Department for Energy Security & Net Zero

Energy Trends

UK, April to June 2024

About this release

Information on energy production, trade, and consumption in the UK for total energy and by specific fuels.

In this release

Data tables

Additional data are available online as part of the Energy Trends series:

Total energy
Coal and derived gases
Oil and oil products
Gas
Electricity
Renewables

This publication is based on a snapshot of survey data from energy suppliers. New data are incorporated in line with the revisions policy.

Percentage change from Quarter 2 2023, primary energy basis

(Mtoe basis)	Production	Imports	Exports	Demand
Total energy	**-7.0%**	**-0.1%**	**-11%**	**-0.9%**
Coal	**-84%**	**-58%**	**+20%**	**-57%**
Primary oil	**-9.1%**	**+8.7%**	**+4.2%**	**-1.3%**
Petroleum products	**-4.7%**	**+6.3%**	**-1.9%**	**-0.6%**
Gas	**-18%**	**-24%**	**-46%**	**-12%**
Electricity	**+13%**	**+31%**	**+75%**	**+13%**

- **UK energy production during the second quarter was down 7 per cent on the same period last year and at a near record low.** Natural gas production decreased by 18 per cent and petroleum production by 9 per cent to a new record low. Output from wind and hydro increased on last year as did nuclear. The fall in production output contributed to net import dependency increasing from 36.7 per cent to 42.2 per cent.
- Renewable electricity generation increased 19 per cent on the second quarter of 2023 with **the share of generation from renewable sources reaching a record high at 51.6 per cent of total generation**, the third consecutive quarter where renewable generation has exceeded fifty per cent. A contributor to this record share was depressed generation during the second quarter, due to both low demand within the UK and record imports of electricity.
- **UK generation of electricity hit a record low at 63.5 TWh**, down 4 per cent on the same period last year, with gas falling 37 per cent to a new record low of 16 TWh, trailing the 17 TWh from wind. **The drop in electricity generation from gas contributed to a record low for the fossil fuel share of 26.6 per cent**. Wind generation has exceeded gas generation for three consecutive quarters.
- **Total final energy consumption was 1 per cent higher than in the second quarter of 2023** with small increases in transport, household and services consumption and a small decrease in industrial consumption. On a seasonal and temperature adjusted basis, household consumption has partially recovered from the record low observed in the third quarter of 2023, but household gas consumption in particular remains low when compared to recent historical levels.

Section 1: UK total energy

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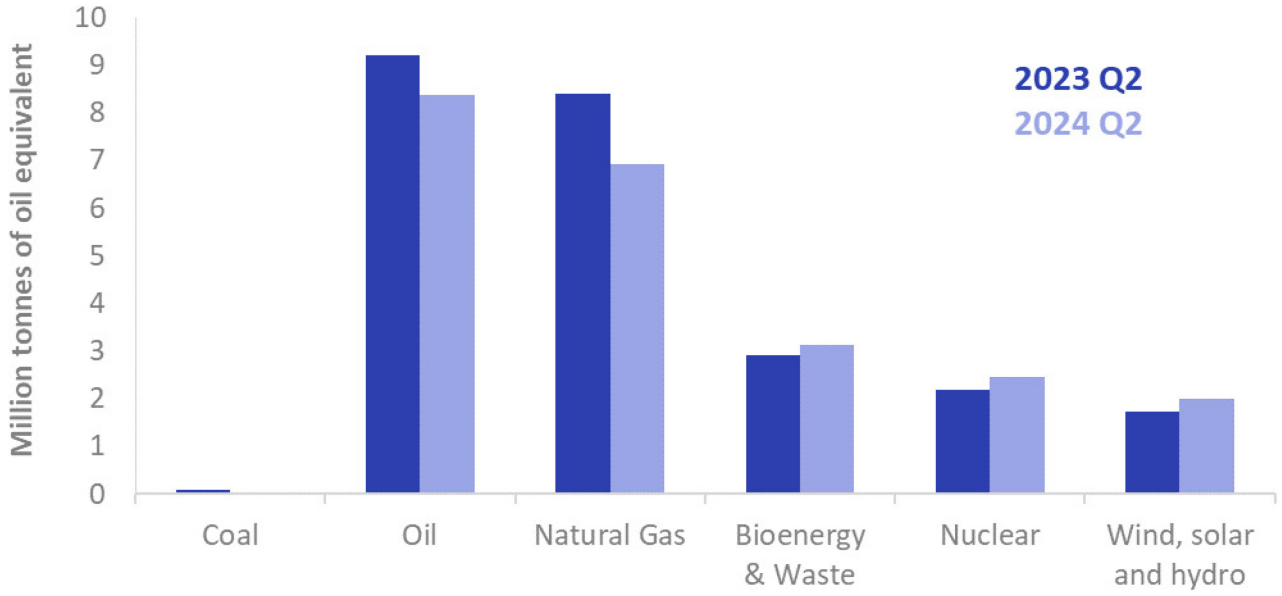
Key headlines

