



Department for
Business, Energy
& Industrial Strategy

Annex E: Energy and the environment

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Carbon dioxide emissions

Provisional 2021 results for UK Greenhouse Gas emissions and progress towards targets were published on 31 March 2022. A copy of the statistical release and associated data tables are available at:

<https://www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2021>

Oil pollution and oil releases

The total amount of oil released offshore during 2021 was approximately 12.8 tonnes. The amount of oil released around the coast of the United Kingdom and offshore in the North Sea is small in relation to total oil production. The number of oil release reports recorded in 2021 was 166, similar to 167 in 2020. There were 3 incidents where oil released exceeded 1 tonne, up from 1 in 2020.

In 2021, the average content of oil in water was 16.9 milligrams per litre, compared to 23.9 in 2020. 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 20 milligrams per litre.

Data on oil releases is available via the [Environmental and Emissions Monitoring System \(EEMS\)](#) which is maintained by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

Gas flaring

Under the terms of petroleum production licenses, gas may be flared only with the consent of the North Sea Transition Authority (NSTA) (formerly the Oil and Gas Authority (OGA)). Flaring in 2021 was estimated to be 799 million cubic metres, this was down more than 20 per cent on 2020. This reduction was largely due to extensive maintenance in 2021.

An additional 237 million cubic metres was vented. Cumulatively gas flared and vented accounted for the equivalent of 3.2 per cent of gross gas production, stable on 2020.

Gas flared and vented has declined in line with production since 2001. A time series of gas flared and vented at terminals, oil fields and gas fields can be found in [Table E.1](#).



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Annex F: Oil and gas resources

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Data are received via the North Sea Transition Authority's (NSTA) Petroleum Production Reporting System (PPRS). Further information is available via the [NSTA](#). The following supplementary tables can be downloaded [here](#):

- Table F.1 Crude oil and Natural Gas Liquids Production
- Table F.2 Gas Production
- Table F.3 Natural Gas Liquids Net Production
- Table F.4 Disposals of Crude Oil
- Long term trends: Oil 3.1.1 Crude oil and petroleum products: production, imports and exports
- Long term trends: Gas 4.1.1 Natural gas and colliery methane production and consumption

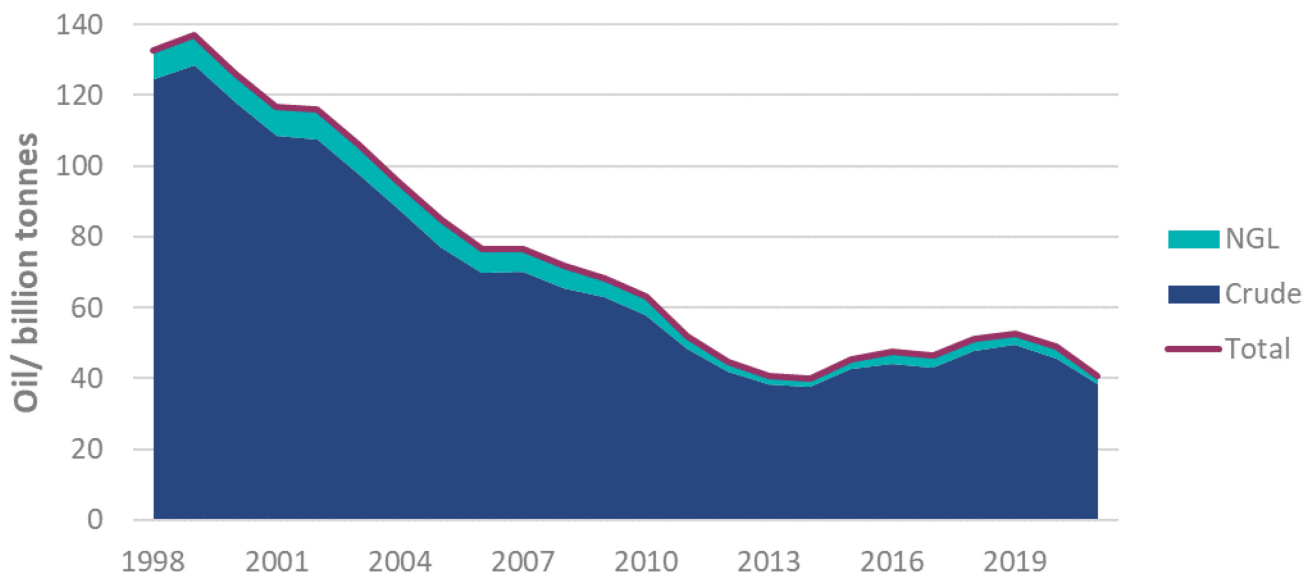
Oil and gas reserves

Data on oil and gas reserves is available from the [NSTA](#).

Production

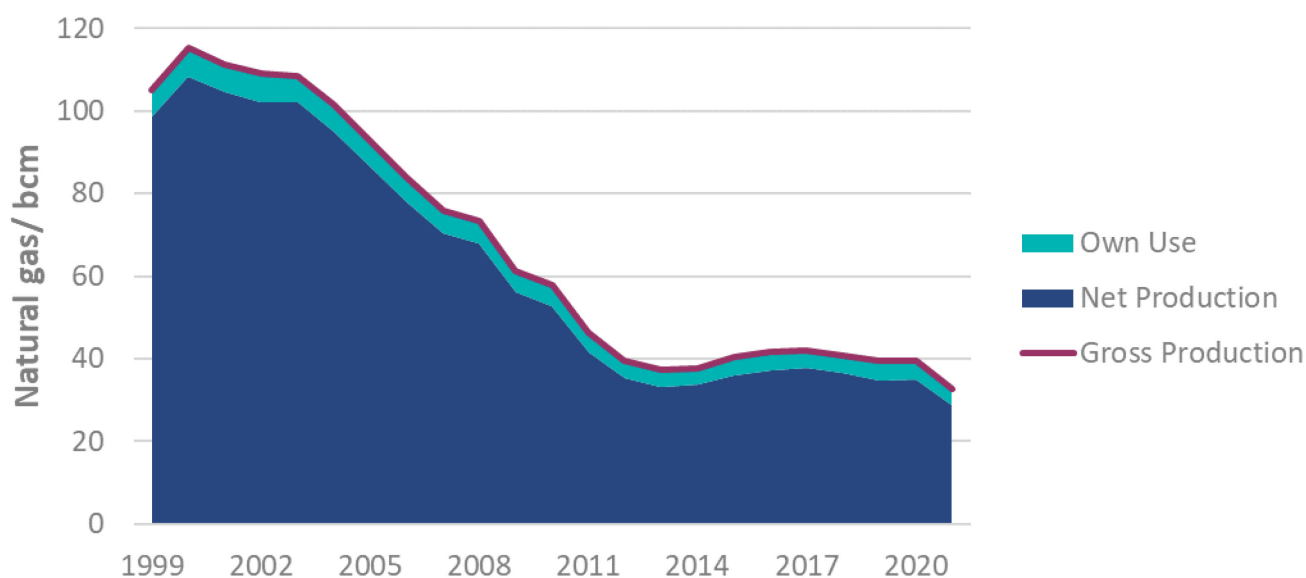
Tables F.1-F.3 show production of crude oil, natural gas and natural gas liquids (NGLs). Following the introduction of the Petroleum Production Reporting System (PPRS) in 2001, aggregate production figures are calculated using mainly terminal level data. Prior to this aggregate production figures were calculated using field level well-head data. The new method is more accurate because oil that leaves the terminal has been stabilised, that is any water, NGLs or other organic compounds have been removed.

