



Department for
Business, Energy
& Industrial Strategy

Digest of United Kingdom Energy Statistics 2020

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Energy and the environment

Carbon dioxide emissions

E.1 Provisional 2019 results for UK Greenhouse Gas emissions and progress towards targets were published on 26 March 2020. 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-2019

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 2019 was approximately 15.6 tonnes.

E.3 The number of oil release reports recorded in 2019 amounts to 215, down on the 277 incidents reported during 2018. There were four incidents where oil released exceeded 1 tonne, comprising 9.4 tonnes of the total released, compared to five such incidents in 2018. A substantial share of the oil released (4.7 tonnes) was from drill cuttings using either Oil- or Synthetic-based muds, which are used to improve efficiencies during exploration and production during a period of investment in the ageing North Sea reserves. A further 2.2 tonnes were released as oil in water during the production process.

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 water for 2019 across the UKCS was 19.8 milligrams per litre compared to 26.5 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 OGA (formerly the Secretary of State). Flaring at installations in 2019 was estimated to be 1344 million cubic metres, 5 per cent lower than 2018; an additional 236 million cubic metres was vented. In total this is equivalent to 4.0 per cent of gross gas production.

E.6 Gas flared and vented had been decreasing since 2001 when oil and gas production neared peak levels. An increase in recent years has accompanied a broadly equivalent increase in UK oil production. A time series of gas flared and vented at terminals, oil fields and gas fields can be found in DUKES Table E.1.

Data sources

E.7 Figures for the total number of oil releases reported are taken from the Environmental and Emissions Monitoring System (EEMS). This is the environmental database of the UK oil and gas industry. Its primary purpose is to record measured and calculated data relating to emissions and discharges from offshore installations. The system is maintained by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

E.8 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 2019 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

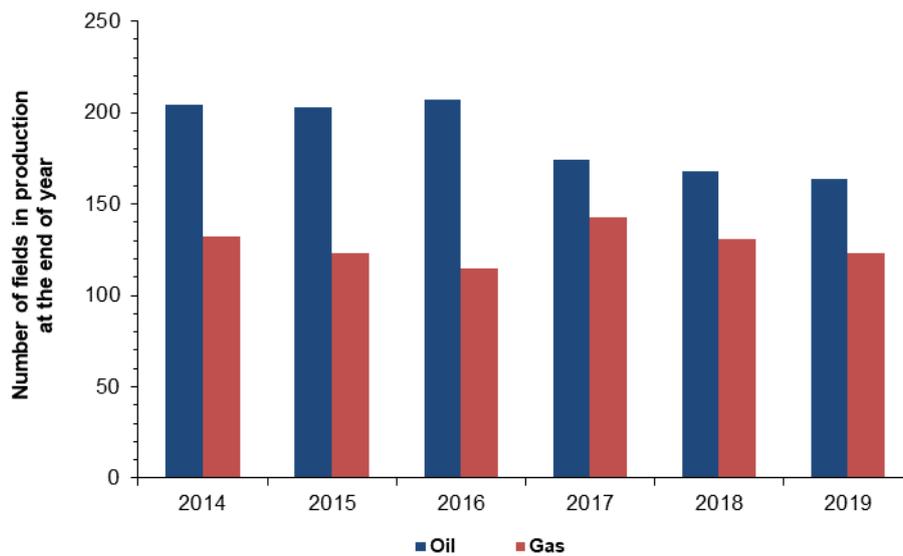
F.4 Table F.A. shows that the number of offshore oil fields in production or under development fell from 234 at the end of 2014 to 167 at the end of 2019. For offshore gas fields the equivalent change was from 134 to 124, with some older gas fields closing and fewer being added into production. The Theddlethorpe terminal closed in 2018 and the remaining fields connected with it ceased 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 2013 there have been five onshore oil terminals. In 2007 there were five onshore associated sub-gas terminals and nine 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

	2014	2015	2016	2017	2018	2019 ^p
Offshore oil fields in production	204	203	207	174r	168r	164
Offshore oil fields under development	30	27	22	15	14	3
Offshore gas fields in production	132	123	115	143r	131r	123
Offshore gas fields under development	2	2	0	0	1	1

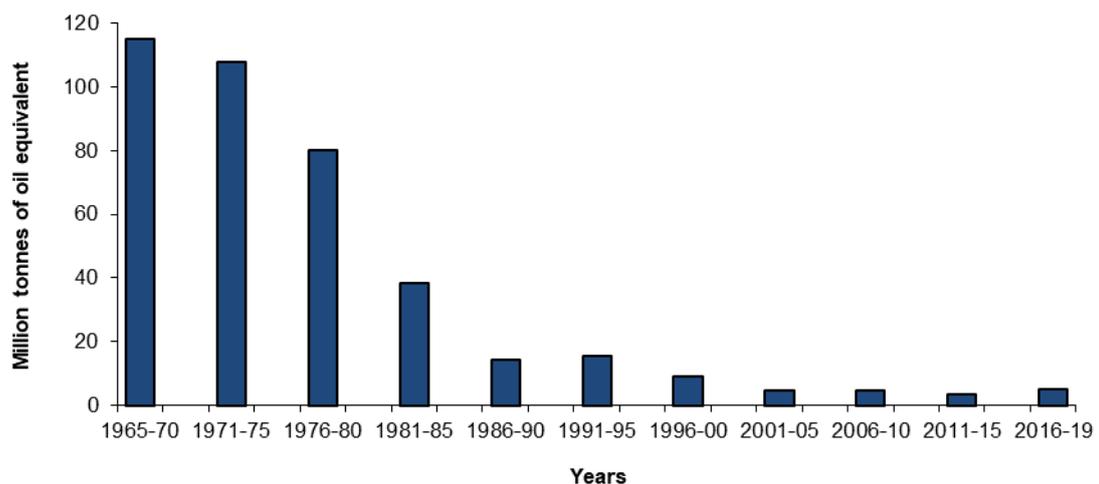
Note: Data marked "p" are provisional and subject to revision

Chart F.1: Number of offshore oil and gas fields in production, 2014-2019



The average size of fields commencing production in the years 2019 was 5.0 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. In addition, improved technology provides a cost-effective means of extracting oil and gas from smaller fields which before would have been considered unviable. The industry continues to face a range of challenges to realise fully the North Sea's potential. Alongside other initiatives, government and industry are tackling these challenges via several working boards reporting to the MER UK Forum.

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



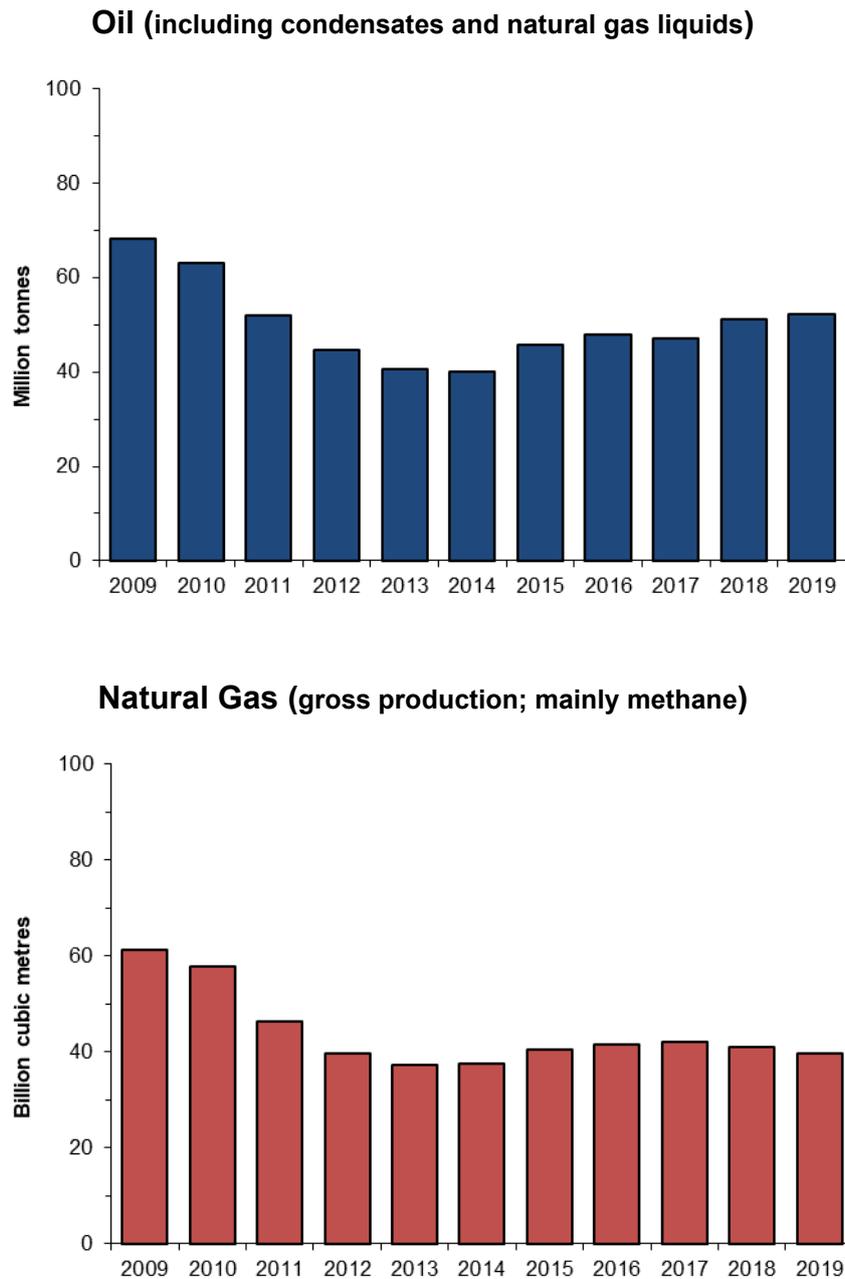
(1) Recoverable reserves originally present based on the operators' best estimate at the time production commenced. Please note that the start-up of the very large Buzzard field in 2007 does not stand out in this table because of the start-up of a significant number of fields with much smaller reserves.

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 2019. After reaching a record level of 137 million tonnes in 1999, production has generally declined each year. However, there has been a steady increase since 2014 due to new investment and the completion of new projects. In 2019 production reached 52.1 million tonnes, 38 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 a marginal increase in 2015 to 2017 as new projects that have come on stream since 2014 have boosted production. However, decreases in more established fields have outstripped increases in newer developments in 2018 and 2019, resulting in an overall fall in production in these years.