In the second quarter of 2024 **total energy production was 22.8 million tonnes of oil equivalent, 7.0 per cent lower** than in the second quarter of 2023, with falls in all primary fuels except bioenergy & waste, nuclear, wind and hydro.

Total primary energy consumption for energy uses fell by 0.6 per cent, with petroleum consumption for road vehicles returning to pre-pandemic levels but reduced gas consumption due to less demand from electricity generators as a result of higher levels of net imports and increased use of renewables. When adjusted to take account of weather differences, primary energy consumption fell by 0.1 per cent.

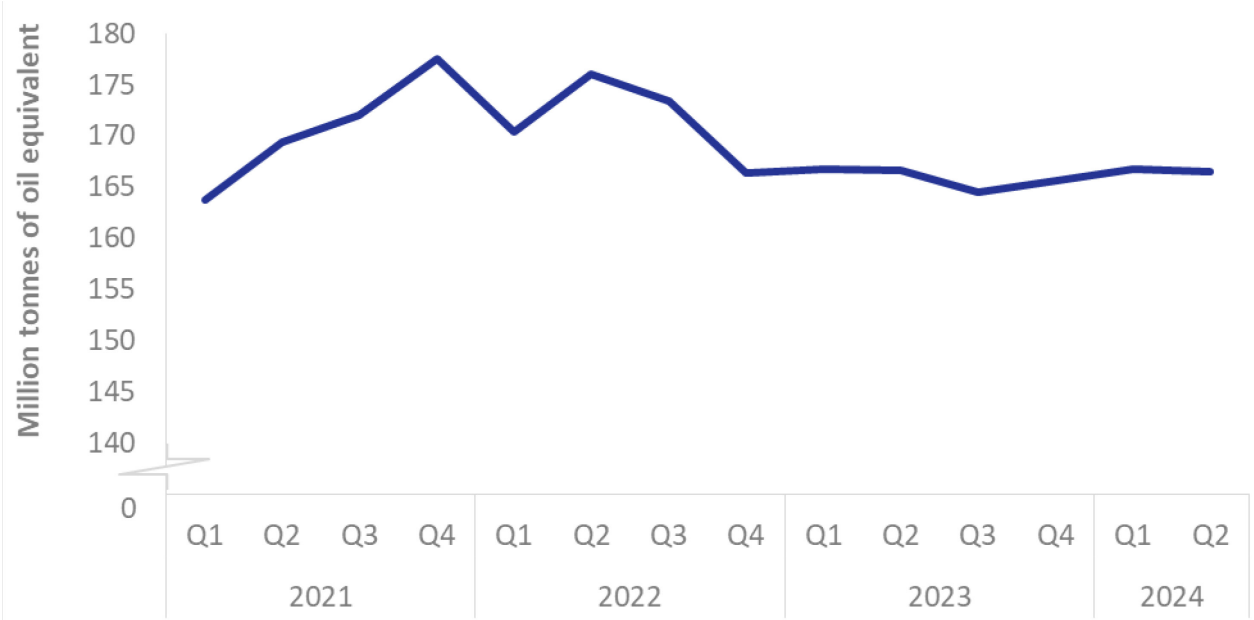
Total final energy consumption (excluding non-energy use) was 0.9 per cent higher compared to the second quarter of 2023. Other final users (mainly from the service sector) consumption rose by 2.4 per cent, transport consumption rose by 1.4 per cent, domestic consumption rose by 1.2 per cent, whilst industrial consumption fell by 2.5 per cent. On a seasonally and temperature adjusted basis, final energy consumption rose by 2.0 per cent, with rises in all sectors except industrial which fell by 2.0 per cent.

