minor decreases in the years since. In 2017, newer (post 1994) fields accounted for 75 per cent of the UK's oil production, with an increase in production in 2015 due to the resolution of maintenance issues affecting the Buzzard field in late 2014 and the new discovery of the current second largest North Sea oil field Golden Eagle reaching full production in 2015. The charts also clearly reflect the start up and prolonged plateau of the very large Buzzard field at the beginning of 2007.The suspension of production from the Elgin/Franklin area because of a gas leak in March 2012 can be seen in chart F.4 with production rising from 2014 following field developments.

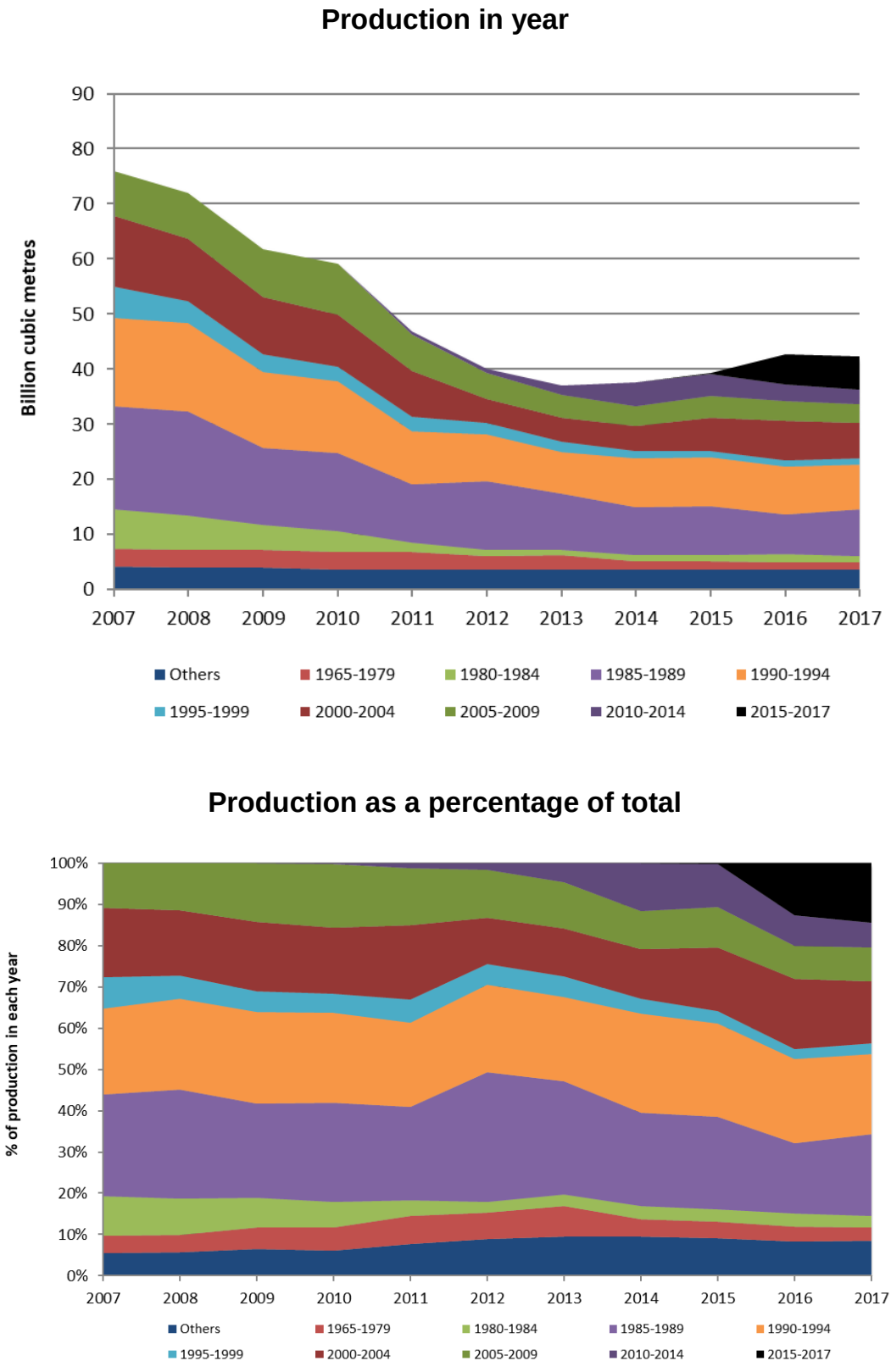
Chart F.4: Age profile of UK crude oil production



Production of gas

F.10 The charts below present gross gas production reported at field/system level and include gas used for drilling, production and pumping operations, but exclude gas flared, vented and re-injected. The data used to produce these charts can be found in OGA's data section of their website at: www.ogauthority.co.uk/data-centre/data-downloads-and-publications/production-data/.

Chart F.5: Age profile of gross UK gas production

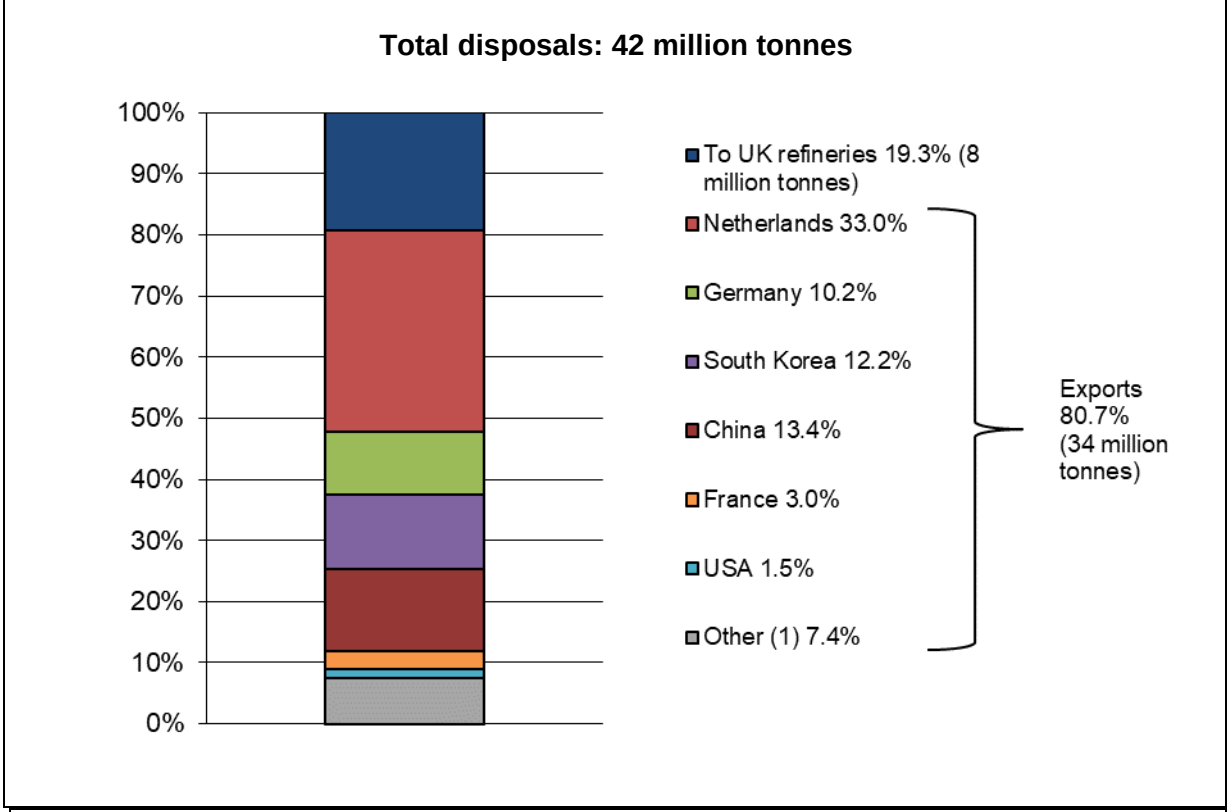


F.11 Gross gas production reached a peak in 2000.Since then production has fallen to 37 per cent of peak production with slight rises in production in 2014, 2015 and 2016 (Chart F.5). As mentioned above (in paragraph F.8) for older oil fields, production from the older gas fields that were discovered in the Southern North Sea has reduced in recent years as the reserves originally present in the fields become depleted. Chart F.5 illustrates this. The apparent extent of the decline in gas production from older fields is not as significant as that shown for oil fields (Chart F.4). This is partly because most associated gas production is not back allocated to individual fields and, therefore, the associated gas is based on terminal start date rather than field start date. However, it should be noted, as mentioned above (in paragraph F.9), for fields that commenced production in 2000 to 2004, the impact of the suspension of production from the Elgin/Franklin area in March 2012 because of a gas leak is clearly reflected.

Disposals of crude oil (Table F.4)

F.12 Table F.4 and Chart F.6 show the destination of crude oil split between amounts to UK refineries and exports (see technical notes, paragraphs F.14 to F.21) by country of destination (from which it may be transhipped elsewhere). The figures are obtained from returns made to the Oil and Gas Authority by operators of oil fields and onshore terminals under the Petroleum Production Reporting System (see paragraphs F.16 to F.18).

Chart F.6: UKCS disposals of crude oil 2017



(1) Of which: Spain 24%, Republic of Ireland 17%, Canada 10%, Singapore 10%, Sweden 7%, Denmark 6% and Norway 5% (for remainder see table F.4).

F.13 The exports figures in Table F.4 may differ from those compiled by the United Kingdom Petroleum Industry Association (UKPIA) and published in Chapter 3. UKPIA figures also include re-exports. These are products that have been imported into the UK and stored before being exported from the UK, and were never part of UK production.

Technical notes and definitions

Petroleum Production Reporting System

F.14 Licensees operating on the UK Continental Shelf are required to make monthly returns on their production of hydrocarbons to the Oil and Gas Authority (OGA). OGA compiles this information in the Petroleum Production Reporting System (PPRS). The PPRS is used to report flows, stocks and uses of hydrocarbon from the well-head through to final disposals from a pipeline or terminal and is the major source of the information presented in this chapter.

F.15 Returns are collected covering field and terminal data compiled by relevant reporting units. Each type of return is provided by a single operator, but usually covers the production of a number of companies, since frequently operations carried out on the Continental Shelf involve several companies working together in joint ventures.

F.16 Every production system has one or more sets of certified meters to measure oil, gas or condensate production. The flows measured by the meters are used to check the consistency of returns and are therefore used to assure the accuracy of the PPRS.