Chart F.1 Oil and NGL production 1998-2021, UK



Crude oil and NGL production peaked in 1999 at 137 million tonnes. Following this production has generally declined. Small increases from 2014 are due to new investment and the completion of new projects. In 2021, oil and NGL production was 41 million tonnes, 30 per cent of the peak and down 16 per cent on 2020. This was due to an extensive planned maintenance schedule including the shutdown of the Forties Pipeline System (FPS), which serves a significant portion of UK oil and gas production, in addition to delayed maintenance in 2020.

Chart F.2 Gas Production 1999-2021, UK

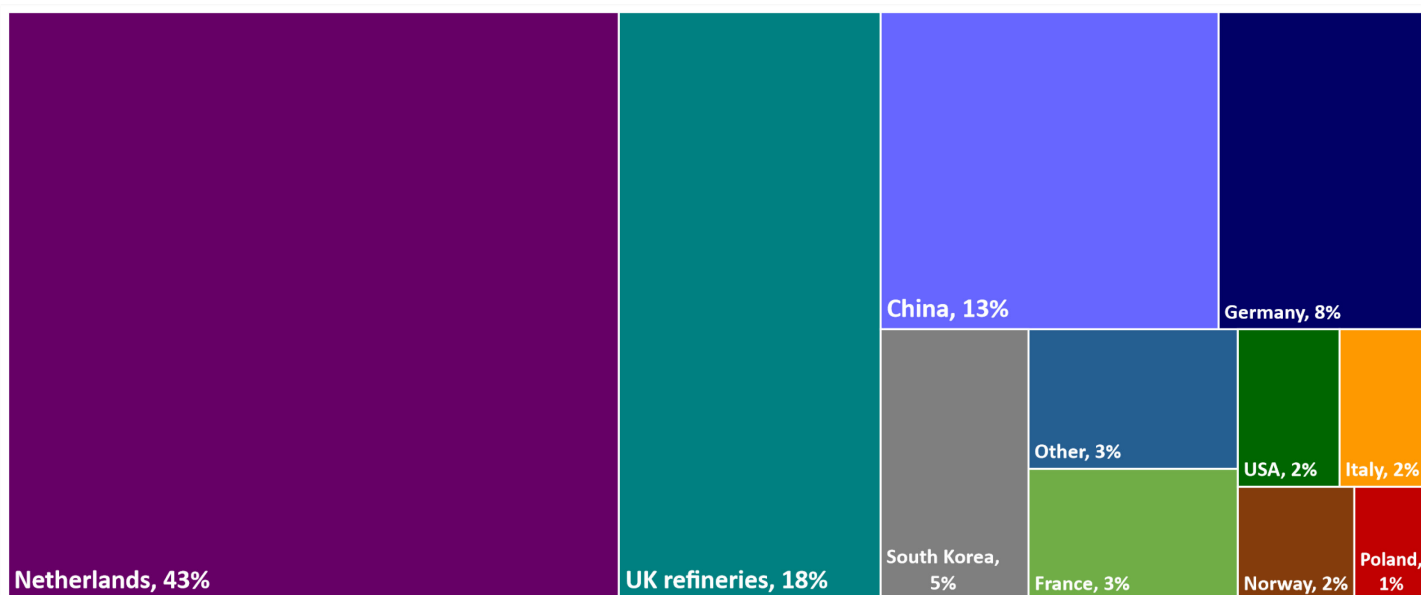


Natural gas production peaked in 2000 at 115 billion cubic metres. Similar to oil production, this peak was followed by several years of decline until 2015. Unlike oil, since 2017 declines in production from well-established fields have outstripped any gains following investment. In 2020, gas production was 33 billion cubic metres, 28 per cent of the peak and down 17 per cent on 2020. This was due to an extensive planned maintenance schedule as mentioned, in addition to delayed maintenance in 2020.

Disposals of Crude Oil

Table F.4 and chart F.3 show the disposals of crude oil following extraction from the UKCS in 2021; disposals include deliveries to UK refineries and exports abroad. Disposals to the Netherlands were the largest accounting for 43 per cent of the total, this was followed by disposals to UK refineries which accounted for 18 per cent. The other category includes 6 countries each accounting for 1 per cent or less of the total. Field level data can still be found from the [NSTA](#).

Chart F.3 Disposals of crude from the UK in 2021



Other of which, Denmark 1.0%, Sweden 0.8%, Spain 0.8%, Portugal 0.7%, Canada 0.1%, Ireland 0.003%.

The export figure in table F.4 and chart F.3 may differ from those published by the United Kingdom Petroleum Industry Association (UKPIA). These figures also include oil that has previously been imported and therefore is not part of UKCS production.



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Annex G: Foreign trade

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Main points for 2021

- Imports of fuels for energy use to the UK in 2021 at 132.7 million tonnes of oil equivalent (mtoe) rose by 8.2 per cent compared to 2020 ([Table G.1](#)).
- Exports of fuels from the UK in 2021 at 65.0 mtoe fell by 13 per cent compared to 2020, and were at the lowest level recorded since 1980 ([Table G.1](#)).
- The energy trade deficit stood at £20 billion (Overseas Trade Statistics basis), a five-fold increase from 2020, driven by an increase in the deficit in natural gas as prices increased ([Table G.2](#)).

By fuel type:

- Coal imports rose by 1.8 per cent to 3.2 mtoe in 2021 ([Table G.1](#)).
- The UK reverted to being a net importer of crude oil in 2021, after becoming a net exporter in 2020 for the first time since 2004, as exports fell by 16 per cent compared to 2020 ([Table G.1](#)).
- The UK was a net importer of petroleum products in 2021 by 6.9 mtoe, 6.6 per cent higher than in 2020 ([Table G.1](#)).
- Gas imports in 2021 at 48.2 mtoe were 17 per cent higher than in 2020, with pipeline imports up by 44 per cent but shipments of Liquefied Natural Gas (LNG) imports down by 20 per cent ([Table G.1](#)).
- Electricity net imports at 2.1 mtoe in 2021 were at a record high level ([Table G.1](#)).
- Renewables net imports fell by 2.6 per cent to 5.0 mtoe in 2021 ([Table G.1](#)).