Chart 1.1 UK production (Energy Trends Tables 1.1 & 1.3)



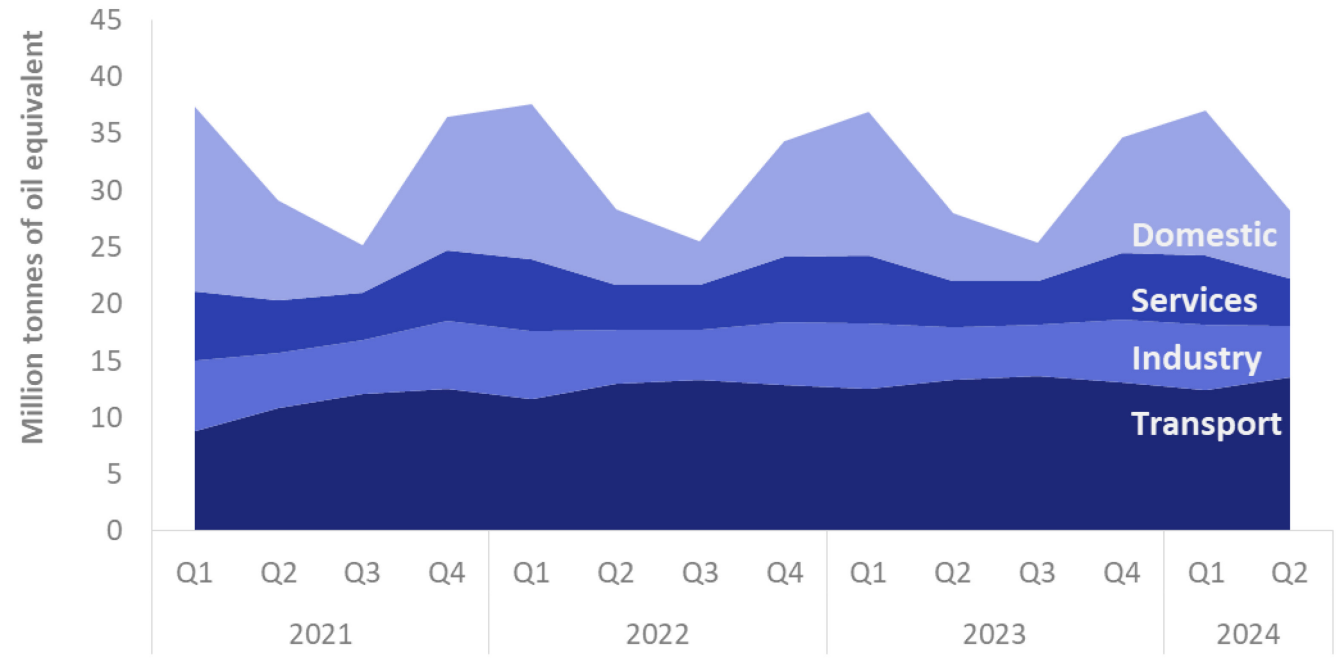
In the second quarter of 2024 **total production was 22.8 million tonnes of oil equivalent, 7.0 per cent lower** than in the second quarter of 2023 with falls in all primary fuels except bioenergy & waste, nuclear, wind and hydro. Production from fossil fuels fell with oil falling by 9.0 per cent and gas by 18 per cent, with oil production in the second quarter of 2024 at the lowest 21st century quarterly level. Although production levels have increased since the planned maintenance schedule in early summer 2021, total oil and gas production is now 35 per cent below pre-pandemic (2019) levels. Nuclear output rose by 12 per cent due to fewer outages, whilst wind, solar and hydro output rose by 16 per cent due to increased capacity and more favourable weather conditions particularly for wind generation.

Chart 1.2 Total inland consumption (primary fuel input basis) (Energy Trends Table 1.2)



In the second quarter of 2024 total inland consumption (including not only fuel used by consumers, but for electricity generation and other transformation) was 166.5 million tonnes of oil equivalent, broadly similar to the second quarter of 2023. This is on a seasonally adjusted and annualised rate that removes the impact of temperature on demand. Consumption of all primary fuels fell, except for petroleum, bioenergy & waste and primary electricity.

Chart 1.3 Final energy consumption by user (Energy Trends Table 1.3)



In the second quarter of 2024 **total final energy consumption (excluding non-energy use) was 0.9 per cent higher** than in the second quarter of 2023. Domestic sector energy consumption rose by 1.2 per cent with average temperatures 0.2 degrees Celsius cooler than a year earlier. Transport consumption rose by 1.4 per cent with petrol and diesel consumption returning to pre-pandemic levels; jet fuel consumption also increased but still lies below pre-pandemic levels. Service sector consumption rose by 2.4 per cent, whilst industrial consumption fell by 2.5 per cent.