Exports

F.17 The term exports used in Table F.4 refers to figures recorded by producers of oil and gas for their exports. These figures may differ from the figures for exports compiled by HM Revenue and Customs (HMRC) and given in Annex G. In addition, HMRC now differentiate between EU and non-EU trade by using the term dispatches for trade going to other EU countries, with exports retained for trade going to non-EU countries. The differences can occur between results from the two sources of information because, whilst the trader's figures are a record of actual shipments in the period, for non-EU trade HMRC figures show the trade as declared by exporters on documents received during the period stated.

F.18 In addition, trade in oil frequently involves a "string" of transactions, which can result in the actual destination of the exports changing several times even after the goods have been dispatched. As such, differences can arise between the final country of destination of the exports as recorded by the producers themselves and in the HMRC figures. The HMRC figures also include re-exports. These are products that might originally have been imported into the UK and stored before being exported back out of the UK, as opposed to actually having been produced in the UK.

F.19 In editions of the Digest before 1997, these exports were called "shipments" in an attempt to highlight their difference from the other sources of trade data.

Units of measurement for gas

F.20 The basic unit of measurement for quantities of flows and stocks is volume in cubic metres at a temperature of 15°C and a pressure of 1.01325 bar.

Monthly and Quarterly data

F.21 Monthly and quarterly data on the production of crude oil and natural gas from the UKCS, along with details of imports and exports of oil, oil products and gas, are available. This information can be obtained free of charge by following the links given at the BEIS Energy Statistics section of the GOV.UK website at:
www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics

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Annex G

Foreign trade

This annex provides an overview of published trade data by HM Revenue and Customs (HMRC) on energy products in the UK. There are some inconsistencies between the HMRC energy trade data and that presented in the main chapters of DUKES. In the main chapters, the trade data are produced from a combination of data from HMRC and from companies responding to BEIS statistical surveys. The data for this annex are presented in tables G1-G7 available at: www.gov.uk/government/statistics/dukes-foreign-trade-statistics

Main points for 2017

Provisional data from HMRC show that:

- There were a total of 147.8 million tonnes of oil equivalent (mtoe) imported to the UK in 2017 which was 3.8 per cent higher than in 2016 (**table G.1**).
- Exports rose in 2017 by 7.7 per cent to 90.6 mtoe, having been broadly level over the past four years (**table G.1**).
- The energy trade deficit stood at £13.3 billion, 29 per cent more than in 2016. The increase was largely due to increased deficit in all energy products (**table G.7**).

Imports by fuel type:

- Coal imports fell by 4.9 per cent to 8.8 million tonnes in 2017 (**table G.2**).
- Crude oil imports rose by 16 per cent to 50.8 million tonnes to satisfy demand at refineries processing as indigenous production fell (**table G.3**).
- HMRC data shows that the UK was a net importer of petroleum product in 2017 by 9.7 million tonnes (**table G.3**).
- Gas imports fell by 1.6 per cent to 524 TWh, within which LNG imports decreased 34 per cent (**table G.5**).

Introduction

G.1 This annex provides an overview of the UK energy trade commodities which also corresponds with that published in the *Overseas Trade Statistics of the United Kingdom (O.T.S.)*[1]. Section I of this annex covers energy trade volumes while section II covers energy trade value.

G.2 The volume information in section I, focuses on the declaration made to HMRC on UK imports and exports in relation to countries outside the European Union (EU) as well as on arrivals and dispatches in relation to EU member states. In table G.1, BEIS has converted the HMRC data into million tonnes of oil equivalent (mtoe), so that energy sources can be combined to provide an overview of total trade. The value information, in section II, corresponds to that published by the Office for National Statistics energy trade value data.

G.3 In this annex, BEIS has used estimates based on its industry trade reports for some recent gas data to improve on the accuracy and quality of the data. Those estimates are indicated and footnoted in the tables.

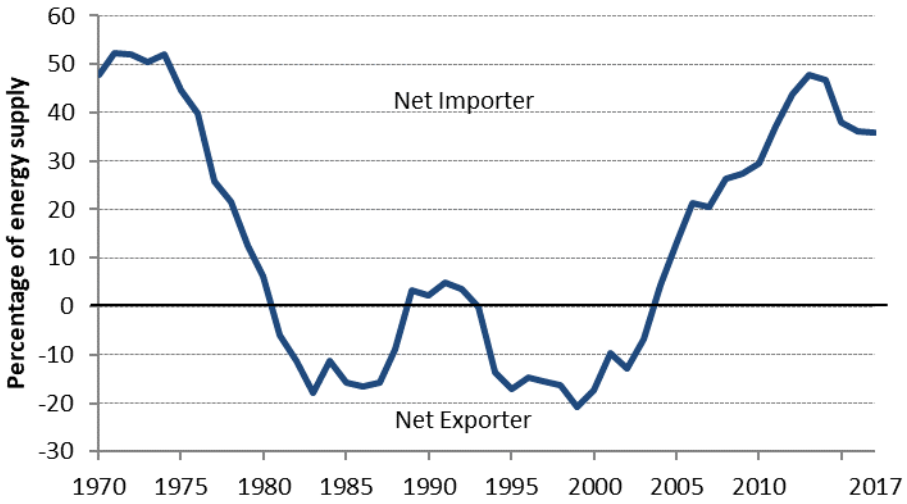
[1] www.uktradeinfo.com/Statistics/Pages/Statistics.aspx

SECTION I - Volume

1.1 Overview - Import and export of fuels

G.4 In the 1970s the UK was a net importer of energy. Discoveries of oil and gas from the North Sea and the price spikes of 1973 led to a large rise in domestic UK crude oil production. In the early 1980s the UK became a net exporter of energy. However, as a result of the Piper Alpha disaster in 1988, oil production fell, leading to the UK reverting back to become a net importer of energy. The UK once again became a net exporter in the mid-1990s as a result of growth in the North Sea production, but after the peak in 1999, North Sea production slowed and since 2004 the UK once again became and has remained a net importer of fuels. **Chart G.1a** below shows the UK net import dependence level (net imports compared to demand) from 1970 to 2017, based on BEIS data. Following the peak in 2013, net import dependency has continued to fall with a sharp fall in 2015. In 2017 net import dependency dropped slightly by 0.4 percentage points to 35.8 per cent as imports rose by 1.2 per cent while exports rose by 4.7 per cent.

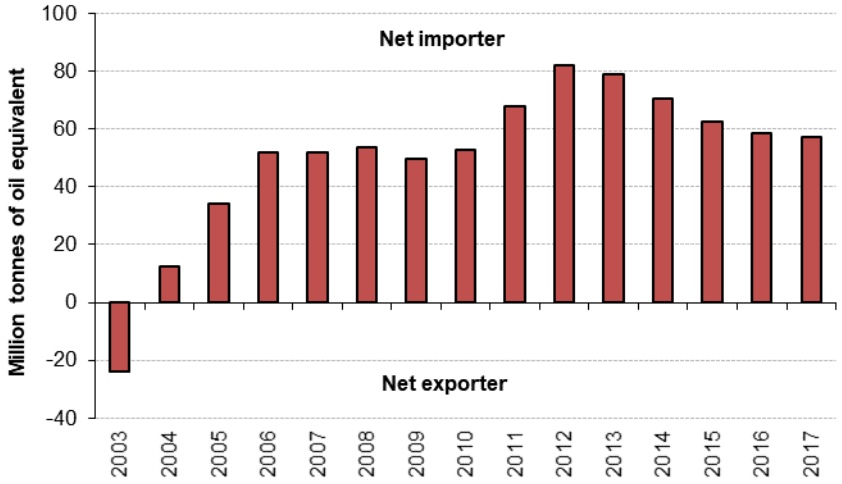
Chart G.1a: UK import dependency, 1970 to 2017



Source: BEIS

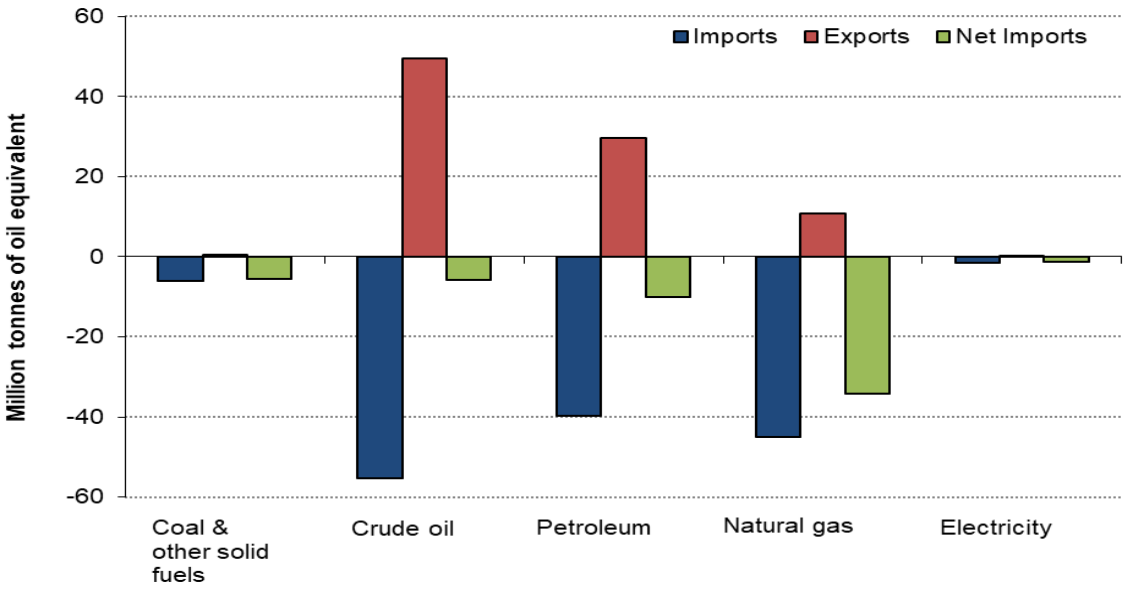
G.5 HMRC data shows that since the switch from being a net exporter in 2003 to a net importer in 2004, the UK has continued to remain a net importer of energy. Net imports have since grown considerably as the falls in UK energy consumption have been outweighed by the continuing decline in production. Since the peak in 2012, net imports have been on the decline and in 2017, total net imports of fuels fell by 1.9 per cent on the previous year to 57.3 million tonnes of oil equivalent (mtoe); as imports rose by 3.8 per cent while exports rose by 7.7 per cent (***Chart G.1b***). ***Table G.1***, at the end of this annex, shows the HMRC UK import and export quantities for all fuel types since 2002.