Introduction

This annex provides an overview of published trade data on energy products in the UK. The data for this annex are presented in Tables G.1 (volumes) and G.2 (values) of DUKES. The first section of this annex covers energy trade volumes and the second covers energy trade values.

In DUKES 2022 the volumes in table G.1 are based on BEIS data only. Previously a mix of BEIS and HMRC trade data was used.

Detailed data on imports and exports by fuel, in their original units of measurement, as previously published in this annex are now available in the main DUKES chapters as shown below:

- Coal imports ([DUKES table 2.7](#)) and exports ([DUKES table 2.8](#))
- Primary oil and petroleum products imports ([DUKES table 3.7](#))
- Primary oil and petroleum products exports ([DUKES table 3.8](#))
- Natural gas imports and exports ([DUKES table 4.5](#))
- Electricity imports and exports ([DUKES table 5.13](#))
- Renewables imports and exports ([DUKES table 6.6](#))

The value information previously corresponded to that published by ONS energy trade value data but data for 2016 onwards used data direct from source, the HMRC UK Trade Info data. In DUKES 2022 the volumes in table G.1 have been updated to use BEIS data only. The values presented in table G.2 are based on HMRC and ONS value data and adjusted to these new volumes. This has been back dated to 2000.

Volume

Overview - Import and export of fuels

In the 1970's the UK was a net importer of energy. Following development of oil and gas production in the North Sea, the UK became a net exporter of energy in 1981. Output fell back in the late 1980's following the Piper Alpha disaster, with the UK regaining a position as a net exporter in the mid 1990's. North Sea production peaked in 1999, and the UK returned to being an energy importer in 2004. In 2013 imports of petroleum products exceeded exports following the closure of the Coryton refinery; the UK is now a net importer of all main fuel types, although in 2020 became a net exporter of primary oils for the first time since 2004, as well as remaining a net exporter of some petroleum products such as petrol and fuel oil.

Chart G.1 shows the UK net import dependency level (net imports compared to supply) from 1970 to 2021. In 2021, 38.0% of energy used in the UK was imported, up sharply from the 2020 level (27.9%) and at the highest level since 2015 (38.3%) due to the easing of the Covid-19 pandemic lockdown restrictions as well as reduced UKCS production due to maintenance which resulted in the UK importing more fuel to meet increased demand.

Chart G.1: UK import dependency, 1970 – 2021

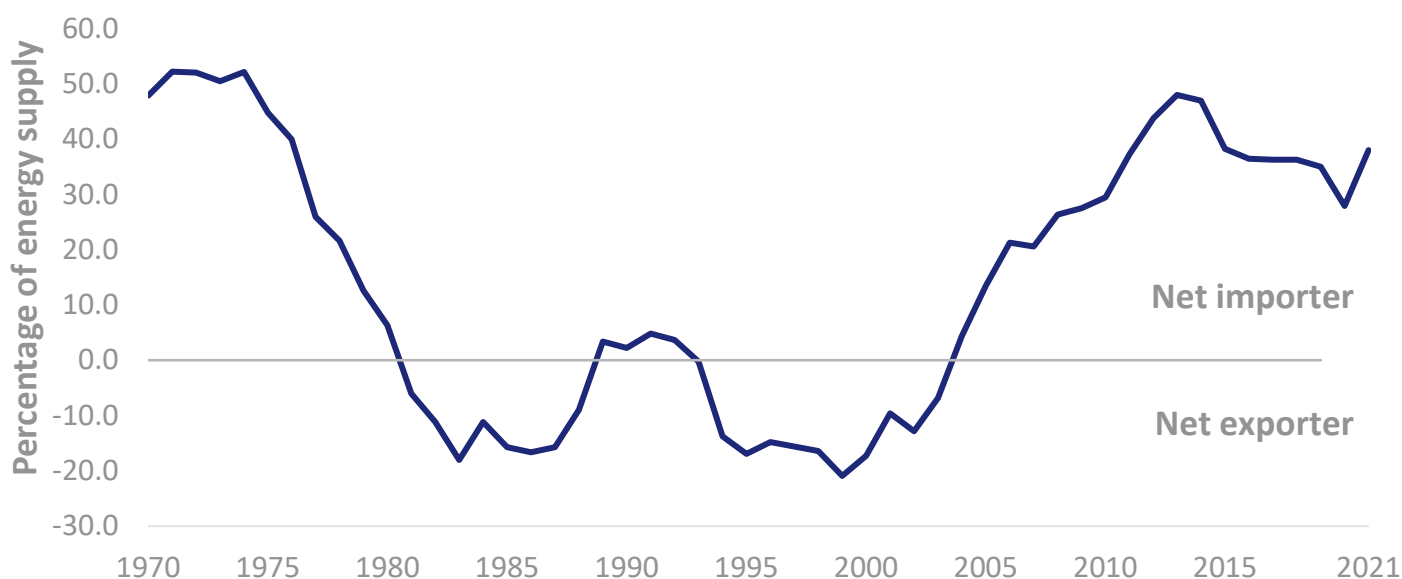
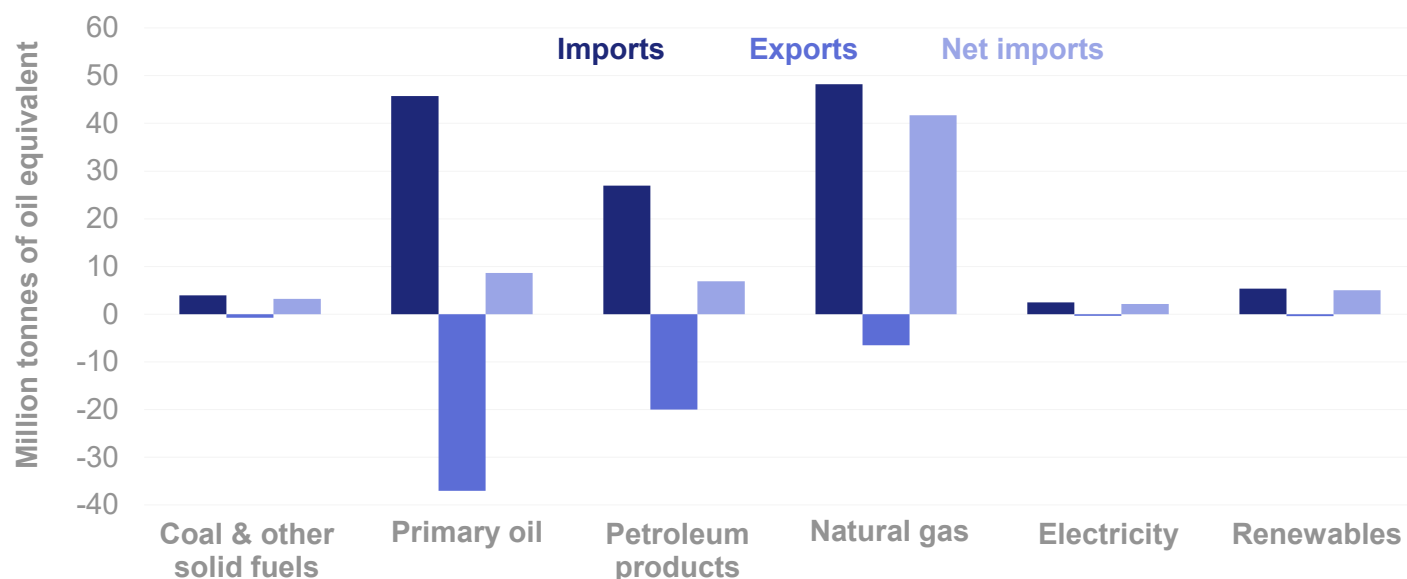