Section 2: Coal and derived gases

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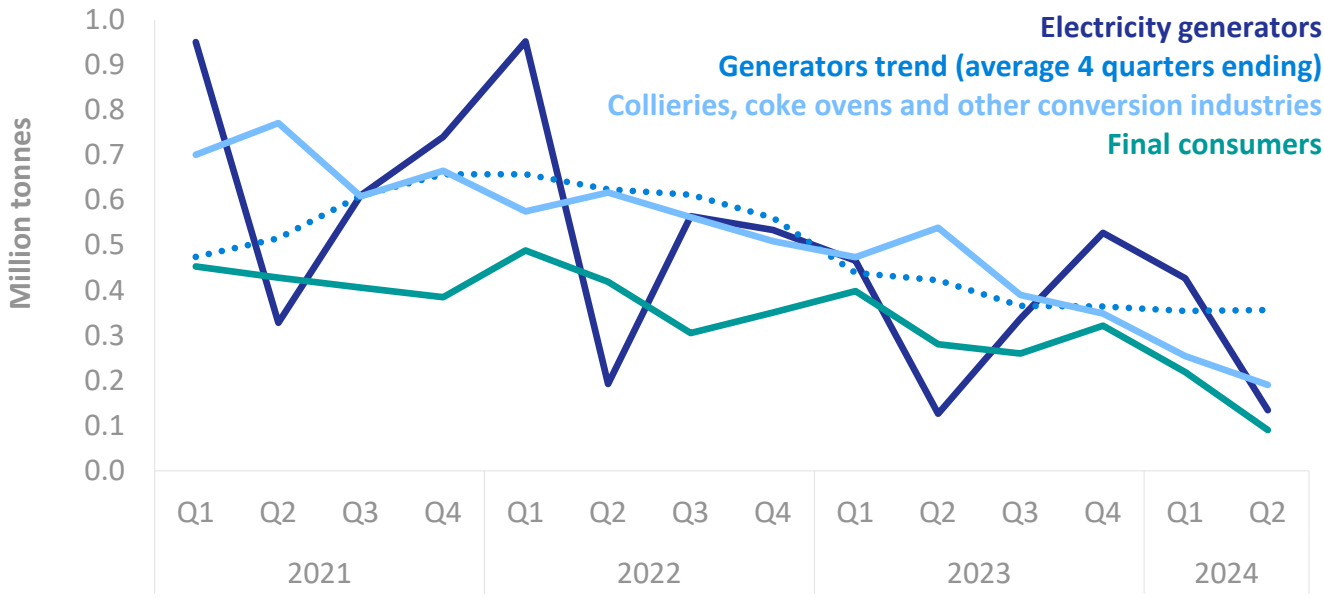
Key headlines

Overall coal production fell to 19 thousand tonnes, down 84 per cent on the second quarter of 2023 and reaching a new record low. With the last large surface mine Ffos-Y-Fran closing at the end of November 2023, there is currently no large-scale surface mining in the UK.

In the second quarter of 2024, **demand for coal by electricity generators rose to 135 thousand tonnes**, 6.6 per cent higher than in Quarter 2 2023 (Chart 2.1). However, this from a low base and coal generation provided less than 1 per cent of the UK's electricity generation during the quarter.

Coal imports fell to 315 thousand tonnes during the quarter, the lowest since the 1970s and 55 per cent down on the same period last year. Colombia was the largest supplier of coal into the UK at 29 per cent of total imports. This was followed by the European Union (28 per cent) and South Africa (17 per cent).