Chart F.3: Production of oil and gas, 2009 - 2019



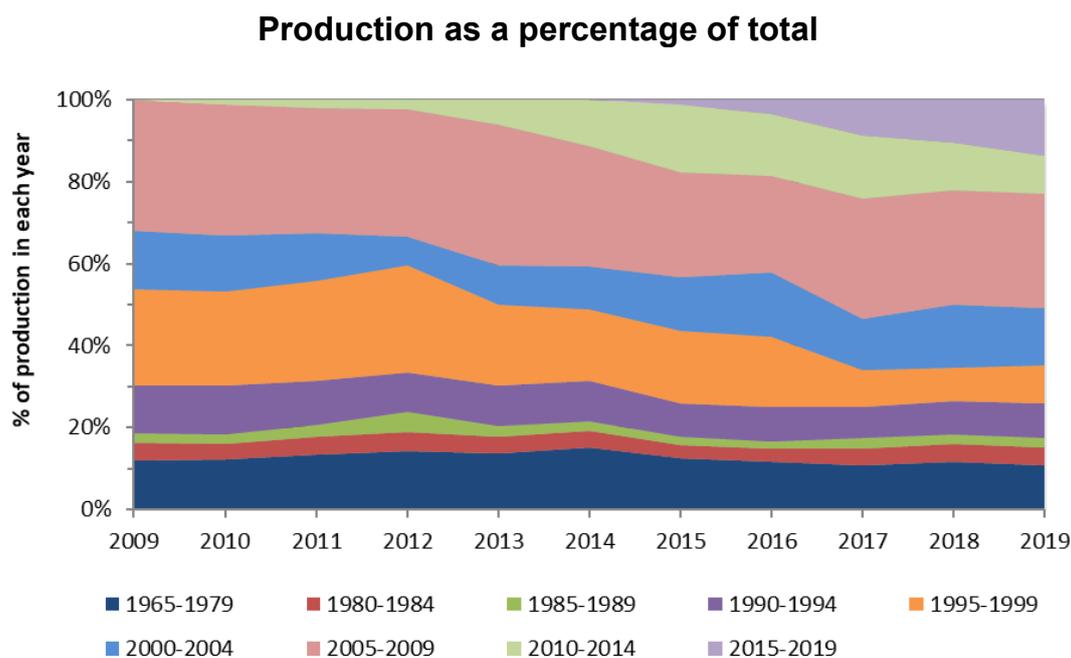
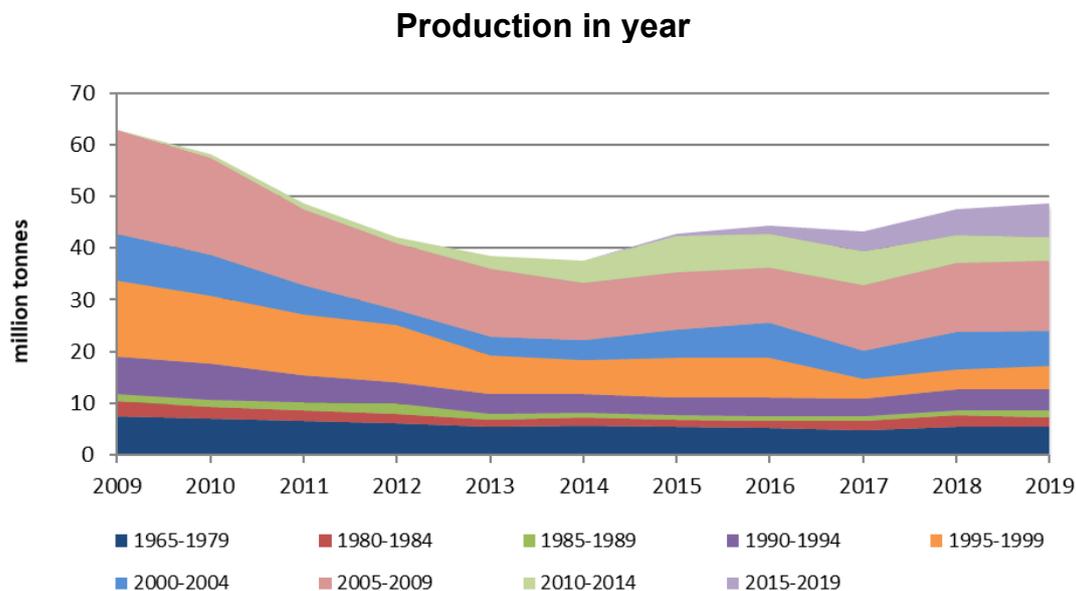
Production of crude oil

F.8 Production from established oil fields has been dropping in recent years. This is illustrated in Chart F.4, where oil production in each year from 2009 to 2019 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-

2014 have remained broadly stable. New projects came onstream in 2017 and 2018, contributing to the increase in overall production in 2018 and 2019. In 2019, newer (post 1994) fields accounted for three-quarters of the UK's oil production, with a sharp increase in production for fields completed since 2015 which alone contributed 15 per cent of total production in 2019.

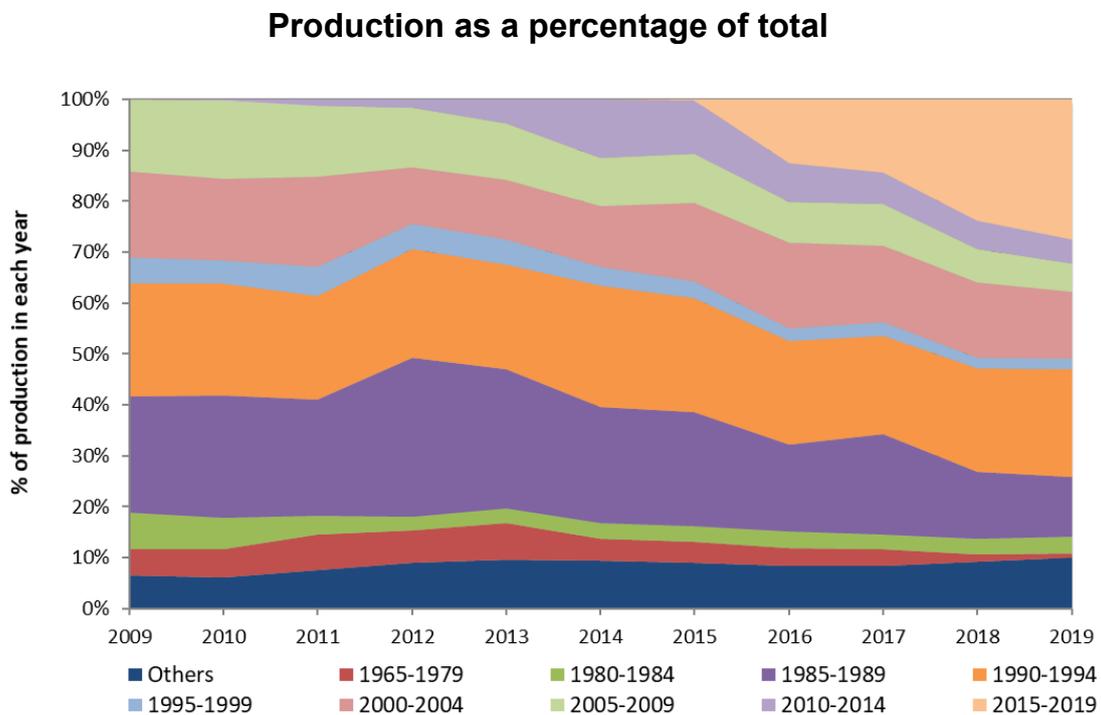
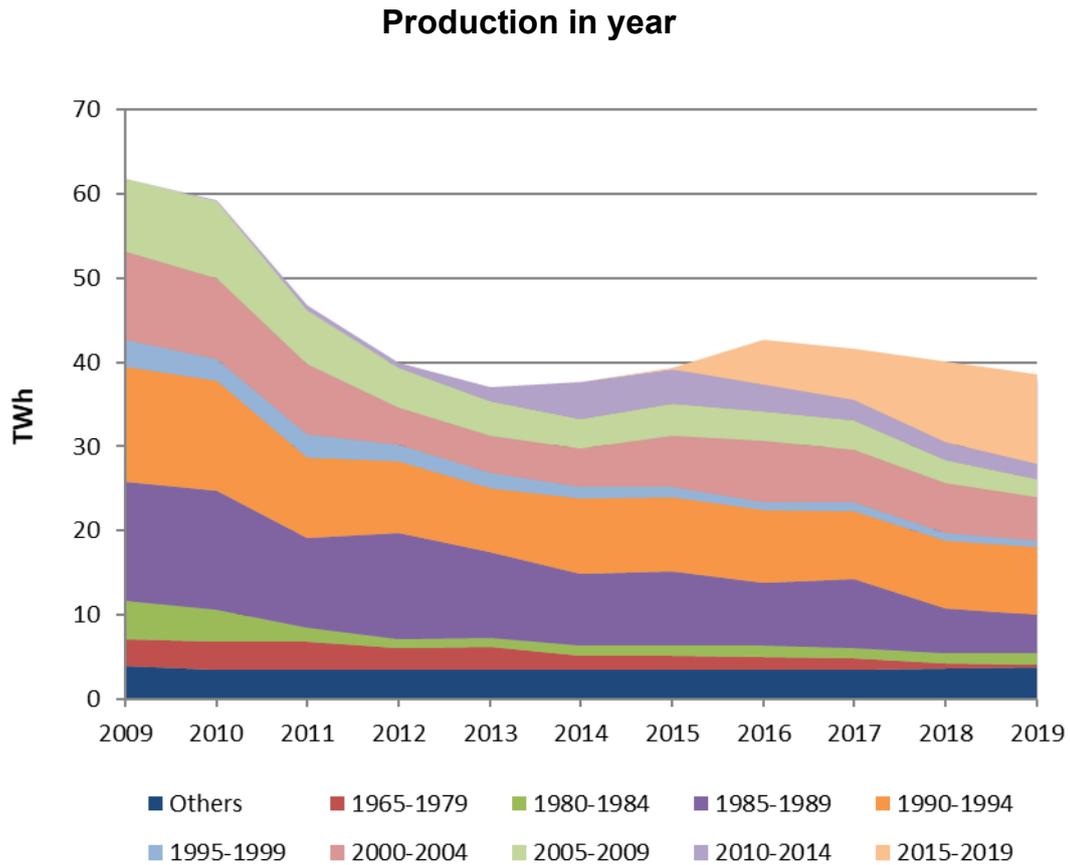
Chart F.4: Age profile of UK crude oil production



Production of gas

F.10 Chart F.5 presents gross gas production reported at field/system level and includes 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