Chart G.2 shows the levels of imports, exports and net exports by fuel type in 2021.

Chart G.2: Imports and exports by fuel type, 2021

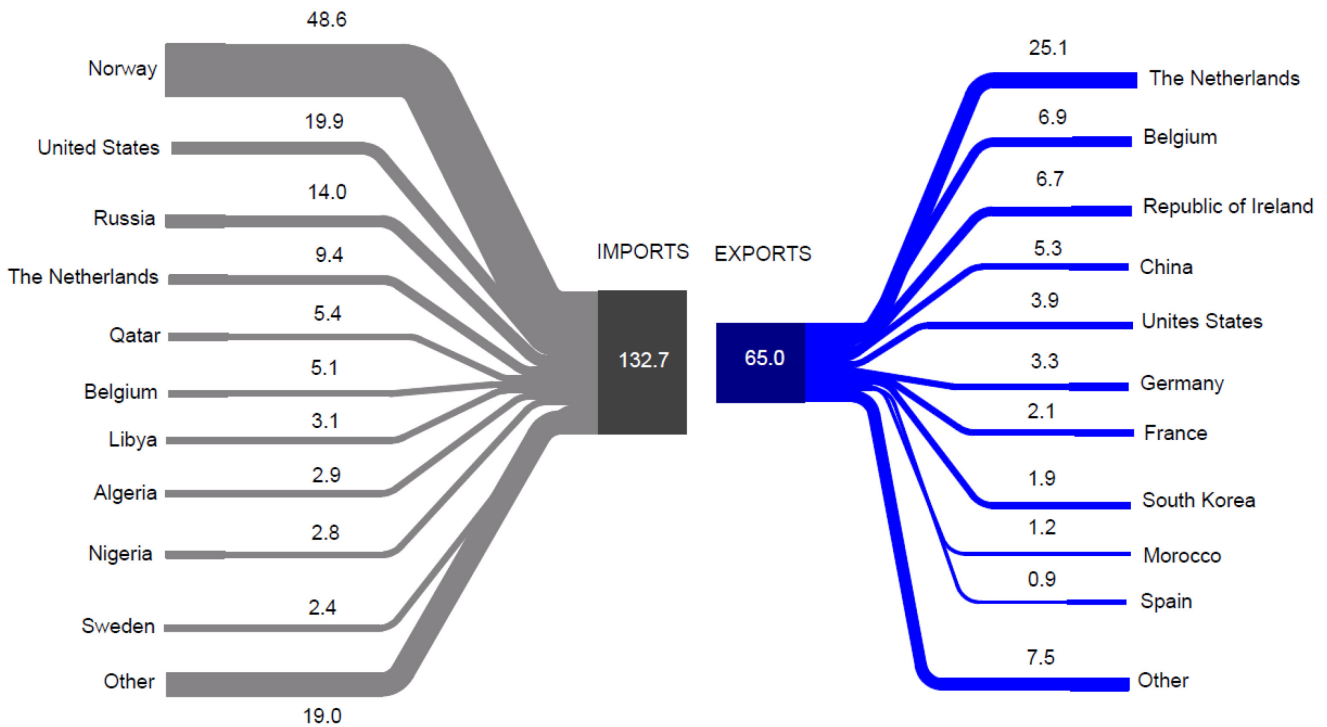


UK markets in 2021

Chart G.3 shows the UK's ten largest markets in volume of imports and exports of coal and other solid fuels, primary oil, petroleum products, natural gas, electricity and renewables. In 2021 Norway accounted for 37 per cent of total imports to the UK, followed by 15 per cent from the United States and 11 per cent from Russia. For exports, The Netherlands accounted for 39 per cent of total exports from the UK, followed by 11 per cent to Belgium and 10 per cent to the Irish Republic.

In March 2022, the Government announced that the UK will phase out imports of Russian oil and oil products by the end of 2022 in response to Russia's illegal invasion of Ukraine. Following that, in April 2022 the Government announced alongside the publication of the [British energy security strategy](#) that the UK will phase out imports of Russian coal by the end of 2022, and imports of Russian LNG as soon as possible after the end of 2022.

Chart G.3 UK trade by country for imports and exports, million tonnes of oil equivalent



Value

Imports and exports of fuels (Overseas Trade Statistics basis)

For statistical purposes, the UK adopts the valuation basis for overseas trade statistics 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.

Following the switch from the energy trade surplus of £1.3 billion in 2004, the UK has remained in deficit (Chart G.4). 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 £24 billion in 2012 before falling back again between 2013 and 2016 driven by a fall in the deficit of crude oil and petroleum products (chart G.5). In 2018 the energy trade deficit rose to under £19 billion including an increase in deficit in oil and petroleum products.

The COVID-19 pandemic has affected trade in 2020 and 2021. In 2020 the energy trade deficit at £3.3 billion, was 62 per cent lower than in the previous year and there was a surplus in crude oil and petroleum products. In 2021 the deficit grew by five times to £20 billion, driven primarily by a deficit in natural gas trade as prices increased.