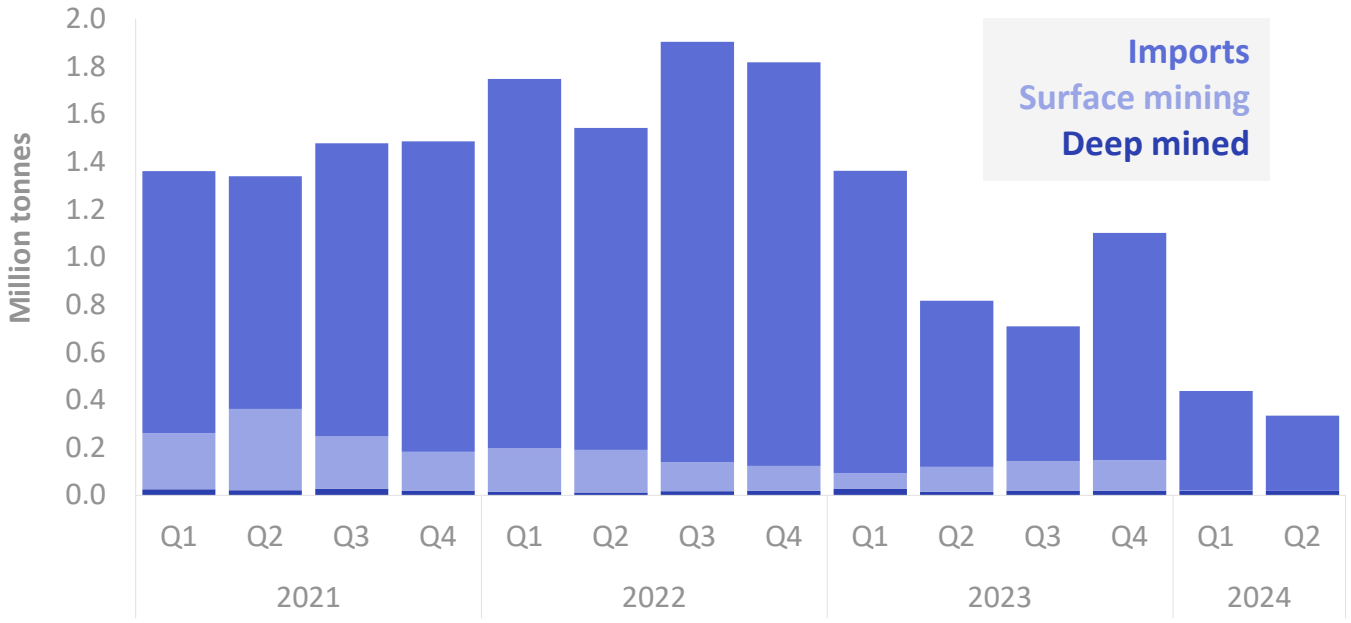
Chart 2.1 Coal Consumption (Energy Trends Table 2.1)



Coal demand for coal-fired electricity generation rose from 127 thousand tonnes in Quarter 2 2023 to 135 thousand tonnes in Quarter 2 2024. However, this is from a low base. Coal use is being phased out with electricity generation favouring gas, nuclear and renewables. As coal use is being phased out, electricity generation favours gas, nuclear and renewables and, more recently, imported electricity (see Energy Trends 5.4 for information on generation). Only one coal-fired power plant was operational in the UK, Ratcliffe-on-Soar as Kilroot closed at the end of September 2023. Drax closed on 25 April 2023 after remaining available over last winter to ensure security of supply if needed. The government remains committed to ending coal use for electricity generation by October 2024.