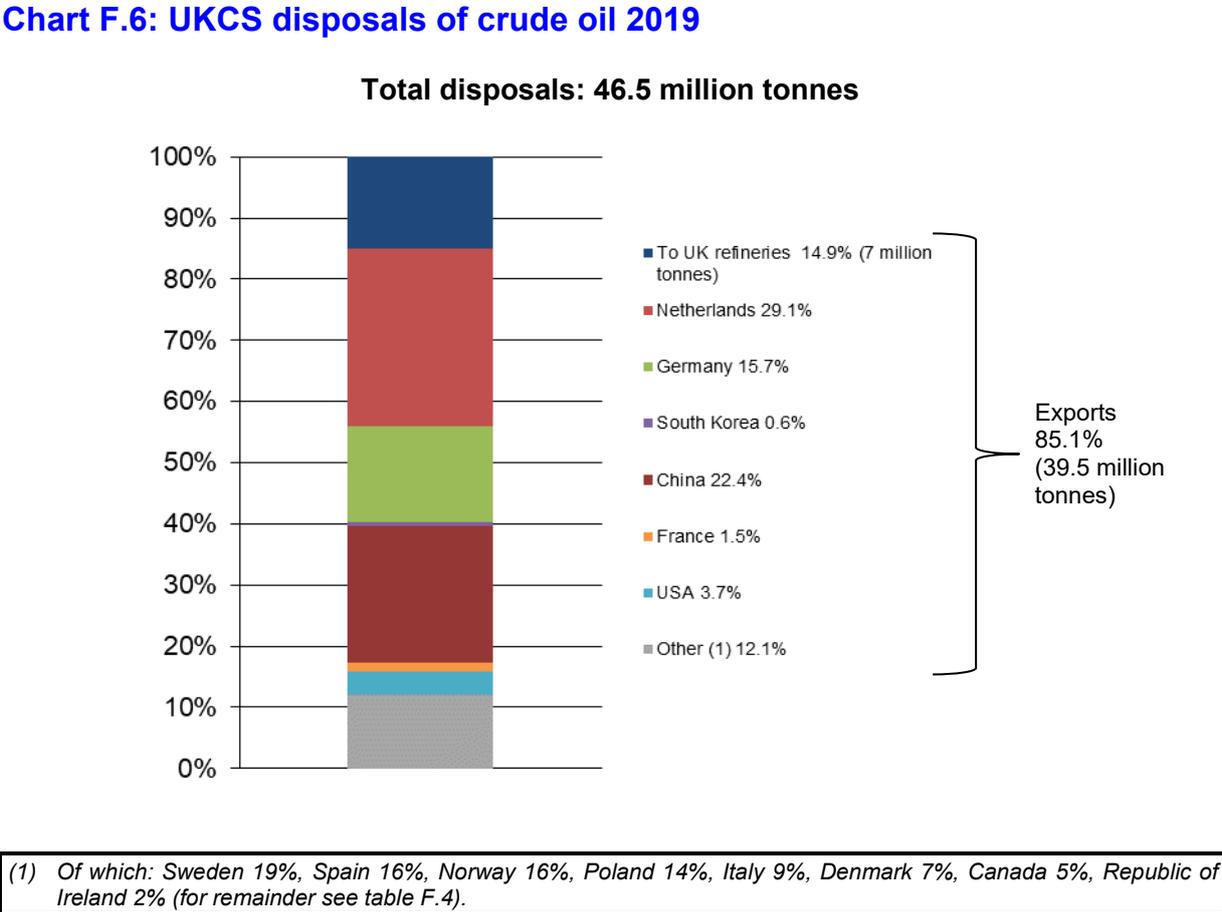


F.11 Gross gas production reached a peak in 2000 and has fallen to approximately 35 per cent of this level since 2012. New projects that came onstream since 2014 increased production into 2015 to 2017 before it fell marginally in 2018 and 2019 (Chart F.5). Production from older gas fields that were discovered in the Southern North Sea has reduced in recent years as the reserves are depleted. Chart

F.5 illustrates this. The 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, associated gas production is based on terminal start date rather than field start date.

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).



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 traders' 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 differences in methodology between the HMRC energy trade data and data presented in the main chapters of DUKES. In the main chapters, the trade data are produced from a combination of data from HMRC and direct from companies responding to BEIS statistical surveys. The data for this annex are presented in tables G.1 – G.7 available at: www.gov.uk/government/statistics/dukes-foreign-trade-statistics

Main points for 2019

Provisional data from HMRC show that:

- There was a total of 145.4 million tonnes of oil equivalent (mtoe) of fuels for energy use imported to the UK in 2019 which was only 0.1 per cent lower than the amount imported in 2018 (**table G.1**).
- Exports of fuels rose in 2019 by 2.9 per cent to 85.7 mtoe (**table G.1**).
- The energy trade deficit stood at £11.1 billion, 39 per cent less than in 2018. The fall was largely due to the surplus in crude oil (**table G.7**).

Imports by fuel type:

- Coal imports fell by 33 per cent to 7.1 million tonnes in 2019 (**table G.2**).
- Crude oil net imports rose by 18 per cent to around 3.8 million tonnes as demand at refineries processing rose slightly (**table G.3**).
- HMRC data shows that the UK was a net importer of petroleum product in 2019 by 11.1 million tonnes which was 8.8 per cent less than in the previous year (**table G.3**).
- Gas imports in 2019 at 518 TWh was broadly similar to the previous year, and within which liquified natural gas (LNG) imports was nearly three times that in the previous year (**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 (equivalent to imports and exports respectively) 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, previously corresponded to that published by the Office for National Statistics energy trade value data but data for 2016 onwards uses data direct from source, the HMRC UK Trade Info 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.

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

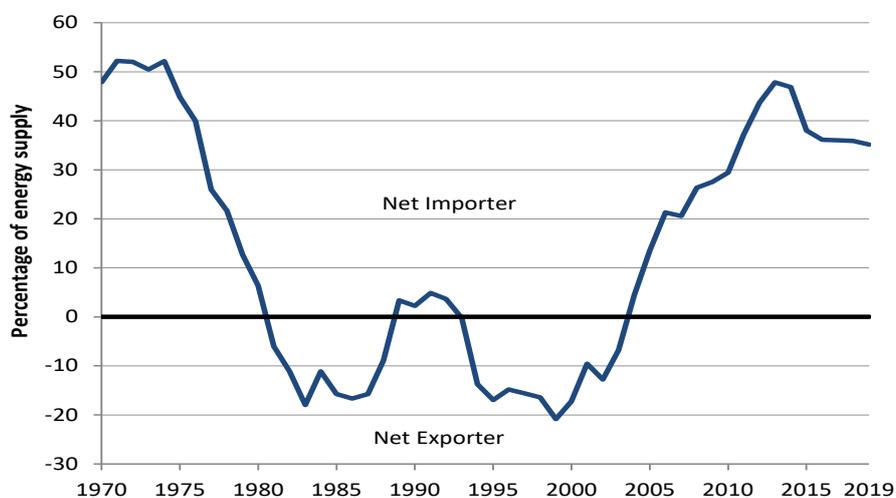
SECTION I - Volume

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, because of the Piper Alpha disaster in 1988, oil production fell, leading to the UK reverting back to being 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** shows the UK net import dependence level (net imports compared to supply) from 1970 to 2019, based on BEIS data. Following the peak in 2013 net import dependency has fallen, with a sharp fall in 2015 (down 8.9 percentage points). Net import dependency has since broadly levelled off and in 2019 at 35 per cent, was only 0.7 percentage points lower than in the previous year as net imports fell by 3.7 per cent while supply fell by 1.7 per cent.

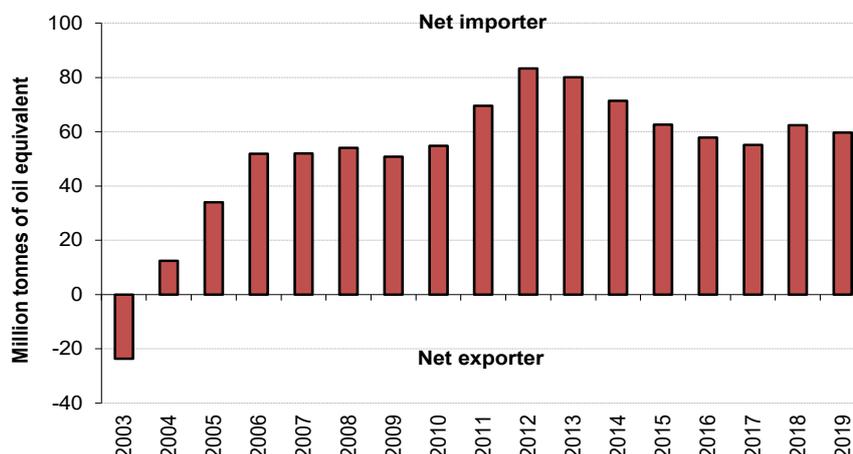
Chart G.1a: UK import dependency, 1970 - 2019



Source: BEIS

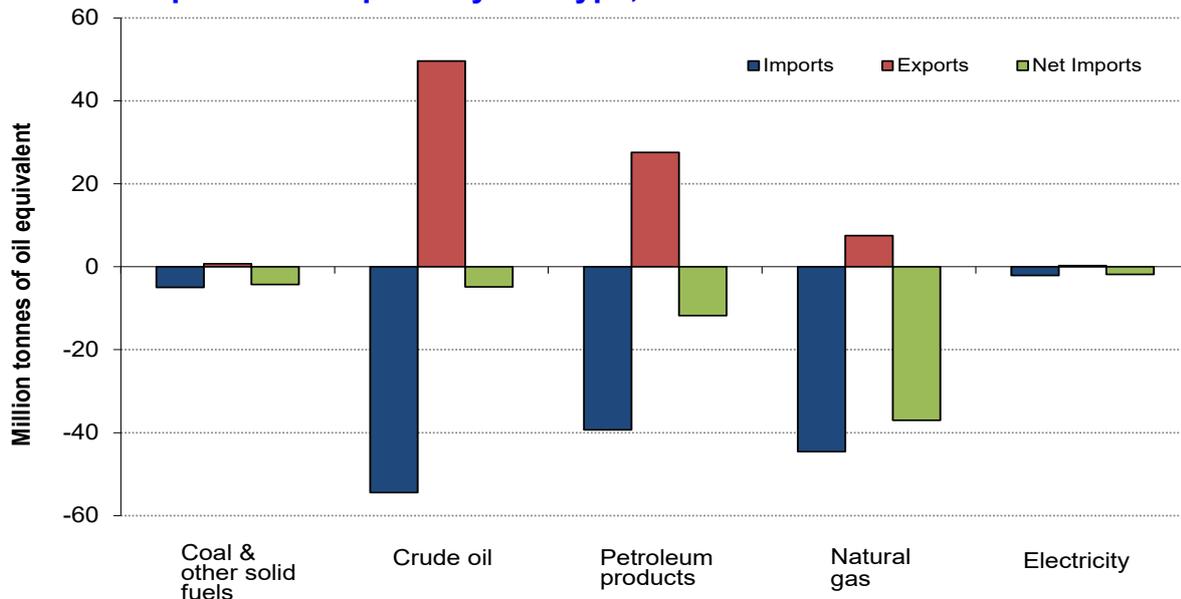
G.5 HMRC data however shows that since the switch from being a net exporter in 2003 to a net importer in 2004, the UK has continued to remain a net importer of energy. Net imports have since grown considerably as the falls in UK energy consumption have been outweighed by the continuing decline in production. Since the peak in 2012, HMRC net imports have declined and in 2019, provisional total net imports of fuels showed that there was a decrease of 4.4 per cent on the previous year to 59.7 million tonnes of oil equivalent (mtoe); as imports remained broadly unchanged while exports increased by 2.9 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 2001.