Chart G.4 Value of net exports of fuel, 2001 – 2021

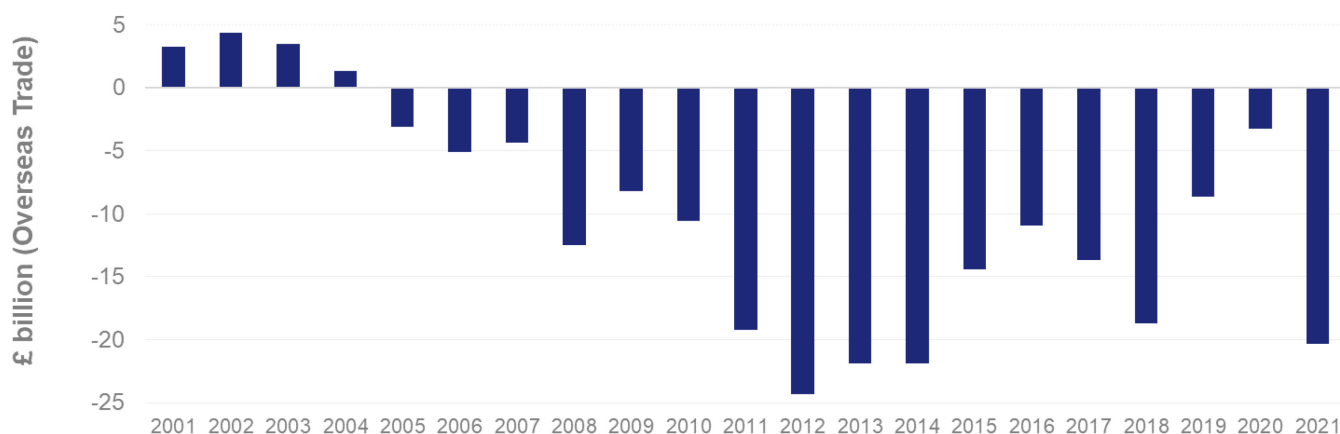
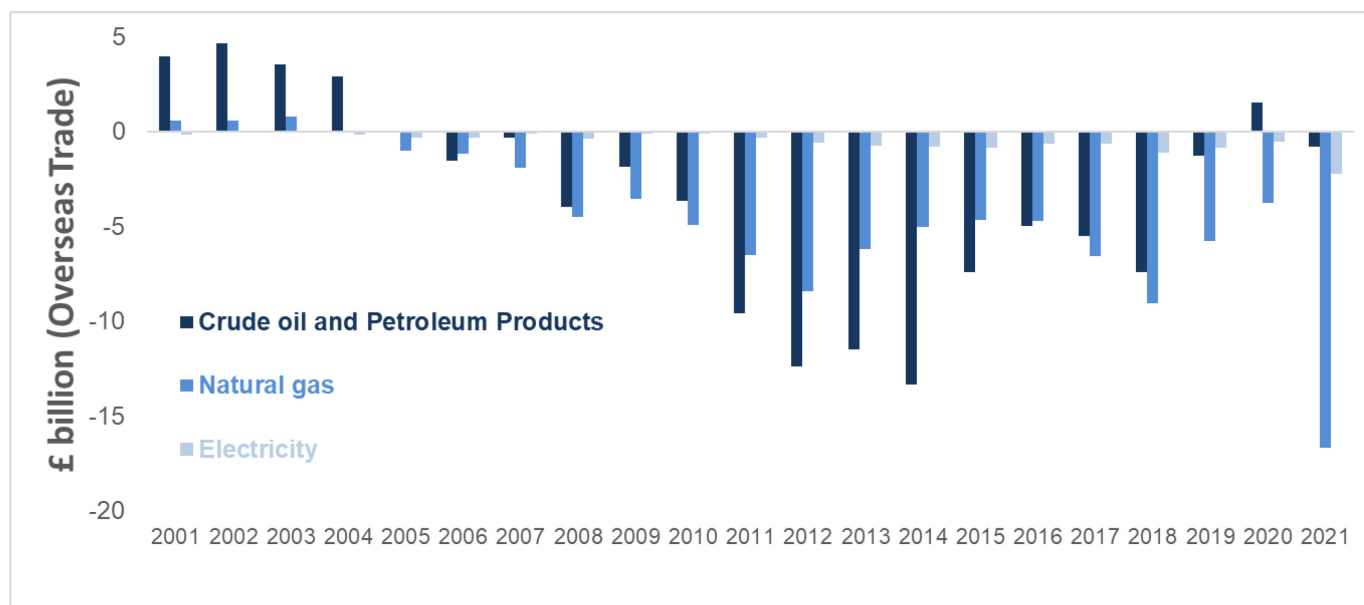


Chart G.5 Value of net exports by fuel, 2001 – 2021



Technical notes and definitions

Except as noted in Table G.2, values of imports are quoted "c.i.f.". 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 except for any duty or tax chargeable in the United Kingdom. Values of exports are "f.o.b.", 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.

Figures correspond to the following items of [SITC \(Rev 3\)](#):

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



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Annex H: Flow charts

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Introduction

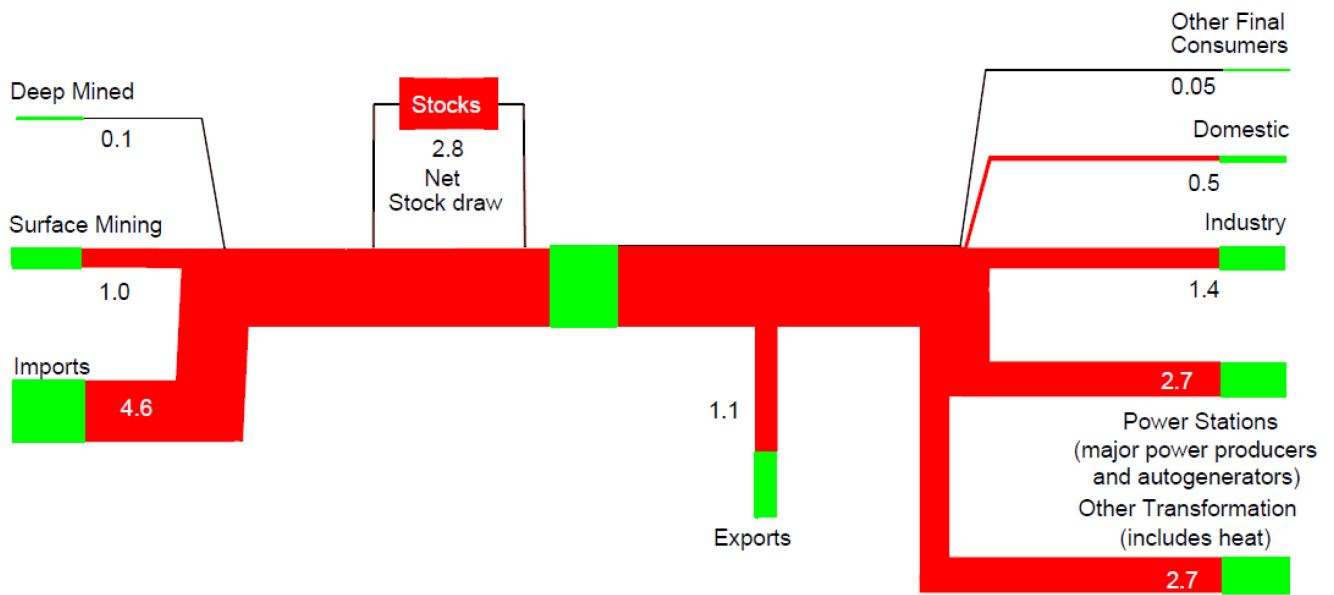
This section brings together the flow charts for individual fuels contained in the main Digest publication. Chart H.1 is for Coal, Chart H.2 is for Petroleum, Chart H.3 is for Natural Gas, Chart H.4 is for Electricity and Chart H.5 is for Renewables. Annual updates will appear in subsequent editions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