Chart G.1b: UK net imports of fuel, 2003 to 2017



G.6 ***Chart G.2*** illustrates trade by fuel type based on HMRC volume data together with average BEIS data on the energy content of the fuels for 2017 and in which the UK was a net importer of all fuels. The UK has for a long time been a net exporter of petroleum products but over the past few years exports levels have declined. In 2017 with fall in indigenous production and increase in crude prices, activities at refineries fell slightly. The UK was again a net importer of petroleum products in 2017 as demand increased slightly by 0.5 per cent while production fell by 0.1 per cent. BEIS petroleum products volume data shows the switch from net exports to net imports occurred in 2013, a year earlier to the HMRC data.

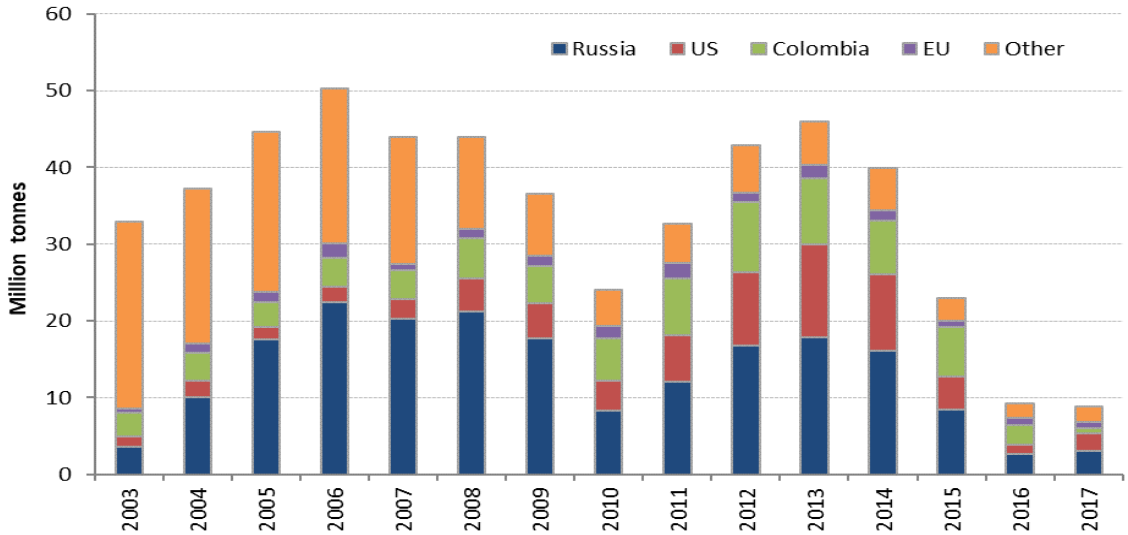
Chart G.2: Imports and exports by fuel type, 2017



1.2 Coal and manufactured solid fuels

G.7 Imports of coal peaked in 2006. Since then there has been a gradual decrease, as coal demand for electricity generation has fallen. Generation from coal became more attractive between 2012 and 2013 as gas prices peaked, resulting in increased imports. Coal imports have since fallen steeply to their lowest level for more than 10 years. In 2017, the UK imported 8.8 million tonnes of coal and other solid fuels, 4.9 per cent (0.5 million tonnes) lower than in the previous year. ***Chart G.3*** illustrates the trends in the imports of coal by country for the years 2002-2017.

Chart G.3: Imports of coal by country of origin 2003 to 2017



G.8 ***Table G.2,*** provides a breakdown of HMRC imports and exports of steam coal, coking coal, anthracite and other solid fuels by country of origin and destination.

G.9 Coal imports from Russia have been steadily increasing and in 2005, Russia overtook South Africa to become the UK's largest coal provider. Though it has since continued to be so; over the recent years imports of coal from Russia have declined sharply. In 2017 coal imports from Russia increased by 17 per cent and by 84 per cent from the USA whilst imports from Colombia fell by 75 per cent. In 2017 of the UK's coal imports 35 per cent were from Russia, 26 per cent were from the US and only 7.4 per cent were from Colombia (down from a share of 28 per cent in the previous year)

G.10 Of the total coal imported in 2017, 53 per cent was steam coal, 40 per cent was coking coal and the rest anthracite and other solid fuels. In 2017, steam coal imports were broadly level with imports from Russia up 32 per cent to 2.2 million tonnes, from the US imports were up five-fold to 1.4 million tonnes but from Colombia steam coal imports were down by 74 per cent to 0.6 million tonnes.

G.11 In 2017, 26 per cent of the UK coking coal imports came from the US followed by another 26 per cent from Australia and 25 per cent from Russia. The bulk of anthracite and other solid fuels imports were from EU countries.

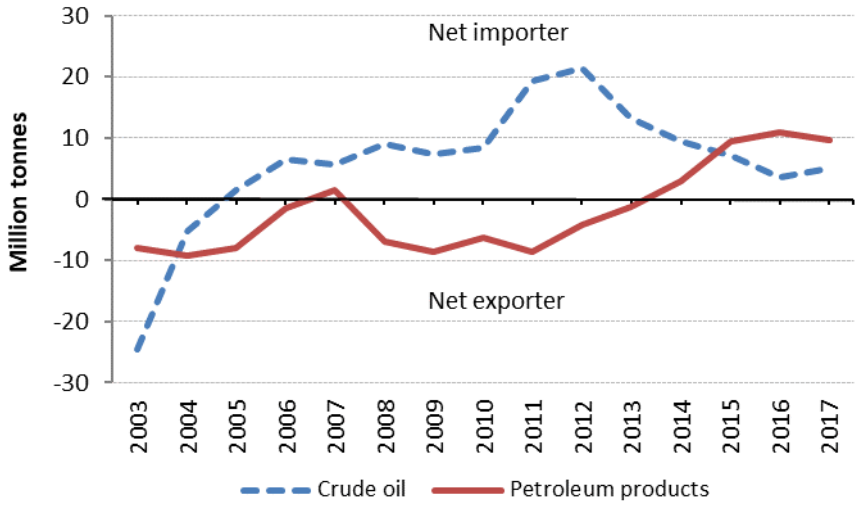
G.12 Exports of coal and other solid fuels fell by 25 per cent to 0.6 million tonnes in 2017 of which 46 per cent were to the Irish Republic, up 6 percentage points.

1.3 Crude oil and petroleum products

G.13 Trade quantities, in thousands of tonnes, of crude oil and refined petroleum products are shown in in ***Table G.3***. In the table, the import values per tonne are expressed on a cost, insurance and freight (c.i.f) basis while the export values are on a free on board (f.o.b) basis (e.g costs of goods to the purchaser abroad) – see section II for more details.

G.14 ***Table G.4*** provides trade data in crude oil by country where the import data, as far as possible, are on a 'country of origin' (or production) basis. Since becoming a net importer of crude oil in 2005, the UK's net imports of crude oil have steadily increased, rising significantly between 2010 and 2012. Net imports of crude oil as reported by HMRC have since been on the decline but in 2017 it rose by 40 per cent to 5.0 million tonnes (***chart G.4)*** due to fall in indigenous production and processing of indigenous crude at refineries.

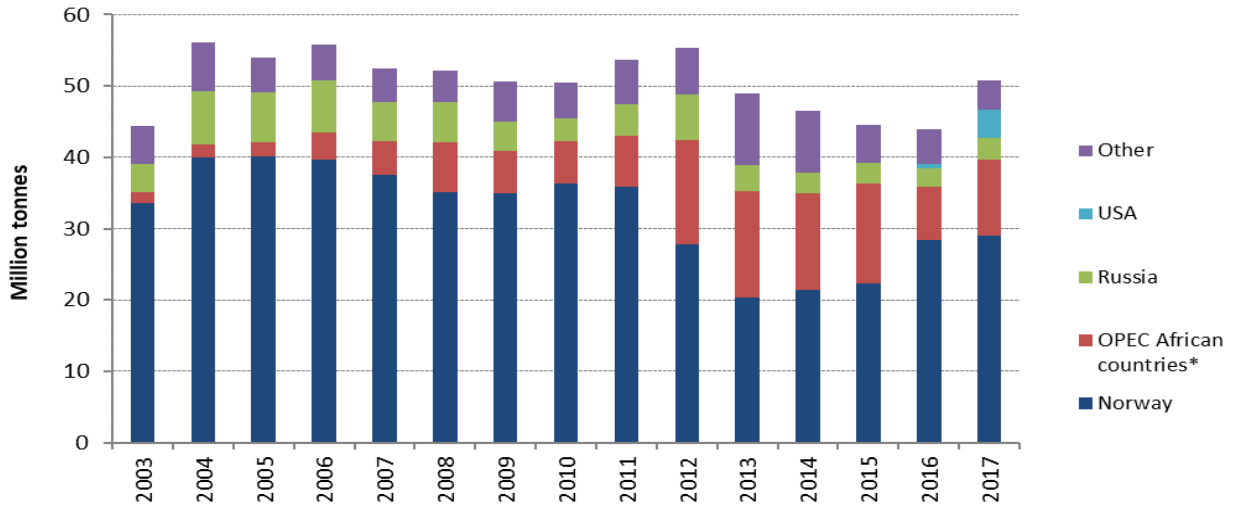
Chart G.4: Net trade of crude oil and petroleum products 2003 to 2017



G.15 Norway remains the major crude oil supplier to the UK and since the low in 2013, imports from this country have grown again (***chart G.5***). In 2017, Norway supplied 57 per cent of the UK's total crude oil imports compared to 76 per cent in 2003. The majority of the remaining imports came from the OPEC African countries such as Algeria, Angola, Libya and Nigeria which together accounted for 21 per cent of the total crude imports. In 2017 imports from USA grew to 8 per cent of the total while imports from Russia

were 6 per cent and from Saudi Arabia, 3 per cent of the total. In 2017, exports of crude oil increased by 14 per cent with exports to EU countries remaining broadly the same as in the previous year and accounted for 63 per cent of the UK's total exports of crude oil. The UK's two largest markets in the EU are The Netherlands and Germany; the bulk of the exports to Germany are for refining and consumption, whilst exports to the Netherlands include oil destined for onward trade to other countries. The largest non-EU markets for crude oil in 2017 were China, up 50 per cent on the previous year and accounted for 51 per cent of the total Non-EU exports followed by South Korea where exports have almost doubled and accounted for 35 per cent of the total non-EU exports.