Chart G.1b: UK net imports of fuel, 2003 - 2019



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 2019 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 the UK has become and remained a net importer of petroleum products (though remained a net exporter for some of the refined products). In 2019 demand for petroleum products fell despite the increase in activities at refineries and the slight increase in the production of petroleum products. The UK was again a net importer of petroleum products in 2019 at around 12 million tonnes of oil equivalent which was 11 per cent less than in the previous year, though production increased slightly by 0.4 per cent while demand fell by 1.9 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.

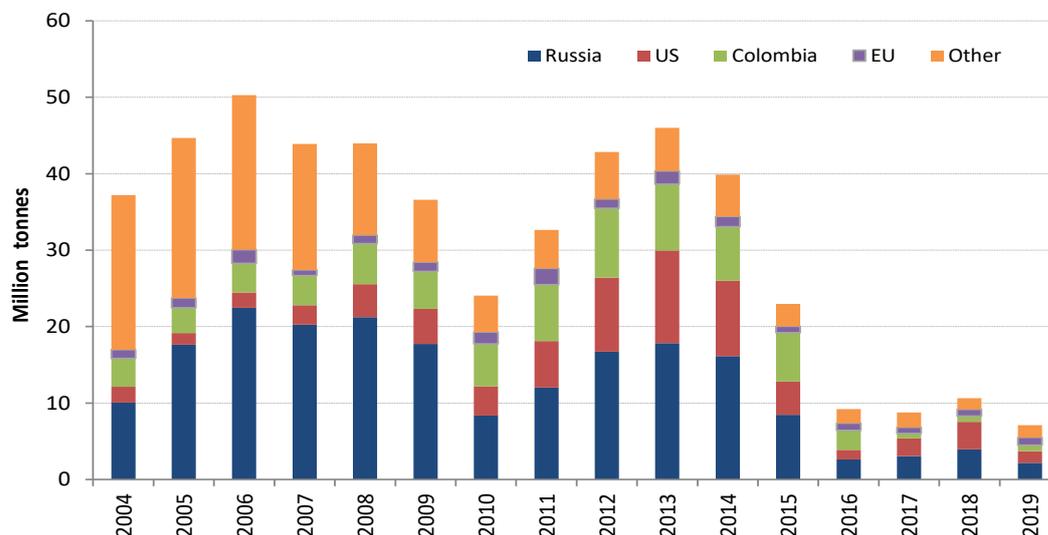
Chart G.2: Imports and exports by fuel type, 2019



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 again 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 as less coal is used in electricity generation. In 2019, the UK recorded 83 days of no coal use in generating electricity, almost four times as many as in 2018. In 2019, the UK imported 7.1 million tonnes of coal and other solid fuels, 33 per cent (3.5 million tonnes) less than in the previous year. **Chart G.3** illustrates the trends in the imports of coal by country for the years 2004-2019.

Chart G.3: Imports of coal by country of origin 2004 - 2019



G.8 **Table G.2**, provides a breakdown of HMRC imports and exports of steam coal, coking coal (including coke and semi-coke of 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. The bigger shares of coal imports in 2019, as in the previous two years, have been from Russia and the USA. In 2019 coal imports decreased largely by 33 per cent as imports from Russia decreased by 44 per cent and from the USA imports decreased by 58 per cent. In 2019, shares of imports from both Russia and the USA fell and of the UK's total coal imports 31 per cent were from Russia, 21 per cent were from the US and 11 per cent were from Colombia.

G.10 Of the total coal imported in 2019, 45 per cent was steam coal, 47 per cent was coking coal and the rest anthracite and other solid fuels. In 2019, steam coal imports were down by 51 per cent with imports from Russia down by 54 per cent to 1.4 million tonnes, from the US imports were down by 75 per cent to 0.6 million tonnes and from Colombia steam coal imports were down by 16 per cent to 0.5 million tonnes.

G.11 In 2019, 26 per cent of the UK coking coal imports (including coke and semi-coke of coal) came from the US followed by 24 per cent from Russia and another 24 per cent from Australia. The bulk of anthracite and other solid fuels imports were from EU countries.

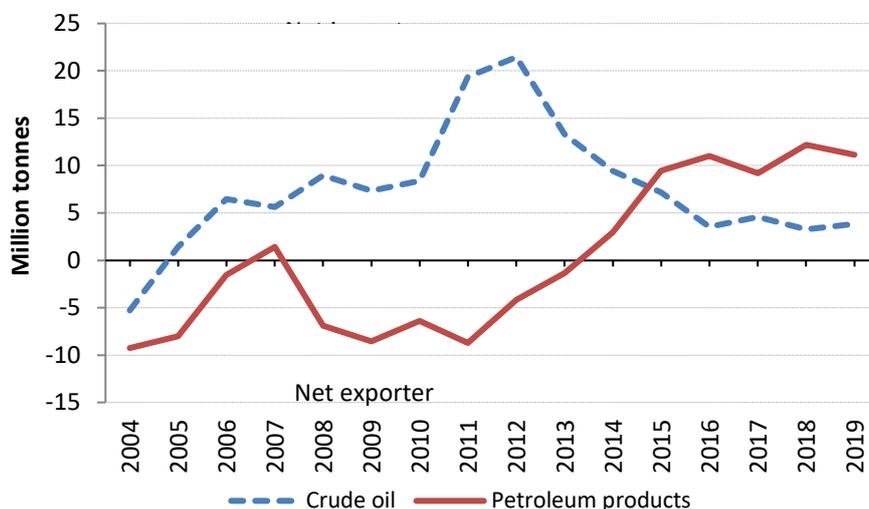
G.12 Exports of coal and other solid fuels rose by 33 per cent to just over 1.0 million tonnes in 2019 of which 27 per cent were to the Irish Republic, 15 percentage points lower than in the previous year.

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 **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 (and BEIS) have since been on the decline, reaching a recent record low of 3.3 million tonnes in 2018. In 2019, with crude oil prices at refineries (in pound sterling terms) being lower than in the previous year by 4.9 per cent, net imports of crude oil increased by 18 per cent to 3.8 million tonnes (**chart G.4**), along with indigenous production, to meet demand for processing of crude at refineries

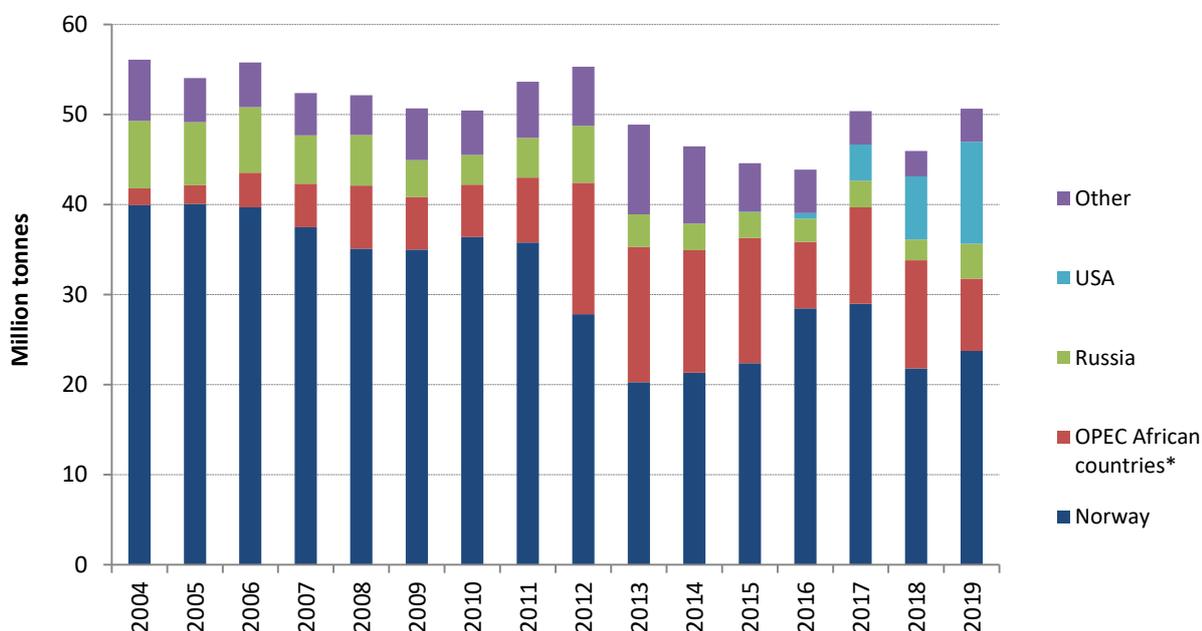
Chart G.4: Net trade of crude oil and petroleum products 2004 - 2019



G.15 Norway remains the major crude oil supplier to the UK and since the low in 2013, crude oil imports from this country have grown again but less so in the past two years (**chart G.5**). In 2019 Norway imports were 8.9 per cent higher than in the previous year but 18 per cent lower than the recent high in 2017. In 2019, Norway supplied 47 per cent of the UK's total crude oil imports (broadly similar to the previous year) compared to 76 per cent in 2003. Of the remaining total crude imports 16 per cent (which was 10 percentage points less than in the previous year) was from the OPEC African countries namely Algeria, Libya and Nigeria and 22 per cent was from USA while imports from Russia were 7.7 per cent and from Saudi Arabia, 1.3 per cent of the total.

In 2019, exports of crude oil rose by 9.7 per cent on the previous year with exports to EU countries up by 16 per cent and accounted for 65 per cent of the UK's total exports of crude oil. The UK's two largest markets in the EU are The Netherlands (up 8.1 per cent) followed by 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 2019 were China, up 39 per cent on the previous year and accounting for 69 per cent of the total Non-EU exports, followed by the USA where exports increased three-fold on the previous year, and accounting for 19 per cent of the total non-EU exports.