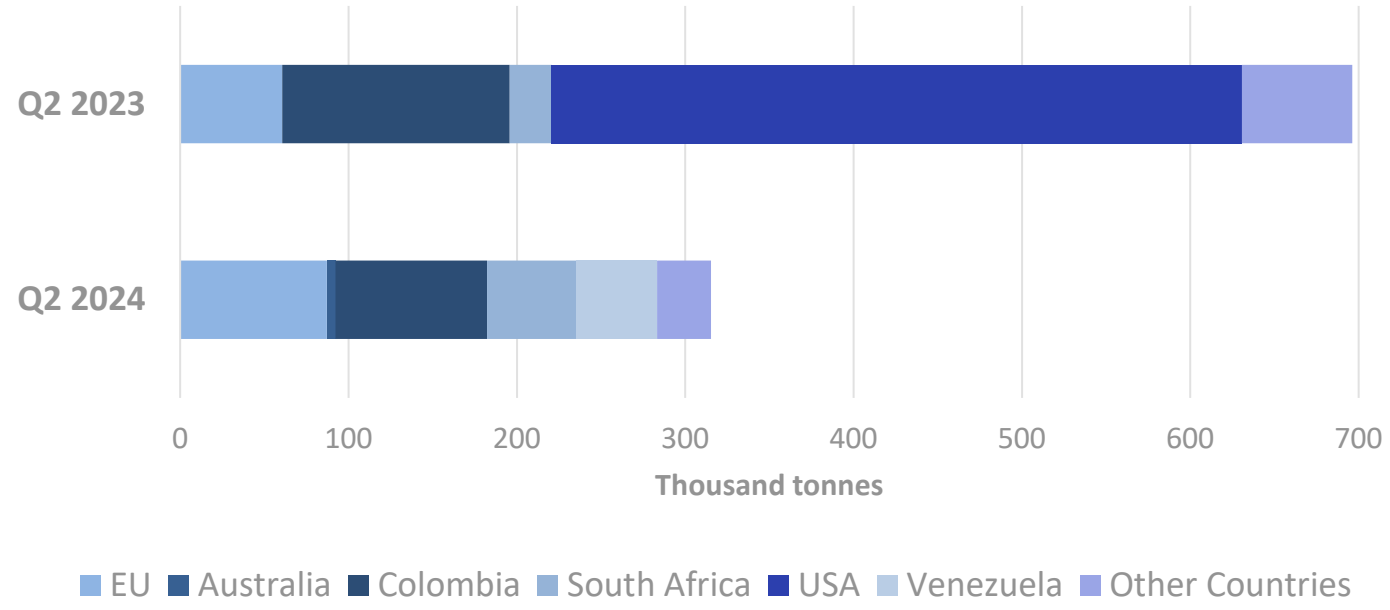
Demand for coal-fired generation is seasonal, peaking in winter when conditions are cold and dark. These peaks have declined as coal-fired generation became less competitive economically and gas and renewable sources displaced it.

Chart 2.2 Coal Supply (Energy Trends Table 2.1)



Domestic coal production has fallen steadily because of mine closures and reduced demand. At the end of 2023 the last of the last large surface mines - Ffos-Y-Fran – ceased operation and coal production reached a record low in the second quarter of 2024, just 19 thousand tonnes. There is now no large-scale surface mining within the UK. Imports filled the gap but have gradually fallen from the peak of 13.4 million tonnes in the second quarter of 2013 as overall demand dropped. In the second quarter of 2024, imports of coal were 0.3 million tonnes, the lowest since the 1970s.

Chart 2.3 Coal Imports (Energy Trends Table 2.4)



Imports this quarter comprised 275 million tonnes of steam coal (87 per cent of imports), 34 thousand tonnes of coking coal (11 per cent of imports) and 7 thousand tonnes of anthracite (2 per cent of imports). The largest provider was the Colombia (29 per cent). This was followed by the European Union (28 per cent) and South Africa (17 per cent).

Section 3: Oil and oil products

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Key headlines

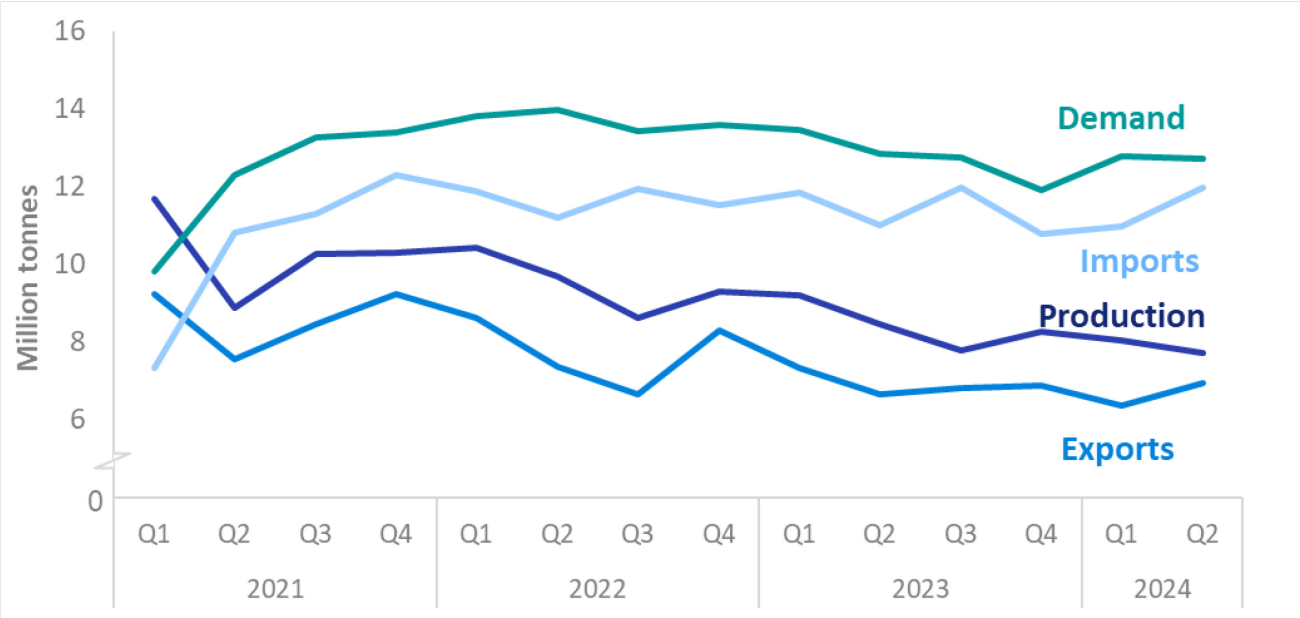
In Quarter 2 2024, production of primary oils fell to a record quarterly low of 7.7 million tonnes likely impacted by the closure of Barra and Harris oilfields as well as the summer maintenance at major oil fields.