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

The summary flow chart updates the last energy flow chart which showed data for 2020. It is based on statistics taken from the main Digest publication, [Table 1.1 – Energy Balance 2021](#). 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.

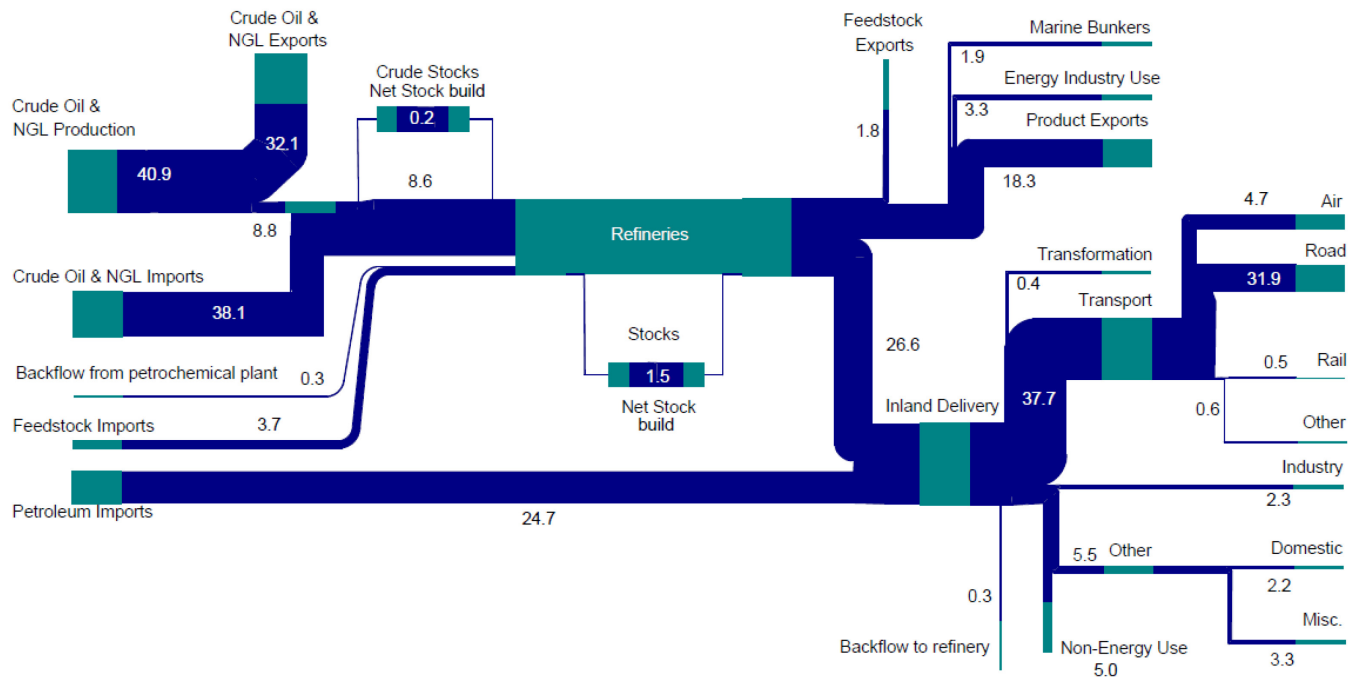
Chart H.1: Coal flow chart 2021 (million tonnes of coal)



Note:

This flow chart is based on the data that appear in [DUKES tables 2.1 and 2.2](#).

Chart H.2: Petroleum flow chart 2021 (million tonnes)



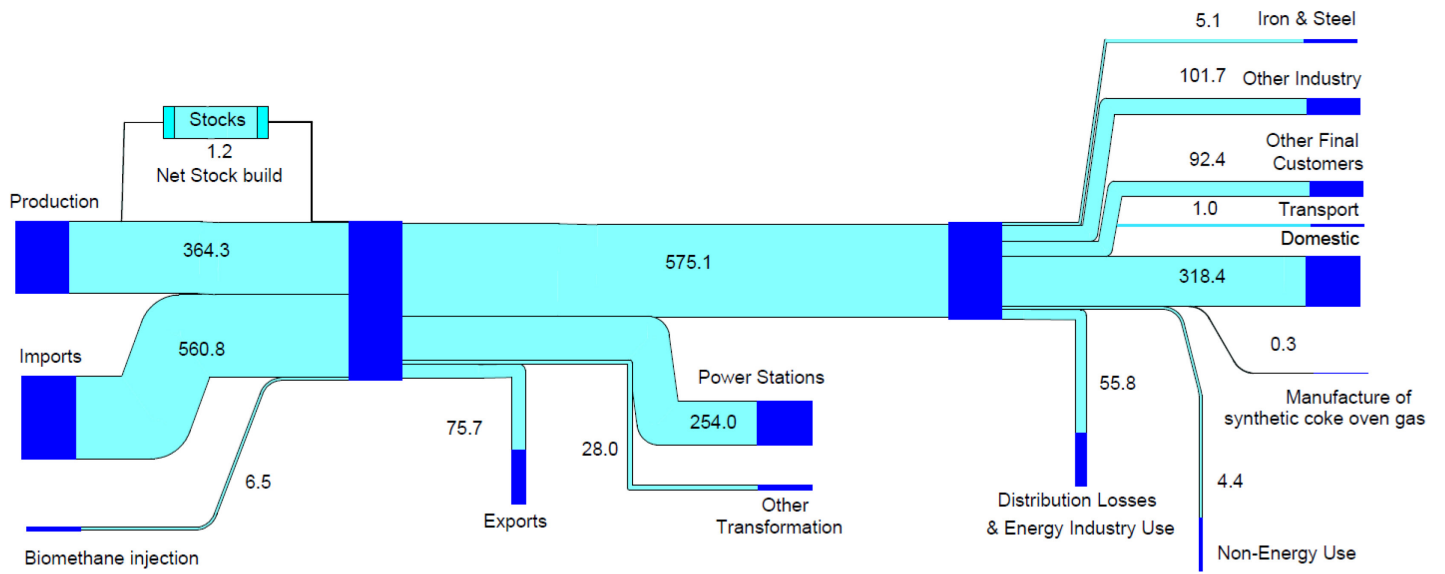
Notes:

This flow chart is based on the data that appear in [DUKES 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.