Chart G.5: Imports of crude oil by country of origin, 2004 - 2019



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

G.16 The main refined petroleum products imported into the United Kingdom remained as gas diesel oil, which accounted for 42 per cent of the total; followed by jet fuel (kerosene type jet fuel), which accounted for 26 per cent. The main refined petroleum products exported in 2019 were motor & aviation spirits which accounted for 26 per cent of the total exported; gas diesel oil accounted for a further 19 per cent and fuel oils 14 per cent. Aviation turbine fuel export accounted for 7 per cent.

G.17 On a net trade basis, in 2019 HMRC data show that the UK was again a net importer of petroleum products with net imports of 11.1 million tonnes (**chart G.4**), and which was 1.1 million tonnes less than in the previous year. In 2019 the UK net imports of aviation turbine fuel were 7.6 million tonnes and of gas diesel oil 10.4 million tonnes. However, in 2019 the UK was also a net exporter of some petroleum products, including petrol (3.9 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 and broadly flat in recent years. 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 had been increasing sharply, reaching a peak in 2010 since when imports levels have declined, remaining broadly level in recent years. In 2019 gas imports were broadly

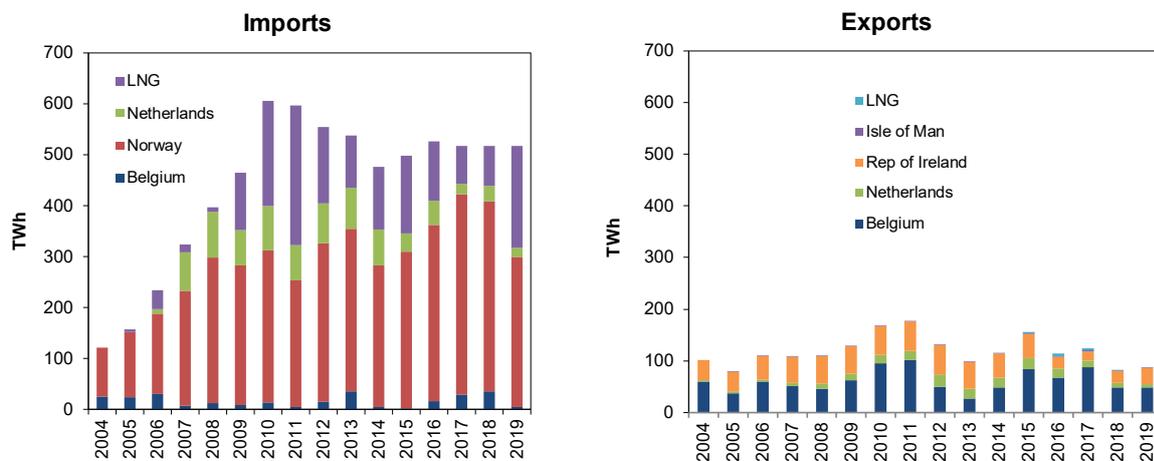
similar to the previous year, although within this pipeline imports were down sharply owing to a three-fold increase in imports of Liquefied Natural Gas (LNG). Gas demand in 2019 was down by 0.7 per cent, within which demand for electricity generation was down by 1.6 per cent and in the domestic sector demand was down by 0.9 per cent. Since the peak reached in 2015, natural gas exports have declined steadily. In 2019 natural gas exports rose by 5.6 per cent as exports to the Republic of Ireland increased by 38 per cent. **Chart G.6** depicts the trends in natural gas imports and exports by country. It also includes trends in the volume of LNG imports (see **Chart G.7** for country breakdown of LNG imports).

The UK has one of the world's largest LNG import capacities, and the largest at a single installation in Europe at South Hook near Milford Haven. The UK also has an established pipeline structure to trade natural gas with the continent. Between 2015 and 2018 the UK exported LNG as 're-loads' because a long-term supply contract fixed lower acquisition prices, making it financially viable to export. However, following the ending of this contract, the UK has not exported LNG, but has taken advantage of the low spot market prices to secure LNG supply from a diverse range of sources.

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 2019 the UK exported 87 TWh of gas which was 5.6 per cent higher than in 2018. 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 2019 whilst gas exports to Belgium fell by 1.3 per cent, exports to The Republic of Ireland rose by 38 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.

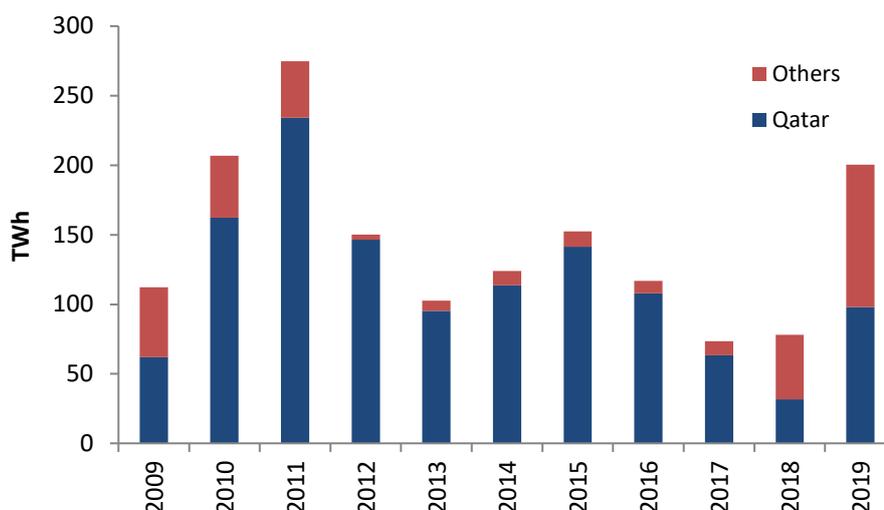
Chart G.6: Imports and exports of natural gas by country, 2004 - 2019



G.22 In 2019 the UK imported 518 TWh of gas which was broadly similar to 2018 but 39 per cent of which comprised of LNG. Gas imports from the Norwegian Continental Shelf fell by 21 per cent and accounted for 57 per cent of the total gas imports in 2019 while gas imports from Belgium fell significantly by 89 per cent. LNG imports from various sources (**Chart G.7**) almost trebled and accounted for 39 per cent of total gas imports in 2019. LNG imports from Qatar were three times more than that in the previous year and accounted for 49 per cent of total LNG imports in 2019. 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 2019 there were several shipments 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, 2009 - 2019



1.5 Imports and exports of electricity

G.24 For over a decade, the UK has been a net importer of electricity. In 2019, imports of electricity were mainly from France (11.9 TWh) and the Netherlands (6.0 TWh); whilst exports were mainly to Ireland (2.2 TWh). In 2019, imports of electricity rose by 15 per cent to 24.6 TWh as falls in imports from France, Ireland and Netherlands were offset by imports from Belgium. However, exports of electricity rose by 52 per cent to 3.4 TWh as export to France, Ireland and the Netherlands rose. Overall net imports of electricity in 2019 was up by 11 per cent from 19.1 TWh to 21.2 TWh.

1.6 Imports and exports of renewables

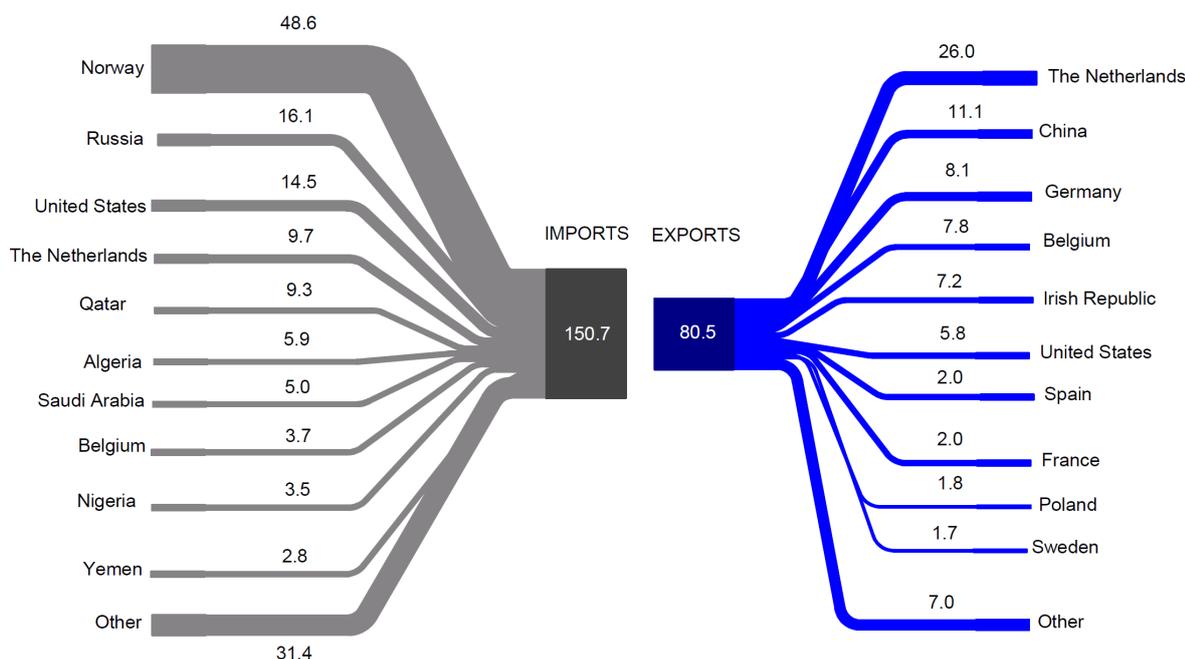
G.25 Apart from wood pellets and biodiesel, HMRC do not collect any other specific data on the imports of renewables intended to be used for energy purposes. In 2019, wood pellets imports to the UK, mainly from the United States, were around 8.7 million tonnes, an increase of 11 per cent on the previous year (**table G.6**) while imports of biodiesel were 7.2 thousand tonnes, a decrease of 4.7 per cent. In 2019 BEIS estimates of total renewables imports to the UK which include wood, wood waste, biomass and liquid biofuels were 5.5 mtoe, up 28 per cent on the previous year. Liquid fuels imports increased by 72 per cent while wood and wood waste imports increased by 17 per cent.

UK markets in 2019

G.26 **Chart G.8** 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 2019.

In 2019, 32 per cent of the total imports to the UK were from Norway followed by 11 per cent from Russia and 10 per cent from the United States while 32 per cent of the total UK exports were to The Netherlands and to China 14 per cent.

Chart G.8 UK trade by country of imports and exports, million tonnes of oil equivalent



Source DUKES 2019

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 (e.g. 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 then continued to grow significantly reaching £22 billion in 2012 before falling back again between 2013 and 2016 driven by a fall in the deficit of crude oil and petroleum products. In 2018 the energy trade deficit rose by 73 per cent to around £18.1 billion including an increase in deficit in oil and petroleum products as crude oil and gas prices increased.