Imports of primary oils rose to meet demand amid low production as refinery demand remained stable and exports increased by 4.2 per cent.

Demand for petroleum products was marginally up by 1.7 per cent. Production decreased by 1.2 per cent and exports rose by 2.4 per cent, creating a shortfall which was met by a 11 per cent increase in imports.

Oil stocks increased by nearly a fifth as the UK completed re-building stocks in April 2024 following the recent contribution to the International Energy Agency (IEA) coordinated stock release. At the end of Quarter 2 2024, the UK held over 150 days of net imports as stocks, well above the IEA requirement to hold 90 days.

Chart 3.1 Production and trade of crude oil and NGLs (Energy Trends Table 3.1)

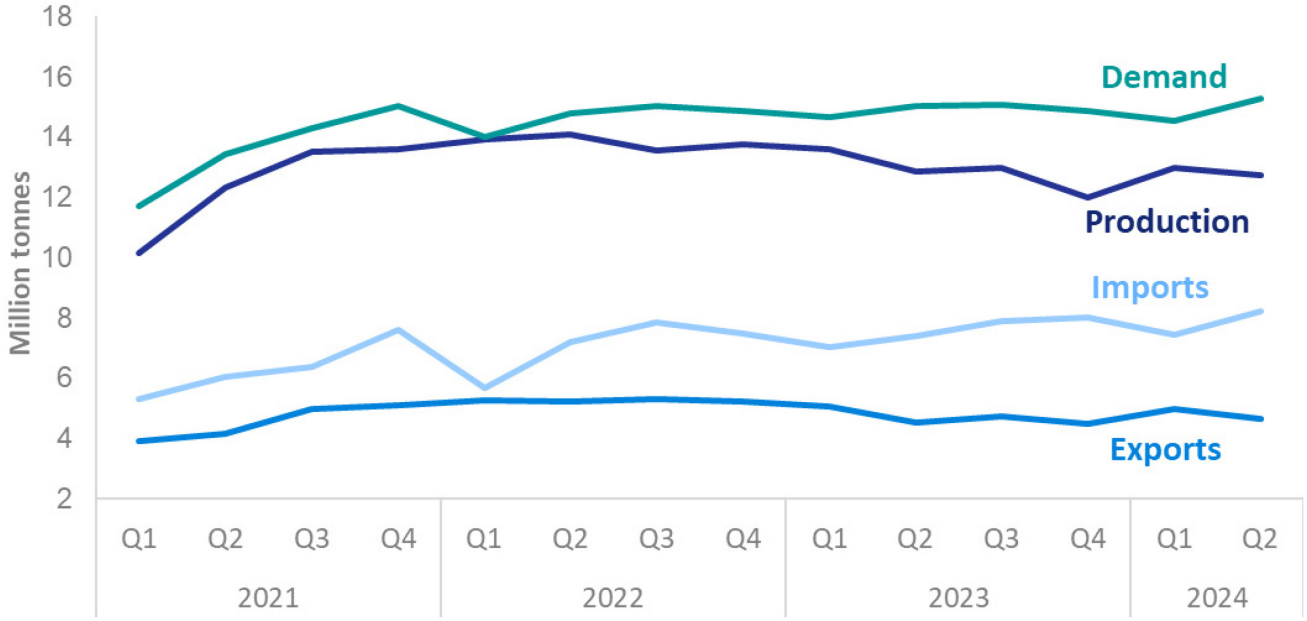


Production of primary oils fell to a record low of 7.7 million tonnes and was down by 8.9 per cent in Quarter 2 2024 compared to the same period in 2023. The fall was likely due to the closures of Barra and Harris oilfields and the summer maintenance at FPS Kinneil and Teesside Norpipe. In general, there has been a sustained decline in offshore oil production in recent years, with a quarterly rate of fall averaging around 11 per cent since 2021.