Chart G.5: Imports of crude oil by country of origin, 2003 to 2017



* The OPEC African members are Algeria, Angola, Nigeria and Libya

G.16 The main refined petroleum products imported into the United Kingdom in 2017 were gas & diesel oil which together accounted for 42 per cent of the total; followed by aviation turbine fuel (kerosene) 25 per cent. The main refined petroleum products exported in 2017 were motor & aviation spirits; gas & diesel oil and fuel oils which together accounted for 66 per cent of the total.

G.17 On a net trade basis, in 2017 HMRC data show that the UK was again a net importer of petroleum products with net imports of 9.7 million tonnes (***chart G.4),*** which was 1.3 million tonnes less than in the previous year. In 2017 the UK net imports of aviation turbine fuel were 8.8 million tonnes and of gas/diesel oils 11.0 million tonnes. However, the UK was a net exporter of some petroleum products of which petrol (6.9 million tonnes) and fuel oils (0.8 million tonnes).

1.4 Imports and exports of natural gas

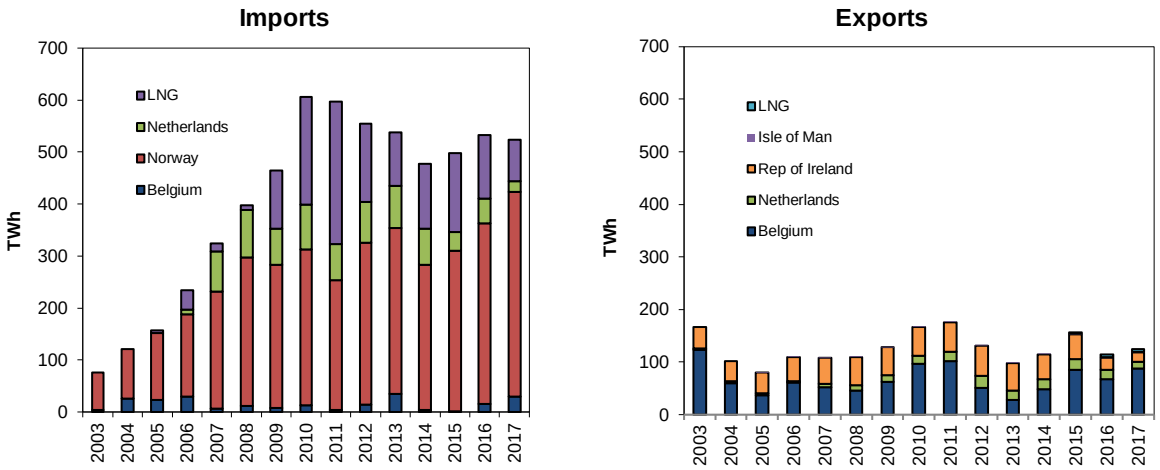
G.18 Between 1997 and 2003 the UK was a net exporter of gas. UK gas production peaked in 2000 and has since been in general decline. As a result the UK has sought to access additional supplies of gas from a range of sources to bridge the gap between indigenous production and demand as reserves on the UK Continental Shelf deplete.

G.19 Since 1999 natural gas imports have been increasing sharply, but since the peak in 2010 imports levels have declined. In 2017 gas imports fell by 1.6 per cent as demand fell by 3.0 per cent. Whilst below the peak reached in 2015, natural gas exports in 2017 rose by 8.9 per cent as exports to Belgium rose by 31 per cent. ***Chart G.6*** depicts the trends in natural gas imports and exports by country. It also includes trends in the volume of Liquefied Natural Gas (LNG) imports (see ***Chart G.7*** for country breakdown of LNG imports). The UK has one of the world's largest LNG importation terminals by capacity and the largest in Europe at South Hook near Milford Haven, and the UK also has the pipeline structure to then export natural gas to the continent. Since 2015 the UK began to re-export imported LNG from storage which in 2017 accounted for 3.6 per cent of the total gas exports and were 18 per cent lower than in the previous year.

G.20 **Table G.5** gives a breakdown of imports and exports of natural gas by country of origin and destination. The data in the table are physical flows as reported by the pipeline or terminal operators to BEIS. Whilst the data presented in the table differ from the nominated flows reported in Chapter 4, the overall net flows (e.g net imports or net exports) are the same.

G.21 In 2017 the UK exported 124 TWh of gas which was 8.9 per cent higher than in 2016. Belgium was the main destination of UK gas exports (from where it could be shipped elsewhere in mainland Europe) followed by The Republic of Ireland. In 2017 whilst gas exports to Belgium rose 31 per cent, exports to The Republic of Ireland fell by 17 per cent. The other main destination of UK gas exports was the Netherlands via the UK share gas fields using the Dutch WGT pipeline system to Den Helder and Uithuizen.

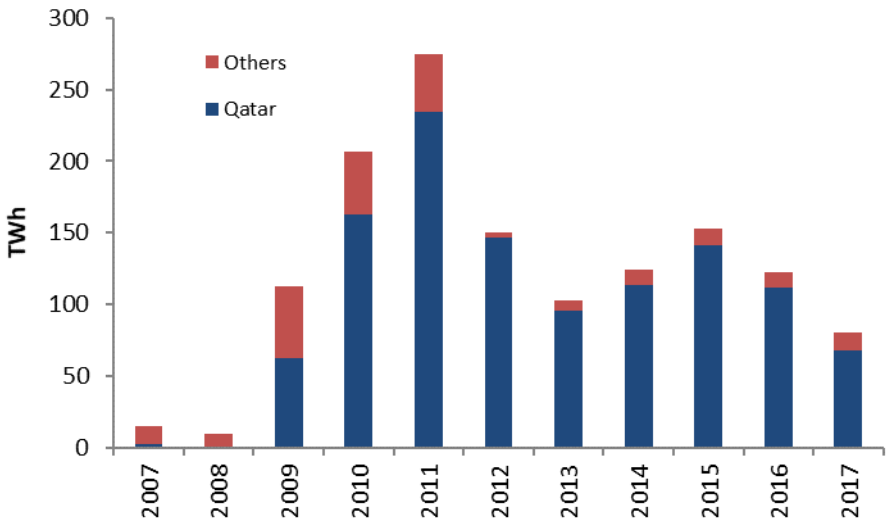
Chart G.6: Imports and exports of natural gas by country, 2003 to 2017



G.22 In 2017 the UK imported 524 TWh of gas which was 1.6 per cent lower than in 2016. Around 75 per cent of gas imports were from the Norwegian Continental Shelf while only 5.6 per cent were from Belgium, twice the volume on the previous year. LNG imports from various sources (***Chart G.7***) decreased by 34 per cent and accounted for 15 per cent of total gas imports in 2017. LNG imports from Qatar fell by 40 per cent and accounted for 84 per cent of total LNG imports in 2017. Supplies were also delivered to the UK from the European mainland via the Balgzand (Netherlands)-Bacton interconnector and from Zeebrugge (Belgium) via the interconnector with Belgium. The origin of the gas molecules from mainland Europe is not known hence are assigned to the Netherlands and Belgium.

G.23 The UK does not import natural gas from Russia but in December 2017 there were a shipment of LNG from Russia. The physical origins of the gas through the pipelines are not available. It is possible that a very small amount of gas from Russia finds its way across continental Europe to the UK, but given the gas pipeline infrastructure it is believed that most of the gas from the Netherlands is sourced from the Dutch sector of the North Sea, and that most of the gas from Belgium is sourced from Norway via Zeepipe (which terminates at Zeebrugge). Thus, any UK gas sourced from Russia is negligible.

Chart G.7: Imports of LNG by country, 2007 to 2017



1.5 Imports and exports of electricity

G.24 For over a decade, the UK has been a net importer of electricity. In 2017, imports of electricity came mainly from France (9.4 TWh) and the Netherlands (7.1 TWh); whilst exports were mainly to France due to nuclear outages. In 2017, imports of electricity fell 9.2 per cent to 18.2 TWh due to a fall in imports from France via the interconnector due to repair works. However, exports of electricity rose by 50 per cent to 3.4 TWh driven by demand from France. As a result, net imports fell by 17 per cent from 17.7 TWh to 14.8 TWh.

1.6 Imports and exports of renewables

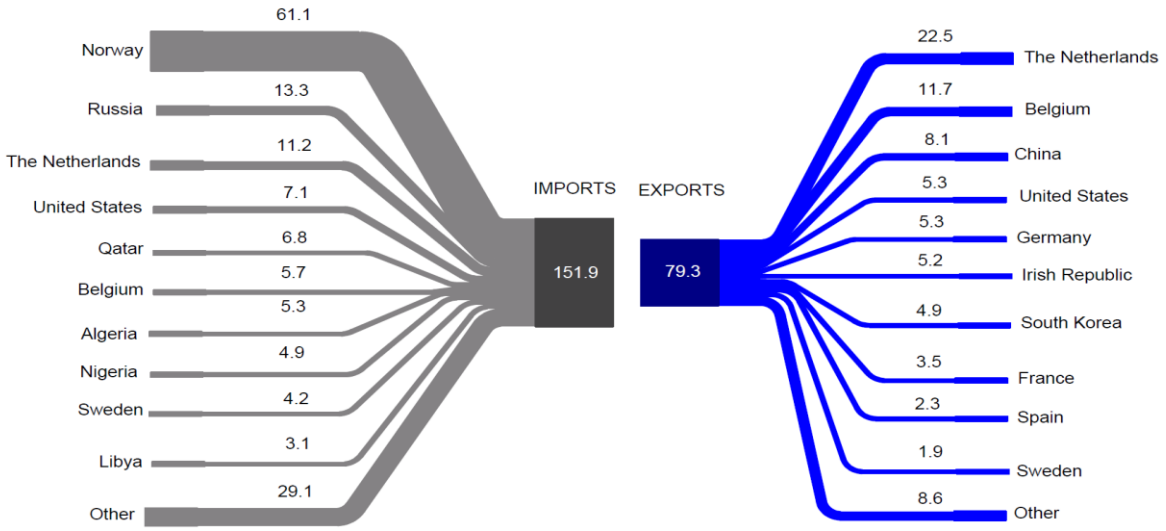
G.25 Apart from wood pellets and biodiesel, HMRC do not collect any other specific data on the imports of renewables intended to be used for energy purposes. In 2017, wood pellets imports to the UK, mainly from the United States, were 7.0 million tonnes, a decrease of 4.7 per cent on the previous year (**table G.6**) while imports of biodiesel were 6.2 million tonnes, a decrease of 38 per cent. In 2017 BEIS estimates of total renewables imports to the UK which include wood, wood waste, biomass and liquid biofuels were 3.5 mtoe, down 7.1 per cent on the previous year.