In 2019 the energy trade deficit at £11.1 billion, was 39 per cent lower than in the previous year and on the same OTS basis there was a surplus in crude oil given the falls in crude oil prices. As a result the combined deficit in crude oil and petroleum products at £3.6 billion (compared to a £2.2 billion surplus in 2004 – see **chart G.10**) was down by 47 per cent on the previous year,

Chart G.9: Value of net exports of fuel, 2004 - 2019

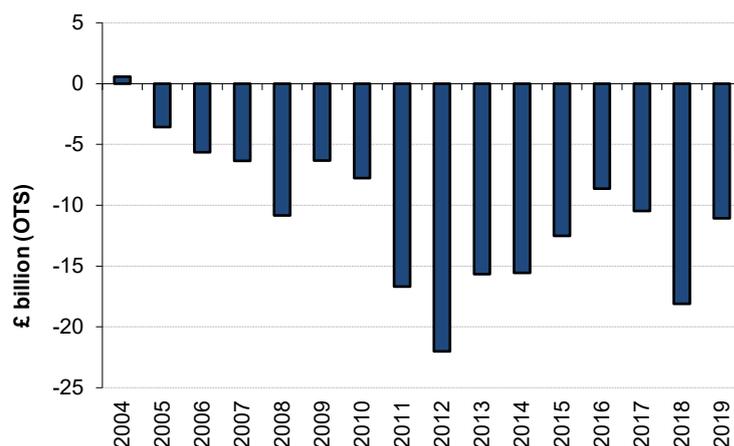
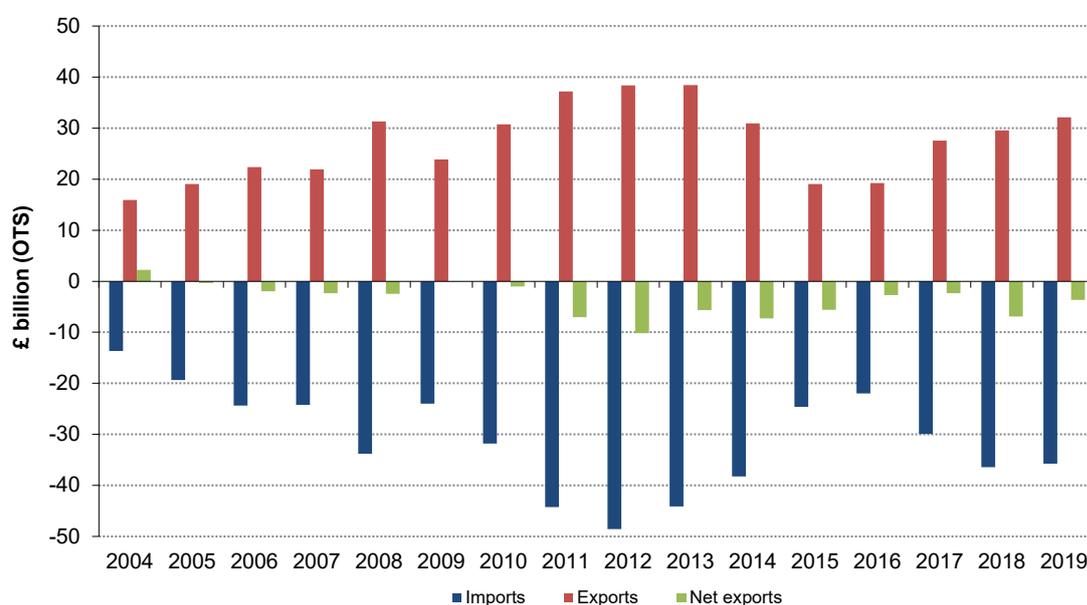


Chart G.10: Value in trade of oils⁽¹⁾, 2004 - 2019



(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.

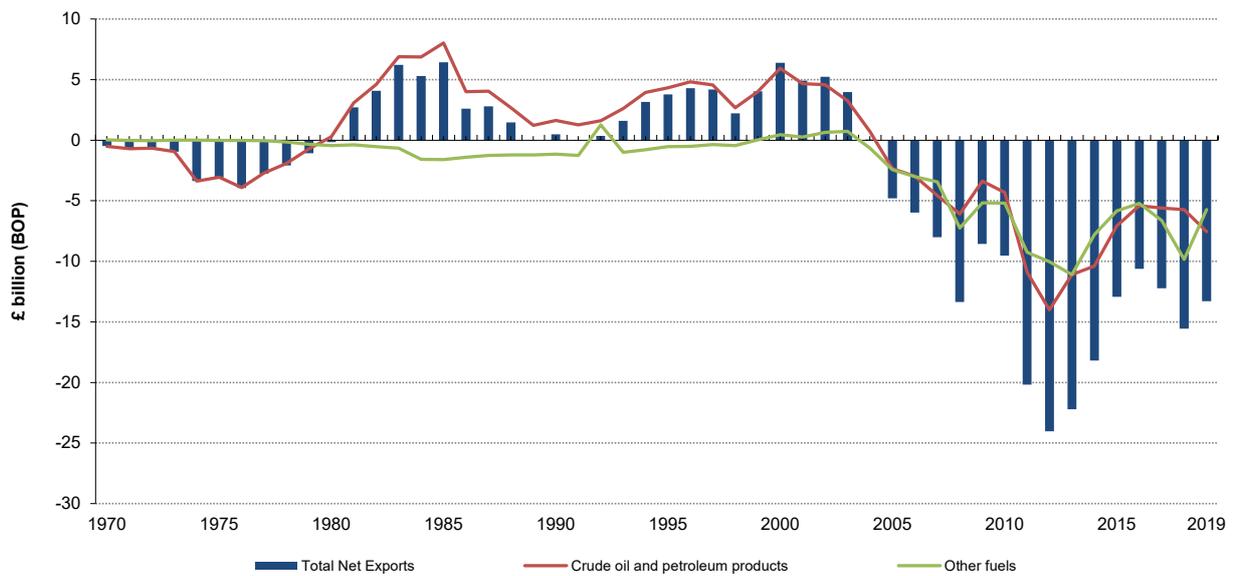
G.30 **Chart G.11** shows the net exports of fuels in value terms on a BOP basis since 1970. The United Kingdom's trade in fuels was dominated by imports until exports started to grow substantially in the mid-1970s, when production from the North Sea started, resulting in a trade surplus in 1981. This 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 6.2 per cent increase in the net trade surplus during 2002.

G.31 Since 2005 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 \$26 per barrel to \$98 per barrel, before falling back to \$63 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. Between 2013 and 2016 deficit fell as crude oil prices fell, reaching a low of \$45 in 2016. In 2017 and 2018 deficit increased, but more so in 2018, as deficit in both crude oil and other fuels increased.

In 2019, on a BOP basis, the total deficit was £13.3 billion, £2.3 billion less than in the previous year and driven by fall in deficit in other fuels by £4.1 billion. Deficit in crude oil, on the same basis, increased by £1.8 billion though crude oil price fell by around \$7 to \$64 per barrel in 2019.

Chart G.11: Value of net exports of fuels on a balance of payment basis, 1970 - 2019



G.32 **Table G.7** shows the trends in the UK trade values from 1970 to 2019 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 and since 2016 HMRC through their UK Trade Info dataset. This means exports as recorded by HM Revenue and Customs on any other basis, will differ from those recorded by the Office for National Statistics and UK Trade Info 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?CI=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.

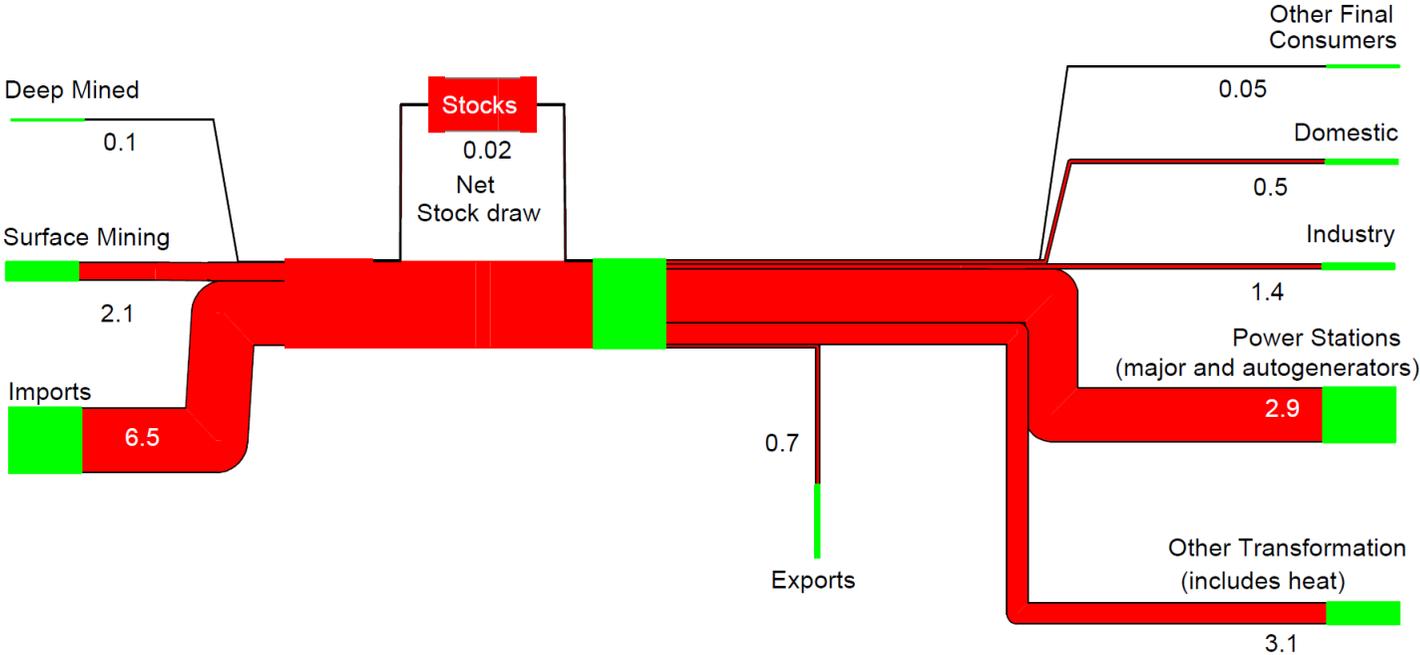
H.2 Also included within the annex is an additional flow chart for Manufactured Solid Fuels (H.6). Annual updates will appear on the BEIS section of the GOV.UK website.

Summary flow chart

H.3 A summary flow chart, UK Energy Flow Chart 2019, is also available on the BEIS section of the GOV.UK website at: www.gov.uk/government/statistics/energy-flow-chart-2019. The summary flow chart updates the last energy flow chart which showed data for 2018. It is based on statistics taken from the main Digest publication, [Table 1.1 – Energy Balance 2019](#). 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.