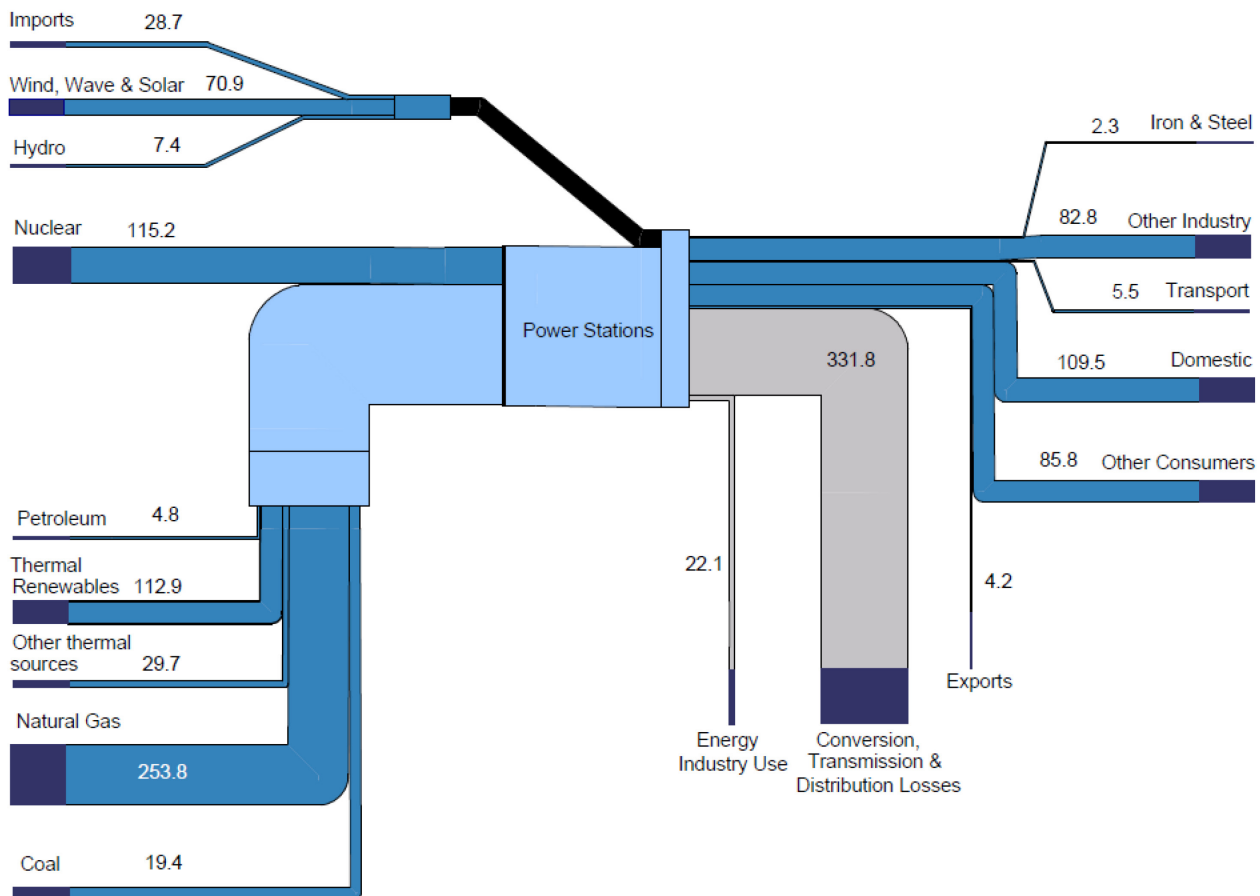
Chart H.3: Natural gas flow chart 2021 (TWh)



Note:

This flow chart is based on the data that appear in [DUKES table 4.1](#), excluding colliery methane.

Chart H.4: Electricity flow chart 2021 (TWh)



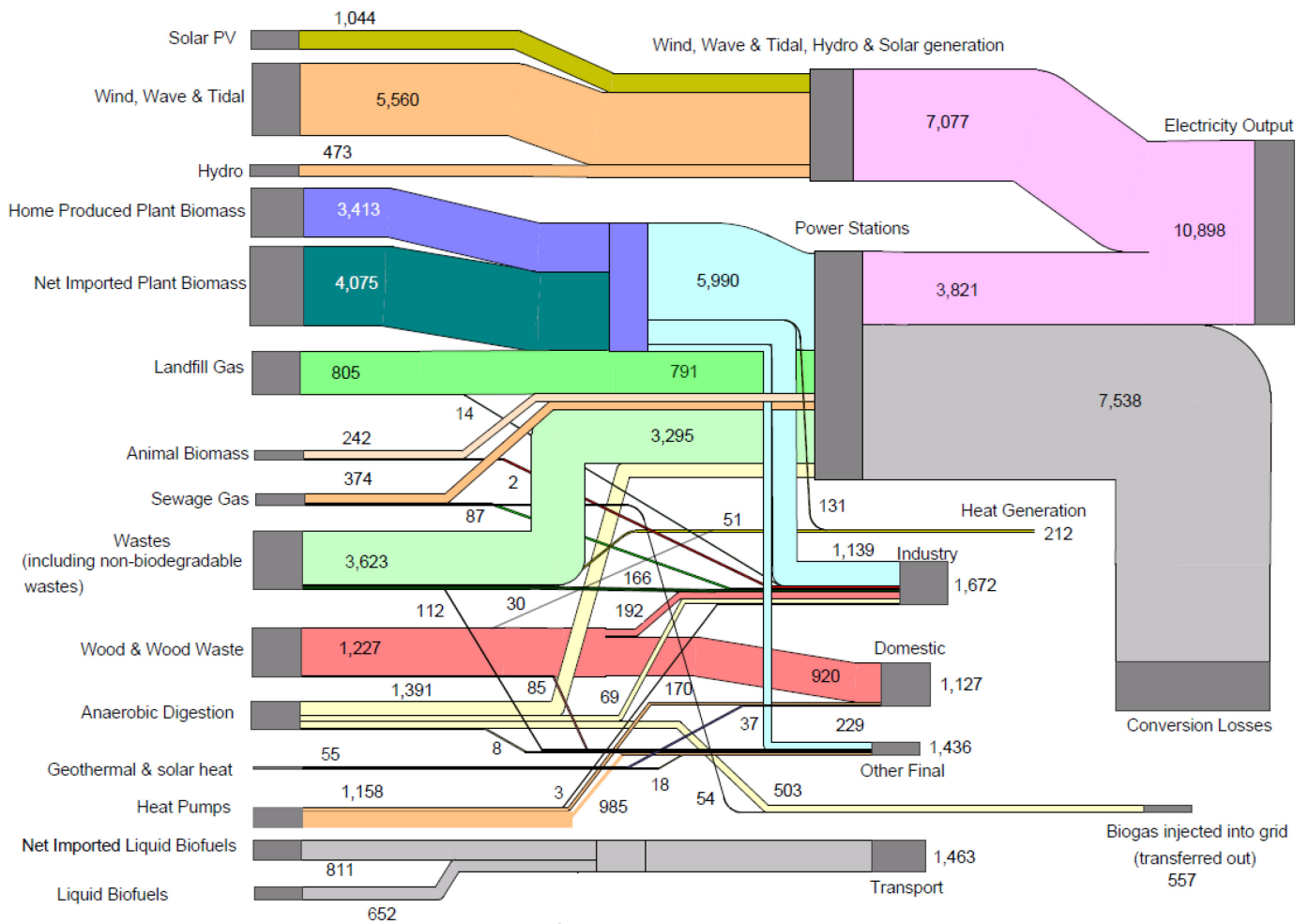
Notes:

This flow chart is based on the data in [DUKES tables 5.1 \(for imports, exports, use, losses and consumption\) and 5.6 \(fuel used\)](#).

Hydro includes generation from pumped storage while electricity used in pumping is included under Energy Industry Use

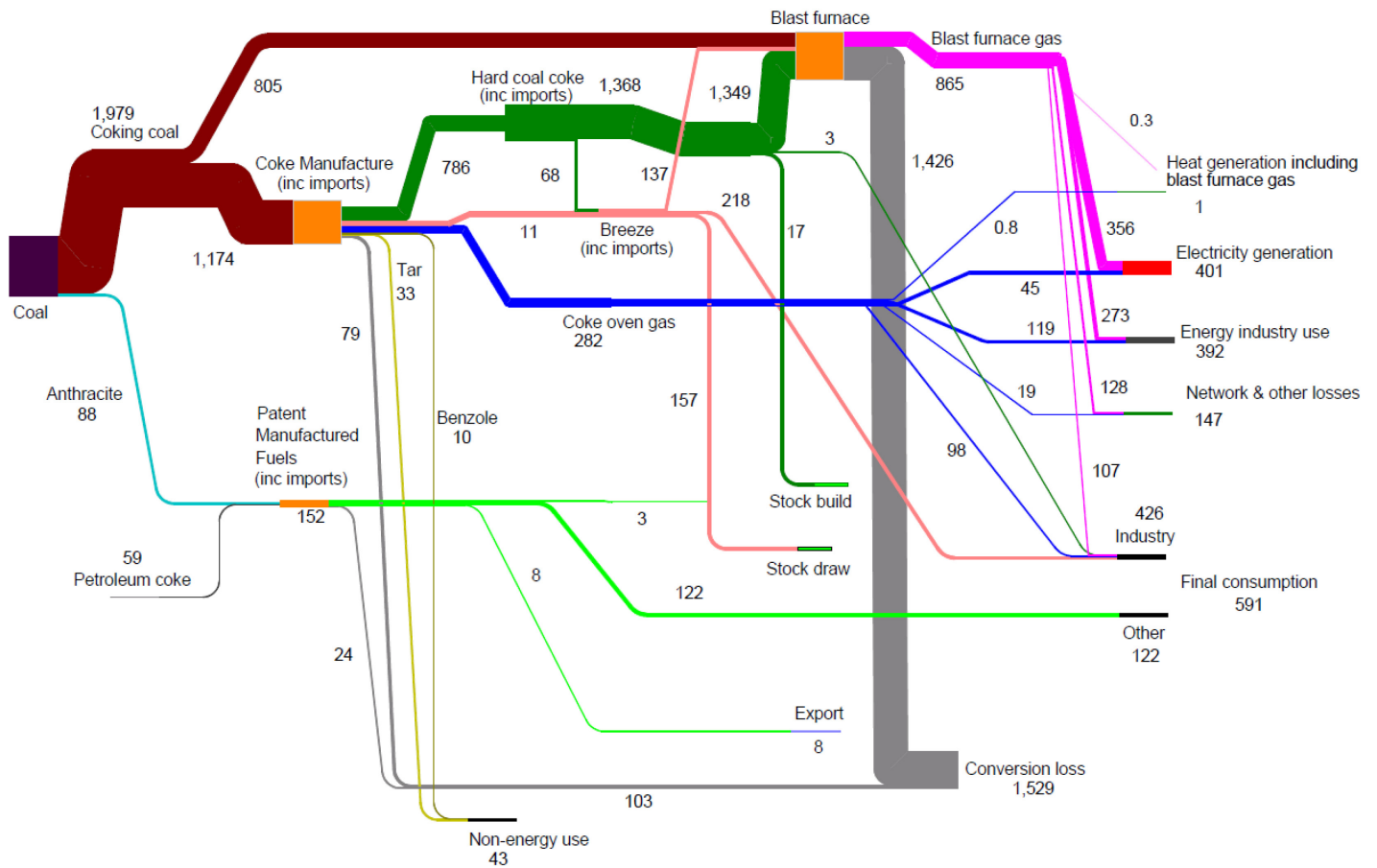
Conversion, Transmission and Distribution Losses is calculated as fuel used (Table 5.6) minus generation (Table 5.6) plus losses (Table 5.1)

Chart H.5: Renewables flow chart 2021 (thousand tonnes of oil equivalent)



Note: This flow chart is based on data that appear in [DUKES tables 6.1 and 6.2](#).

Chart H.6: Manufactured Solid Fuels flow chart 2021 (thousand tonnes of oil equivalent)



Note: This flow chart is based on data from [DUKES tables 2.1 and 2.3](#).



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Annex I: Energy balance net calorific values

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Aggregate energy balance (Table I.1)

These tables show the flows of energy in the United Kingdom from production to final consumption through conversion into secondary fuels such as coke, petroleum products, secondary electricity and heat sold using Net Calorific Values (NCV) from 2004 to 2021. The NCVs used are detailed in table A.2 of DUKES available at: <https://www.gov.uk/government/statistics/dukes-calorific-values>.



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Annex J: Heat reconciliation

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Introduction

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

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

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

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 above.

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

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,

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

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 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.

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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