UK markets in 2017

G.26 **Chart G.8** below shows the UK's ten largest markets in volume trade of coal, primary oils and oil products, gas, electricity and renewables, in million tonnes of oil equivalent, in 2017.

In 2017, 40 per cent of the total imports to the UK were from Norway followed by 9 per cent from Russia while 28 per cent of the total UK exports were to The Netherlands and to Belgium 15 per cent.

Chart G.8 UK trade by country of imports and exports



Source DUKES 2017

SECTION II – Value

2.1 Imports and exports of fuels (Overseas Trade Statistics basis)

G.27 For statistical purposes, the UK adopts the valuation basis for overseas trade statistics (OTS) as recommended in the International Merchandise Trade Statistics Concepts & Definitions published by the United Nations. This means that the valuation of exports and dispatches is on a free on board (fob) basis (eg costs of goods to the purchaser abroad) while the valuation of imports and arrivals is on a cost, insurance and freight (cif) basis which includes all the incurred expenses in moving the goods to the point of entry into the UK, but excludes any duty or tax chargeable in the UK.

G.28 On an OTS basis, following the switch from the energy trade surplus of £0.6 billion in 2004, the UK has remained in deficit (*Chart G.9*). Between 2005 and 2008, the energy trade deficit grew steadily but fell back in 2009 reflecting lower oil prices. It has since continued to grow significantly reaching £22 billion in 2012 but in 2013 it fell back again driven by a fall in the deficit of crude oil and petroleum products. Deficit has continued to fall since but in 2017 the deficit rose by 29 per cent to £13.3 billion with increases in crude oil and gas prices. The deficit of crude oil and petroleum products, on the same basis, in 2017 was £4.8 billion (20 per cent more than in 2016) compared to a £2.2 billion surplus in 2004 (*Chart G.10*).

Chart G.9: Value of net exports of fuel, 2003 to 2017

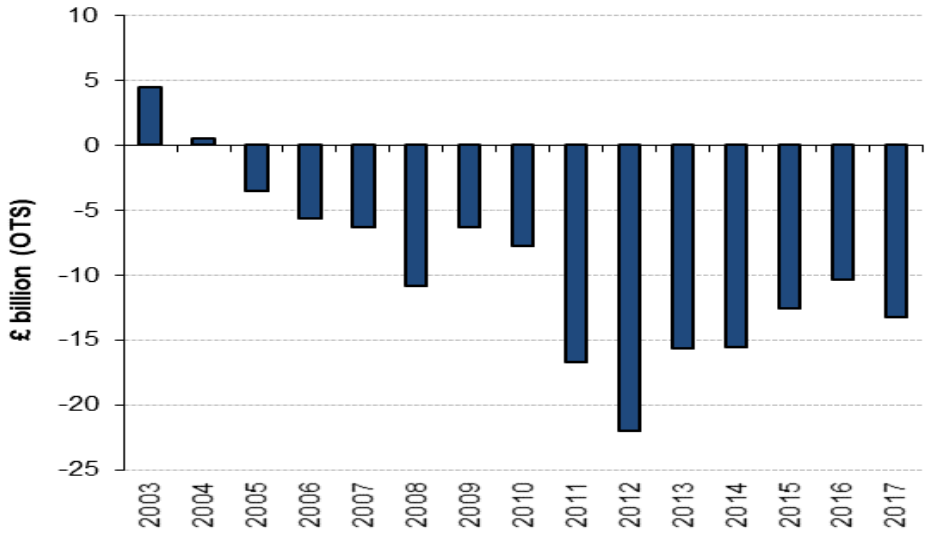
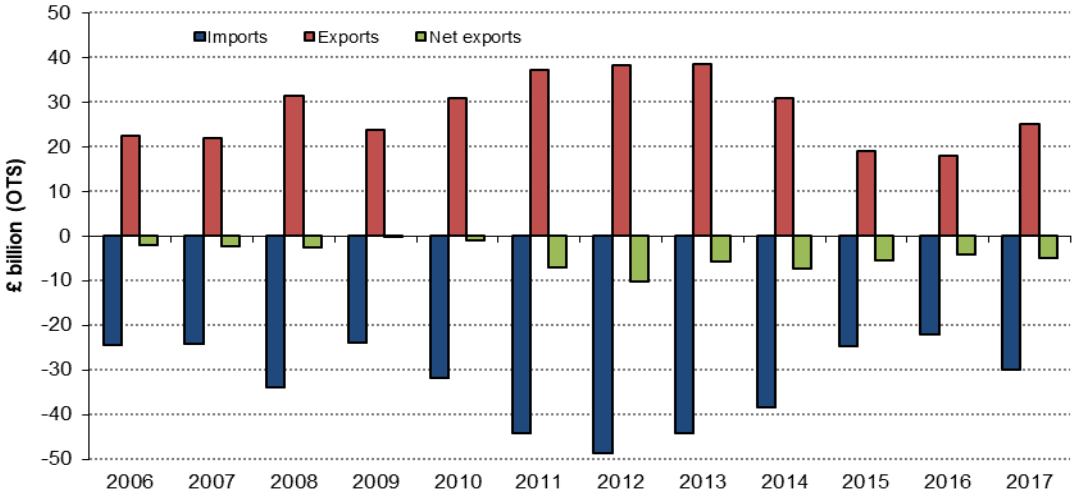


Chart G.10: Value in trade of oils[(1)], 2006 to 2017



(1) Crude oil and petroleum products

Imports on CIF, exports on FOB basis

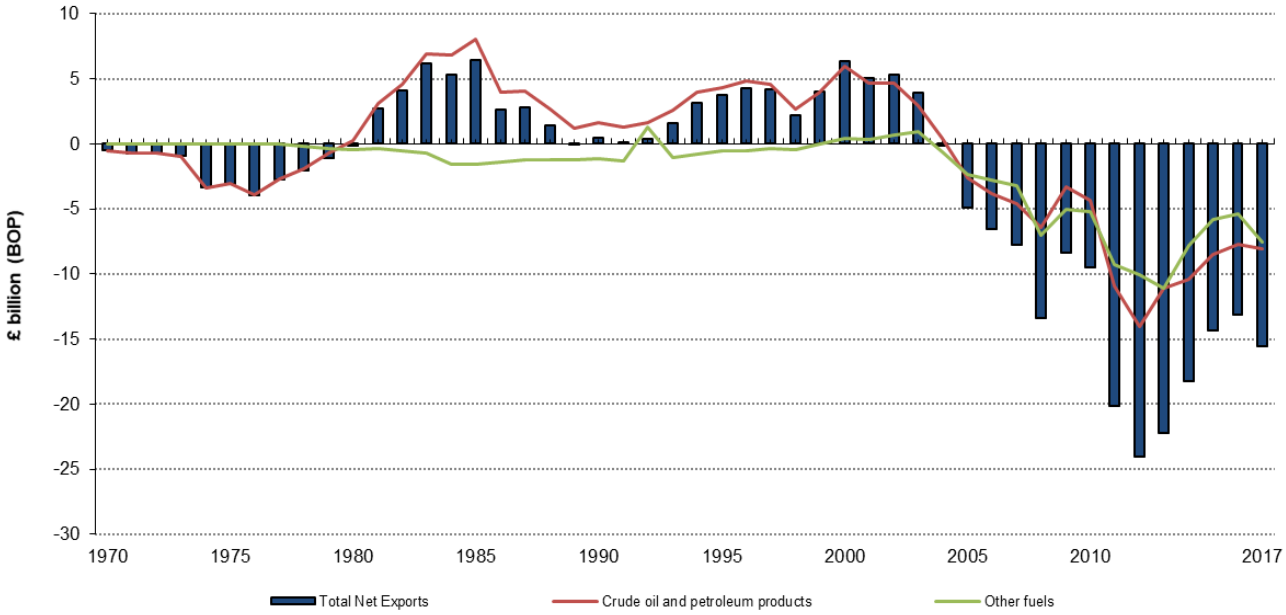
2.2 Imports and exports of fuels (Balance of Payment basis)

G.29 In order to conform with the International Monetary Fund (IMF), the Office for National Statistics (ONS) compiles their energy trade data on a balance of payment basis (BOP) in which the value of goods is the value at the point of the exporting country, e.g the freight and insurance costs to the UK is excluded from the value recorded by HMRC.

G.30 ***Chart G.11*** shows the net exports of fuels in value terms on a BOP basis since 1970. The United Kingdom's trade in fuels was dominated by imports until exports started to grow substantially in the mid-1970s, when production from the North Sea started, resulting in a trade surplus in 1981. This surplus was sustained between 1981 and 2003, except for a small deficit in 1989, and amounted to just under £80 billion over that period. However, these surpluses were reduced by the fall in oil prices in 1986, and then by the fall in North Sea production following the Piper Alpha accident in 1988 and the resulting safety works. Although the trade surplus increased steadily from 1992 to 1996, there were falls in 1997 and 1998 due to the drop in the price of crude oil. Prices of crude oil and petroleum products increased in 1999 and again in 2000 giving it, in current price terms, the highest net surplus. In 2001 the value of the trade surplus fell, reflecting falls in the price of crude oil and petroleum products; however, this was partly reversed by a 5 per cent increase in the net trade surplus during 2002.

G.31 Since 2004 the UK has been a net importer of fuels with deficits recorded both for oil and the other fuels series. The deficit increased sharply in 2008 due to a sharp rise in the price of crude oil with Brent prices increasing by $25 per barrel to $98 per barrel, before falling back to $62 per barrel in 2009. In 2011 there was another sharp increase in the size of the energy trade deficit, which more than doubled that in 2010, from £9.5 billion to £20.2 billion; this was mainly due to the oil deficit increasing from £4.3 billion to £10.9 billion, as oil prices rose sharply from an average of $80 per barrel in 2010 to $111 per barrel in 2011. In 2017, on a BOP basis, the total deficit was £15.6 billion, £2.4 billion more than in the previous year driven by deficit in crude oil increasing by £0.3 billion, as more crude oil were imported at higher prices and deficit in other fuels increasing by £2.1 billion. Crude oil price rose by around $10 per barrel to stand at $54 per barrel in 2017.

Chart G.11: Value of net exports of fuels on a balance of payment basis, 1970 to 2017



G.32 **Table G.7** shows the trends in the UK trade values from 1970 to 2017 both on an OTS and BOP basis. Import values on a f.o.b. basis are also included in the table, to allow net exports to be presented on a comparable f.o.b. basis over the same period.