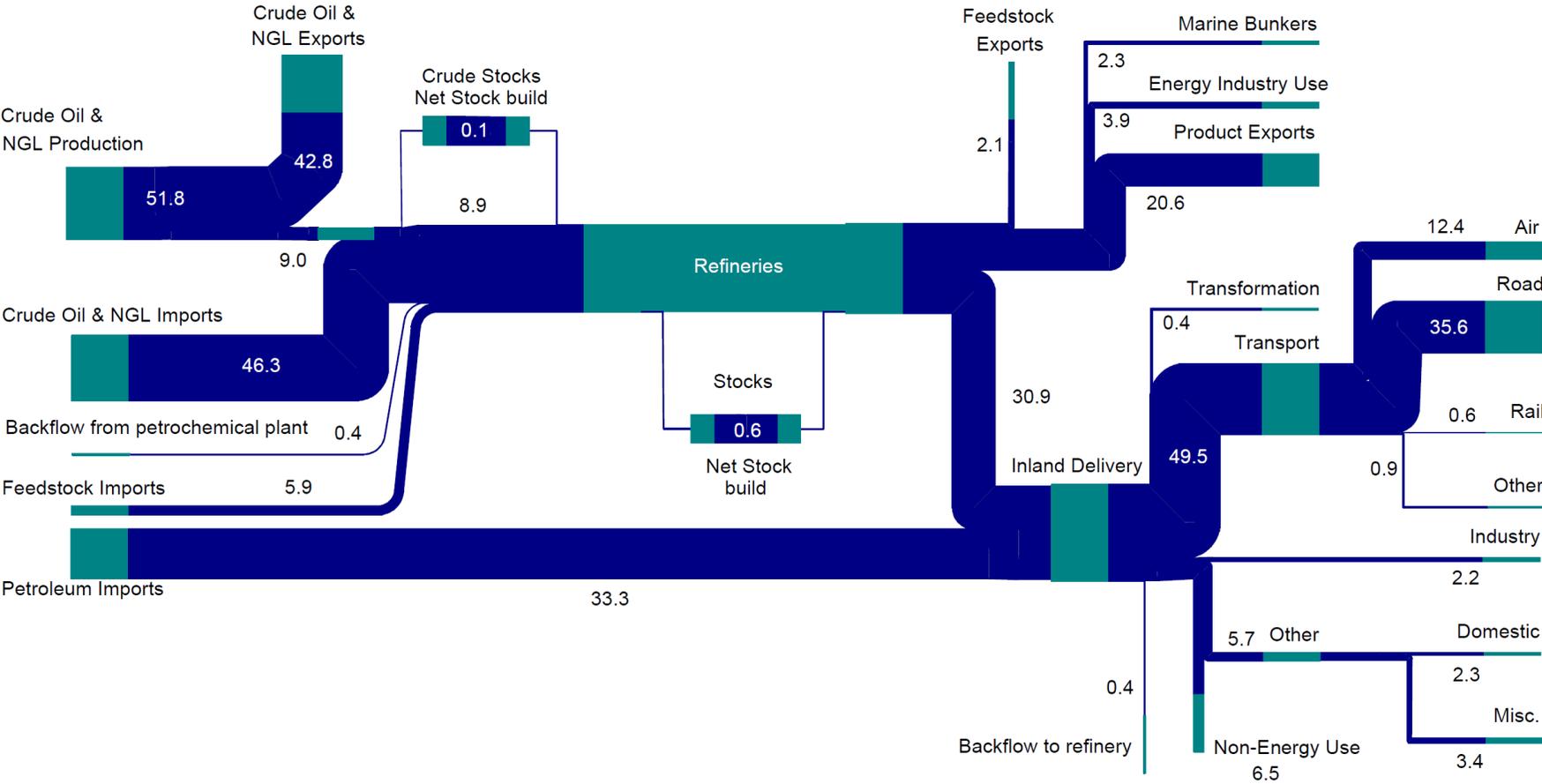
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Chart H.1: Coal flow chart 2019 (million tonnes of coal)



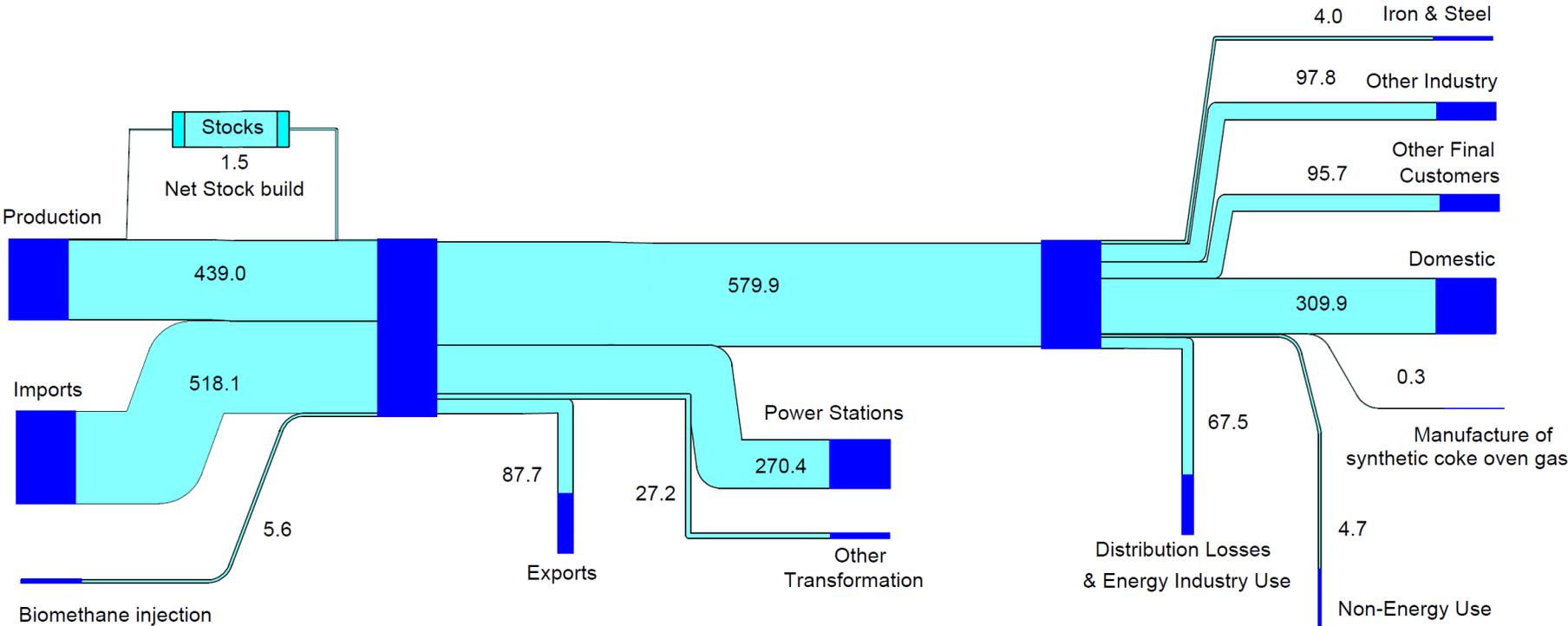
Note:
This flow chart is based on the data that appear in Tables 2.1 and 2.4.

Chart H.2: Petroleum flow chart 2019 (million tonnes)



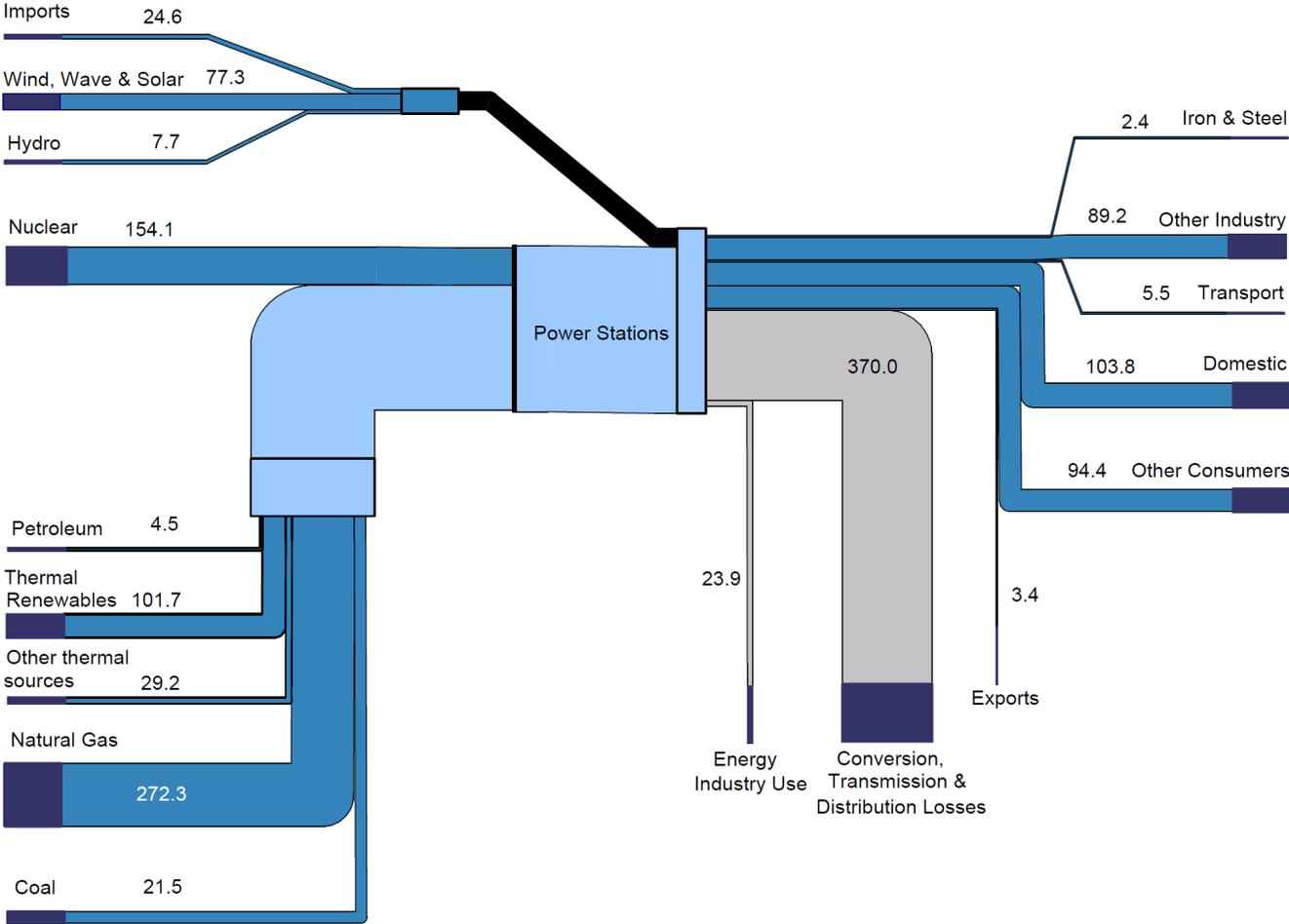
Notes:
 This flow chart is based on the data that appear in Tables 3.1 and 3.2.
 The numbers on either side of the flow chart will not match due to losses in transformation.
 Biofuels are not included.