Technical notes and definitions

G.33 The figures of imports and exports quoted in this annex are derived from notifications to HM Revenue and Customs, and may differ from those for actual arrivals and shipments, derived from alternative and/or additional sources, in the sections of the Digest dealing with individual fuels. Data in Table G.1 also include unpublished revisions to Customs data, which cannot be introduced into Tables G.3 to G.5.

G.34 All quantity figures in Table G.1 have been converted to million tonnes of oil equivalent to allow data to be compared and combined. This unit is a measure of the energy content of the individual fuels; it is also used in the Energy section of this Digest and is explained in Annex A, paragraphs A.45 to A.46. The quantities of imports and exports recorded in the Overseas Trade Statistics, in their original units of measurement, are converted to tonnes of oil equivalent using weighted gross calorific values and standard conversion factors appropriate to each division of the Standard International Trade Classification (SITC). The electricity figures are expressed in terms of the energy content of the electricity traded.

G.35 Except as noted in Table G.7, values of imports are quoted “c.i.f." (cost, insurance and freight). Briefly this value is the price that the goods would fetch at that time, on sale in the open market between buyer and seller independent of each other, with delivery to the buyer at the port of importation, the seller bearing freight, insurance, commission and all other costs, etc, incidental to the sale and delivery of the goods with the exception of any duty or tax chargeable in the United Kingdom. Values of exports are “f.o.b." (free on board), which is the cost of the goods to the purchaser abroad, including packing, inland and coastal transport in the United Kingdom, dock dues, loading charges and all other costs, charges and expenses accruing up to the point where the goods are deposited on board the exporting vessel or at the land boundary of Northern Ireland.

G.36 Figures of the value of net exports in Tables G.7 are derived from exports and imports measured on a Balance of Payments (B.O.P) basis. The figures are consistent with the European System of Accounts 1995, the basis on which they are published by the Office for National Statistics. This means exports as recorded by HM Revenue and Customs, will differ from those recorded by the Office for National Statistics on a B.O.P basis.

G.37 Figures correspond to the following items of SITC (Rev 3) at
http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=14&Lg=1

Coal	321.1 and 321.2
Other solid fuels	322 and 325 (part)
Crude oil	333
Petroleum products	334, 335, 342 and 344 (plus Orimulsion reclassified to division 278 during 1994)
Natural gas	343
Electricity	351

G.38 In 1993, the Single European Market was created. At that time, a new system for recording the trade in goods between member states, called INTRASTAT, was introduced. As part of this system only obliges small traders to report their annual trade and as some trading supply returns are late, it is necessary to include adjustments for unrecorded trade. This is particularly true of 1993, the first year of the system and of coal imports in that year.

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Annex H

Flow charts

Introduction

H.1 This section brings together the flow charts for individual fuels contained in the main Digest publication. Chart H.1 is for Coal, Chart H.2 is for Petroleum, Chart H.3 is for Natural Gas, Chart H.4 is for Electricity and Chart H.5 is for Renewables. Annual updates will appear in subsequent editions of the main Digest publication and on the BEIS section of the GOV.UK website.

H.2 Also included within the annex is an additional flow chart for Manufactured Solid Fuels (H.6). Annual updates will appear on the BEIS section of the GOV.UK website.

Summary flow chart

H.3 A summary flow chart, UK Energy Flow Chart 2017, is also available on the BEIS section of the GOV.UK website at: www.gov.uk/government/statistics/energy-flow-chart-2017. The summary flow chart updates the last energy flow chart which showed data for 2016. It is based on statistics taken from the main Digest publication, Table 1.1 – Energy Balance 2017. The chart is a simplification of the energy balance figures, illustrating 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). They are shown in their original state and after being converted into different kinds of energy by the secondary fuel producers. The flows are measured in million tonnes of oil equivalent, with the widths of the bands approximately proportional to the size of the flow they represent. The flow charts for individual fuels have been produced on a similar basis.

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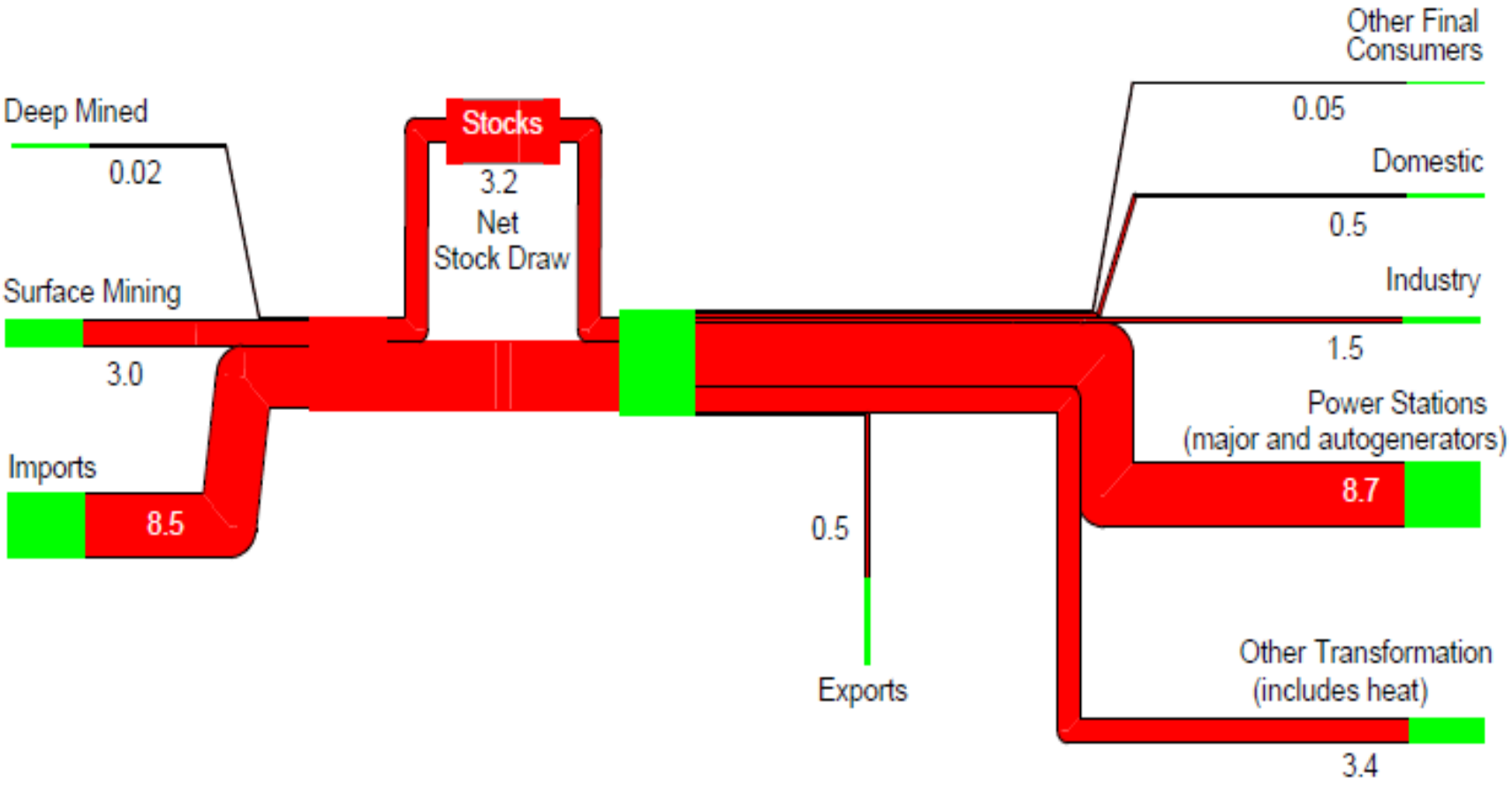
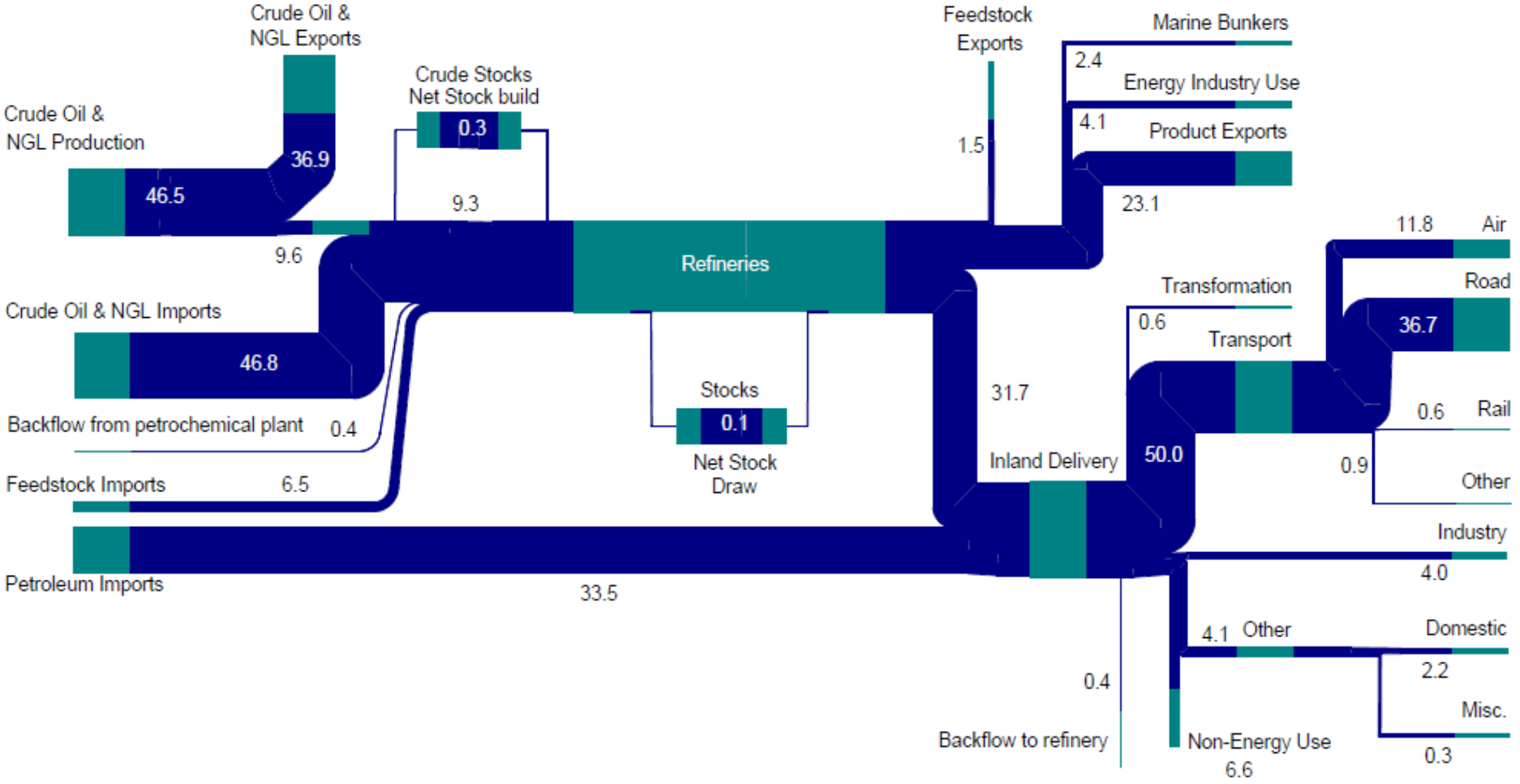
Chart H.1: Coal flow chart 2017 (million tonnes of coal)



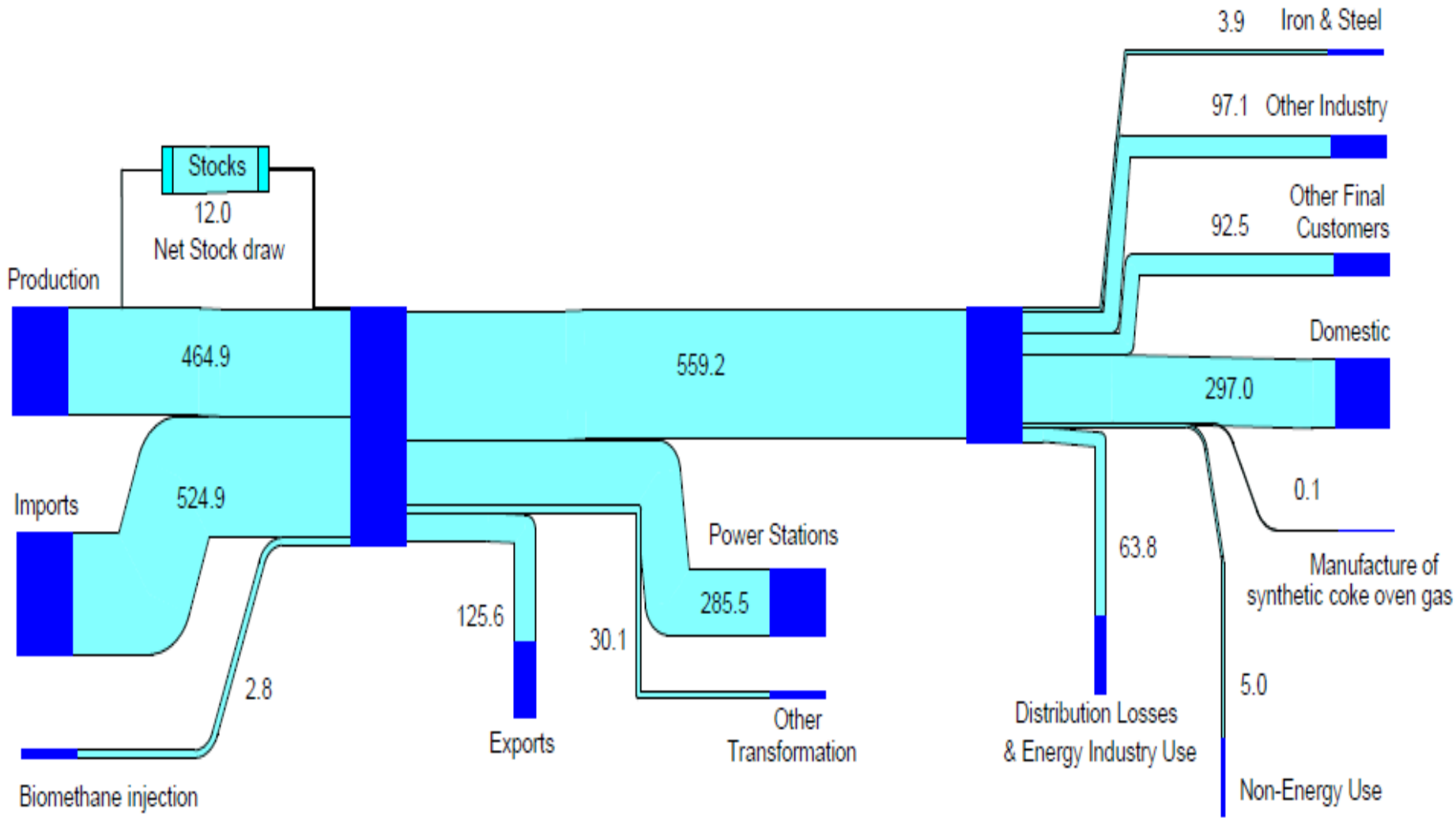
Note:
This flow chart is based on the data that appear in Tables 2.1 and 2.4.

Chart H.2: Petroleum flow chart 2017 (million tonnes)



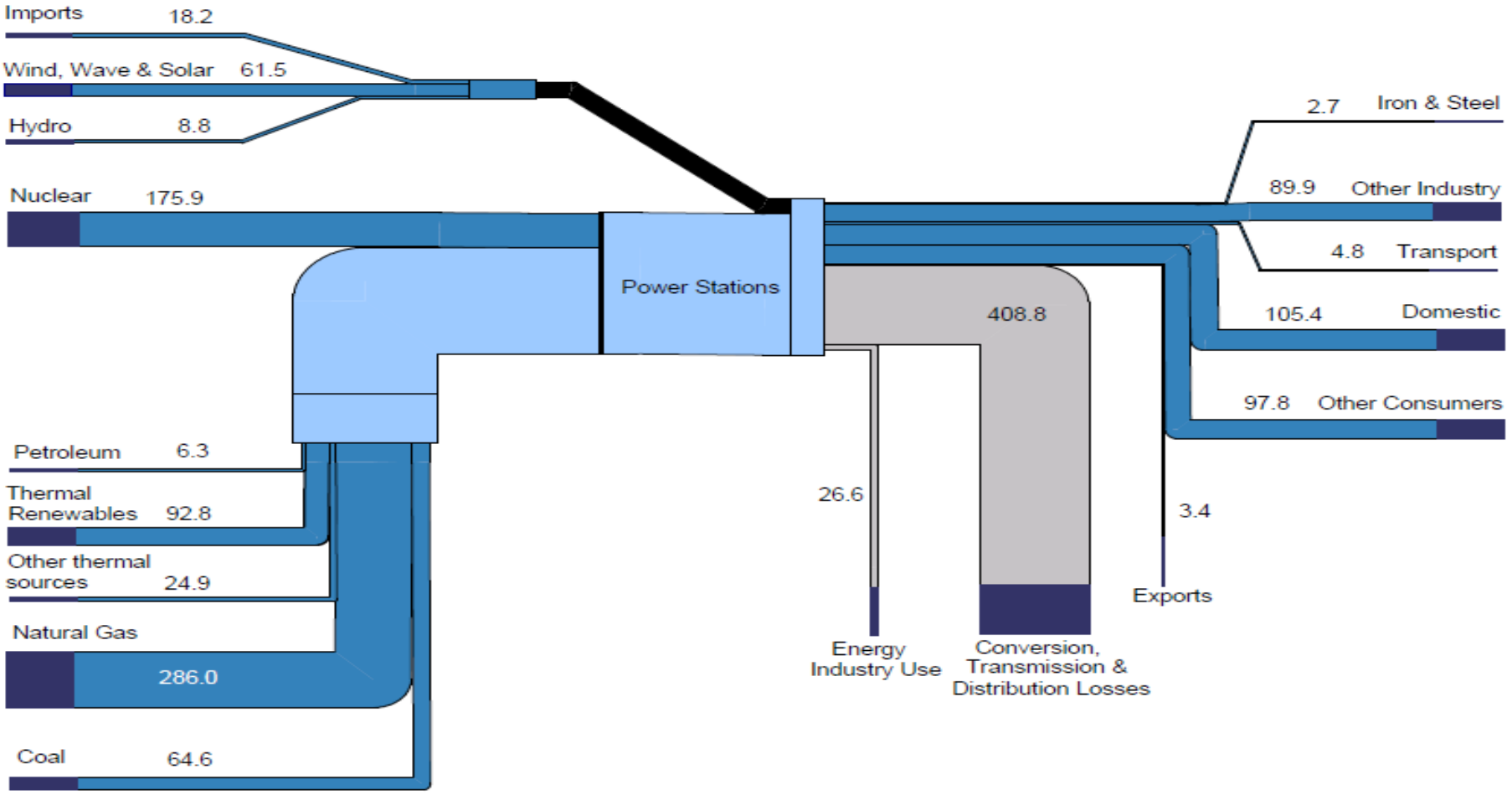
Notes:
This flow chart is based on the data that appear in Tables 3.1 and 3.2.
The numbers on either side of the flow chart will not match due to losses in transformation.
Biofuels are not included.