Chart H.3: Natural gas flow chart 2019 (TWh)



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

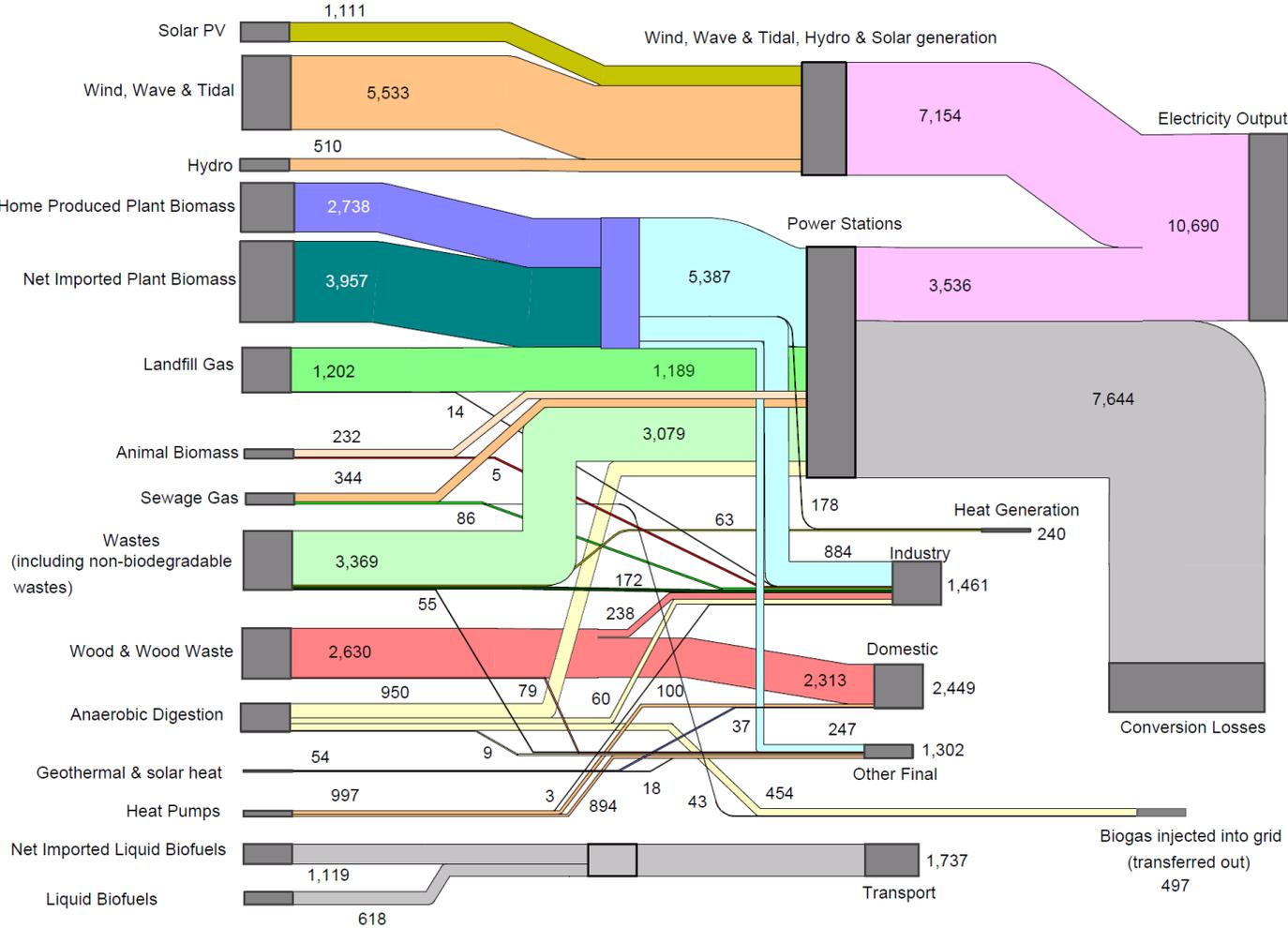
Chart H.4: Electricity flow chart 2019 (TWh)



Notes:

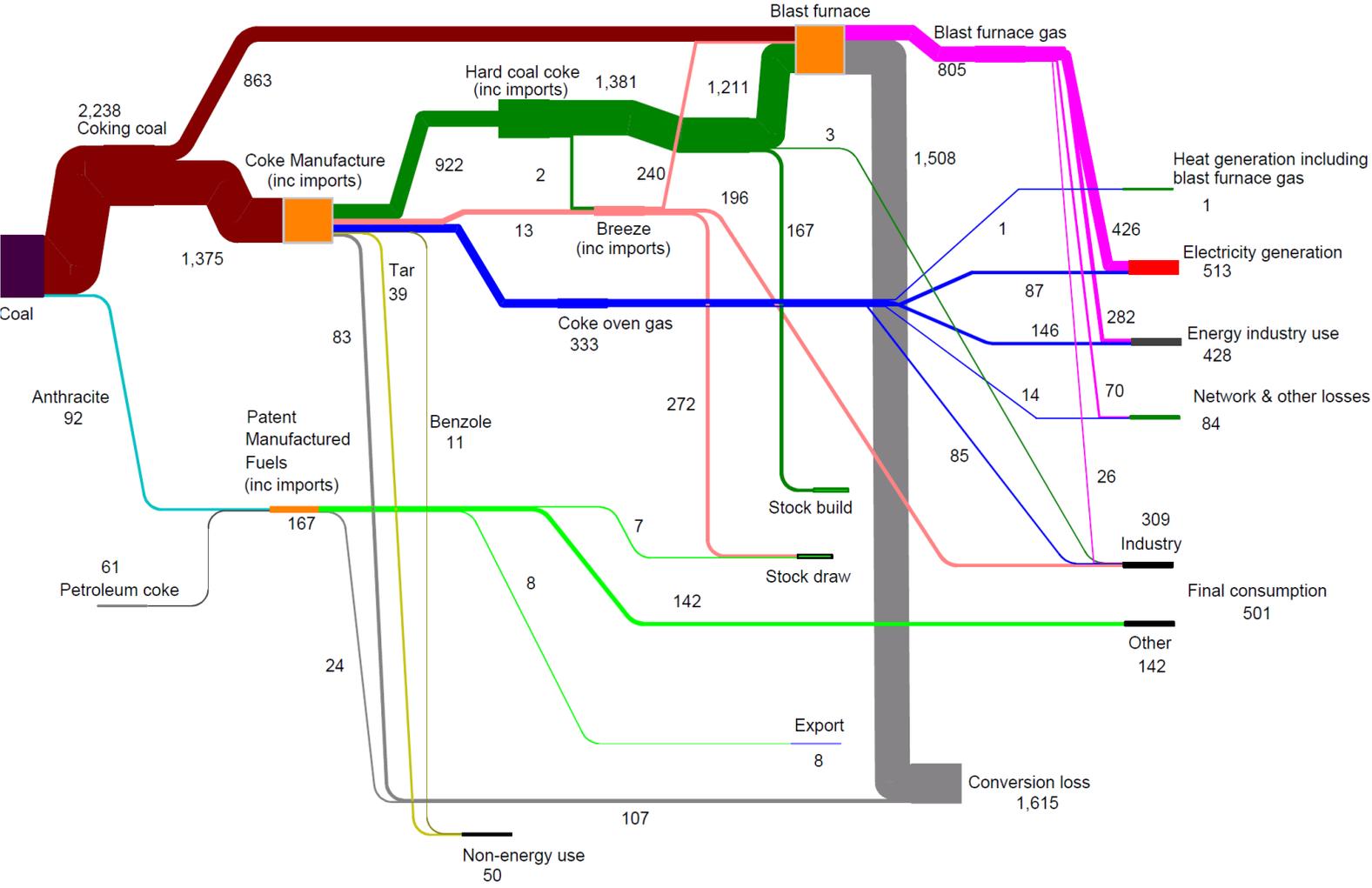
- This flow chart is based on the data in Tables 5.1 (for imports, exports, use, losses and consumption) and 5.6 (fuel used).
- (1) Hydro includes generation from pumped storage while electricity used in pumping is included under Energy Industry Use
- (2) Conversion, Transmission and Distribution Losses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

Chart H.5: Renewables flow chart 2019 (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 2019 (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 DUKES 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 6E 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 12.2 per cent in 2019.

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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. Annex J 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 For transparency, 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.

Methodology

J.3 Data sources used to compile heat generation and heat sold are primarily from the Combined Heat and Power Quality Assurance Program (CHPQA)¹ and also data collected for the Heat Metering and Billing Regulations² with some assumptions being carried over from the previous estimates prior to these regulations being in force.

CHPQA data

J.4. These data are supplied to BEIS annually by Ricardo Energy and Environment and form the basis of DUKES Chapter 7; Combined Heat and Power³. The data include heat exported and whether it's being exported to an entity declared 'not part of same qualifying group', in which case it is deemed to be sold under a contract thus satisfying the definition set out in paragraph J1 above.

J.5 This year, a sectoral analysis of heat generators has shown that certain suppliers are classified as 'Electricity, gas, steam, and air conditioning supply'. This sector falls within the transformation sector in the energy balances and as such can't be deducted from any sector in final consumption and their main business is deemed to be supplying a heat network. It is therefore included in the heat generation row and for transparency, as an 'of which heat networks' row below this in the annex tables.

Non CHPQA data

J.6 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 Trends⁴, the data have been evaluated and incorporated into the heat generation figures presented in this annex. As there are gaps in this data, CHPQA data have been used where possible. For other schemes, various assumptions were applied to the HMBR dataset;

- Heat supplied was 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

¹ www.gov.uk/guidance/chpqa-guidance-notes

² www.gov.uk/guidance/heat-network

³ www.gov.uk/government/statistics/combined-heat-and-power-chapter-7-digest-of-united-kingdom-energy-statistics-dukes

⁴ www.gov.uk/government/publications/energy-trends-march-2018-special-feature-article-experimental-statistics-on-heat-networks

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.8 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 HMRB database despite having to use assumptions to achieve the correct estimates across generators and final customers.

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