Chart H.3: Natural gas flow chart 2017 (TWh)



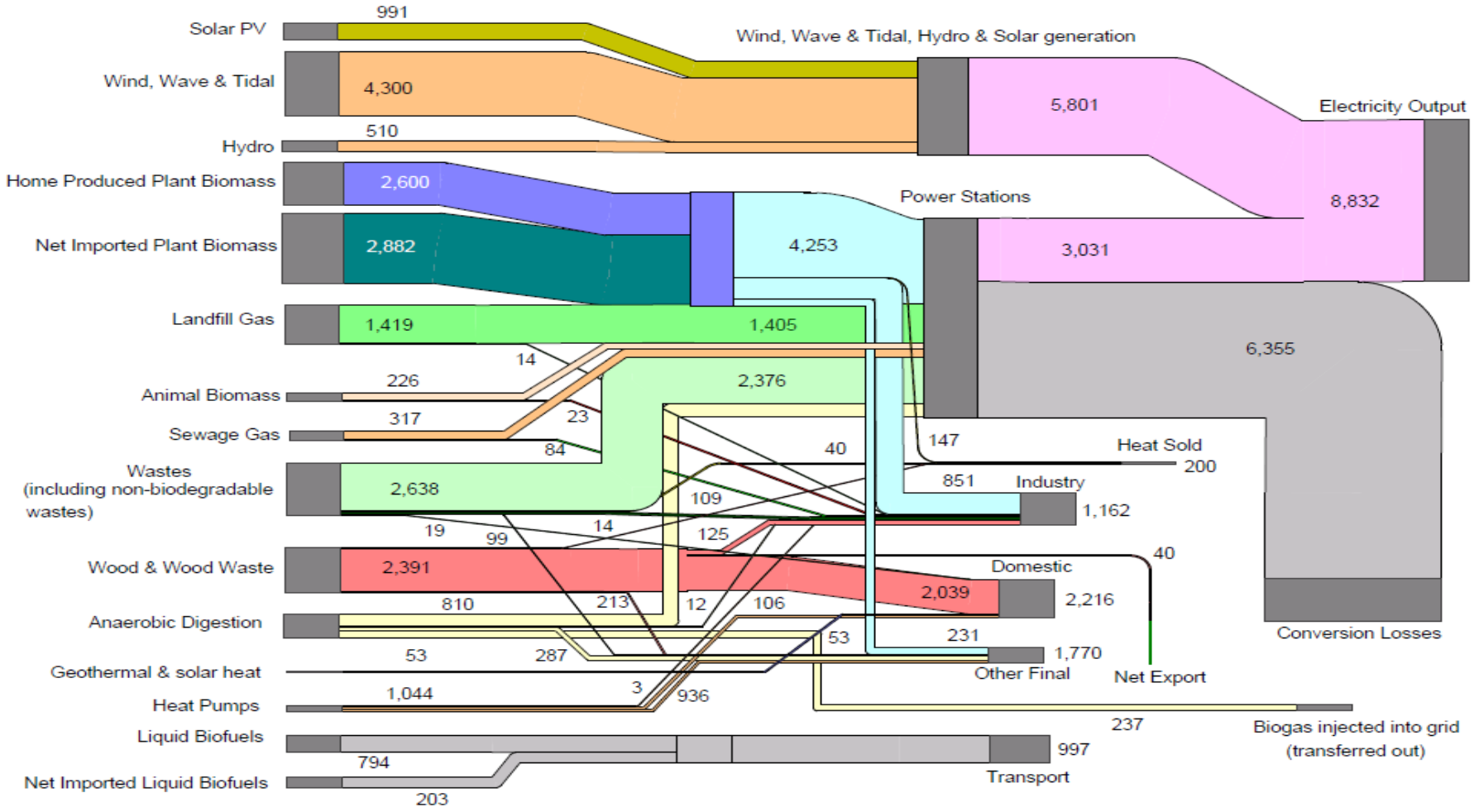
Note:
This flow chart is based on the data that appear in Table 4.1, excluding colliery methane.

Chart H.4: Electricity flow chart 2017 (TWh)



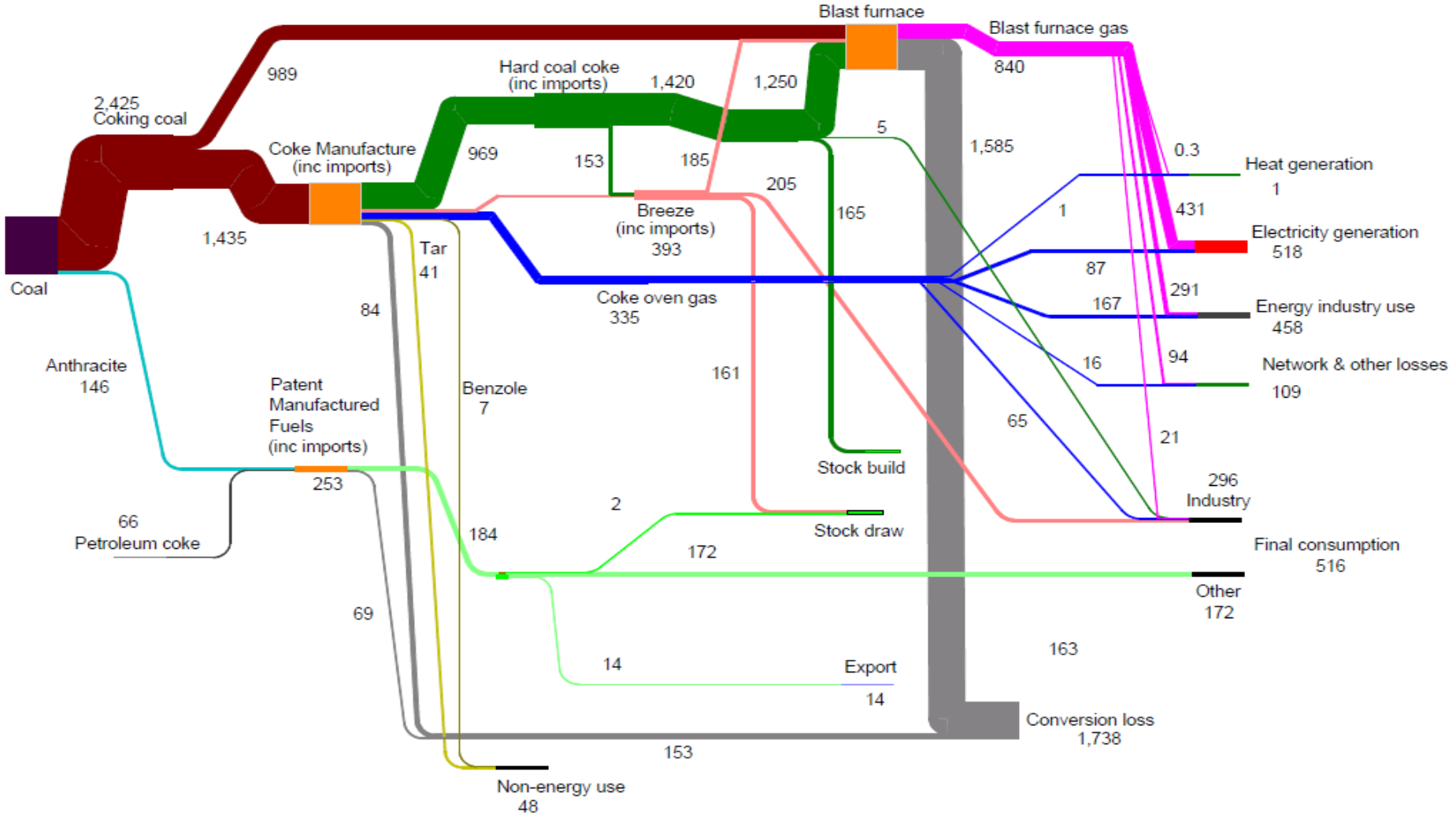
Notes:
This flow chart is based on the data in Tables 5.1 (for imports, exports, use, losses and consumption) and 5.6 (fuel used).
(1) Hydro includes generation from pumped storage while electricity used in pumping is included under Energy Industry Use
(2) Conversion, Transmission and Distribution Losses is calculated as fuel used (Table 5.6) minus generation (Table 5.6) plus losses (Table 5.1)

Chart H.5: Renewables flow chart 2017 (thousand tonnes of oil equivalent)



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

Chart H.6: Manufactured Solid Fuels flow chart 2017 (thousand tonnes of oil equivalent)



Annex I

Energy balance: Net Calorific Values

Aggregate energy balance (Table I.1)

I.1 These tables, available at: www.gov.uk/government/statistics/energy-chapter-1-digest-of-united-kingdom-energy-statistics-dukes 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 using Net Calorific Values (NCV). The NCVs used are detailed in Annex A of DUKES available at: www.gov.uk/government/statistics/dukes-calorific-values

I.2 A key reason for showing these balances on a NCV basis is to enable comparisons with EU statistics, which use this method. This approach has been used when comparing EU Member States' shares of renewables in final energy consumption, as set out on pages 78 to 88 of the December 2010 Energy Trends article, Renewable energy: Statistics used for the EU 2020 renewables target.

I.3 The principles behind the presentation used in the Digest are explained in Annex A. The figures are presented on an energy supplied basis, in tonnes of oil equivalent.

I.4 These energy balance tables have been used in the calculation of the percentage of energy derived from renewable sources, detailed in DUKES Chapter 6, table 6D available at: www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes. The contribution of renewables has continued to grow in recent years, with the share reaching 10.2 per cent in 2017.

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Annex J

Heat reconciliation

Introduction

J.1 Heat sold has been separately identified in the energy balances since 1999. It is defined as heat that is produced and sold under the provision of a contract. The introduction of heat sold into the energy and commodity balances did not affect the individual fuel totals, since the energy used to generate the heat has been deducted from the final consumption section of the energy balances and transferred to the transformation section. The tables show the detailed analysis of the heat generation row of the main energy balances, by sector generating the heat, and are available at:
www.gov.uk/government/statistics/energy-chapter-1-digest-of-united-kingdom-energy-statistics-dukes

J.2 To make the heat sold information more transparent, data on the quantity of fuel by consuming sector used to produce heat that is subsequently sold are being made available in the tables that accompany this annex. When producing the energy and commodity balances the quantities of fuel shown in the tables have been deducted from the final consumption section and moved to the transformation section.

Methodology

J.3 Following the publication of experimental statistics collected in respect of the Heat, Metering and Billing Regulations (HMBR) database in the March 2018 edition of Energy Trends[1], the data have been evaluated and incorporated into the heat generation figures presented in this annex. As there are gaps in this data, the annual data supply for CHP enabled schemes provided by Ricardo Energy and Environment (as part of the CHPQA scheme[2]) have been retained for producing the heat sold and fuel input ("heat generation") for CHP supported schemes.

J.4 For non-CHP schemes, various assumptions have been used;

- Heat supplied has been assumed to be heat sold
- The fuel input has been estimated by assuming the previous efficiency
- Where the fuel categories are not sufficiently disaggregated, historic proportions have been applied
- For those networks which have mixed final consumers, it is difficult to assign heat supplied to each sector. To address this, the average generation for domestic consumers (residential properties display considerably less variation compared to industrial and commercial consumers) was used with the remainder being allocated across industrial consumers, and the commercial and public sectors.

J.5 The decision not to use the HMRB data set for CHP schemes was deemed to be appropriate due to the CHPQA administration data being timely and subject to quality assurance. It also provides the correct level of detail such as fuel type, sector generating heat, and final customer types. In contrast, the previous non-CHP estimates were previously derived from the Building Research Establishment's "National 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; these estimates are now considered less relevant than the more up to date data collected in the HMBR database despite having to use assumptions to achieve the correct estimates across generators and final customers.

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[1] www.gov.uk/government/publications/energy-trends-march-2018-special-feature-article-experimental-statistics-on-heat-networks
[2] www.gov.uk/guidance/chpqa-guidance-notes