Net imports of primary oils increased by 16 per cent compared with Quarter 2 2023 as the 4.2 per cent increase in exports in Quarter 2 2024 was more than offset by an 8.7 per cent increase in imports.

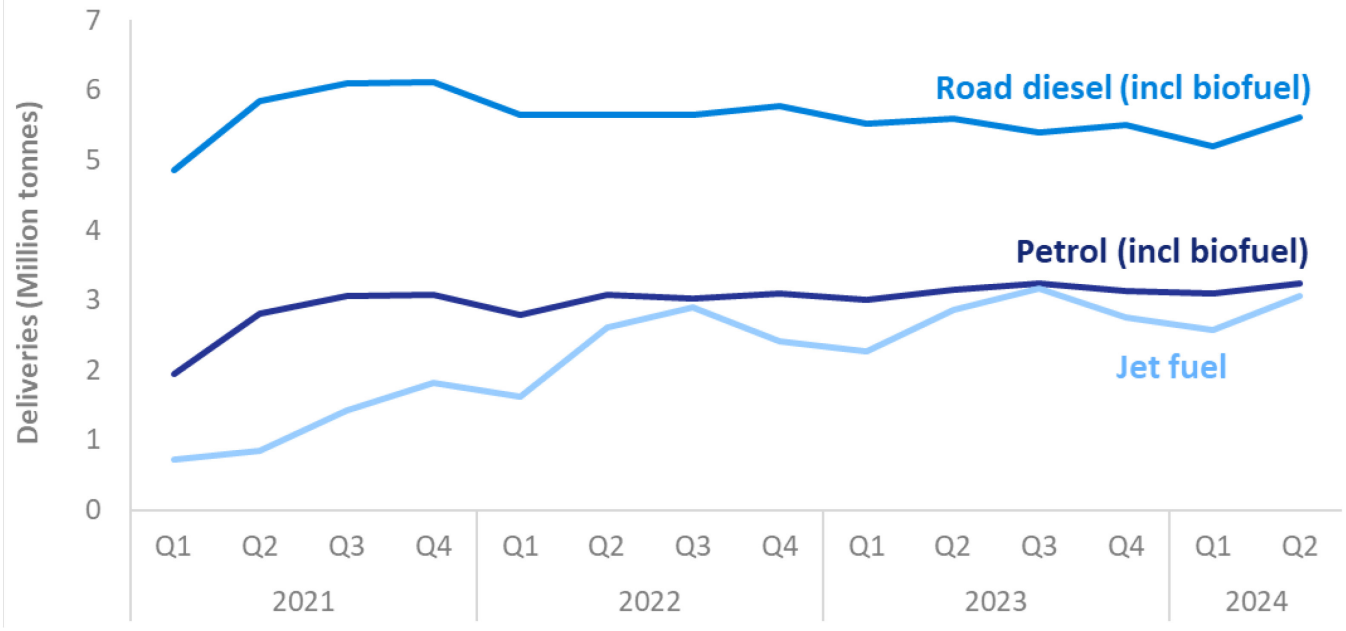
Demand for petroleum products was up 1.7 per cent in Quarter 2 2024 compared to the same quarter in 2023. As production decreased by 1.2 per cent and exports increased by 2.4 per cent, demand was met by an 11 per cent increase in imports. The UK remained a net importer of 3.6 million tonnes, an increase of a quarter on the same period last year.

Chart 3.2 Production and trade of petroleum products (Energy Trends Table 3.2)



Final consumption increased by 2.7 per cent, largely driven by a 260 thousand (2.3 per cent) increase in transport. Demand for jet fuel continued the post-pandemic trend of recovery, up by 6.8 per cent in Quarter 2 2024 compared to the same period in the previous year. Road fuels saw a more stable trend, with petrol demand increasing by 4.3 per cent while diesel fell by 3.3 per cent. Within this, bio-ethanol demand also increased by 7.4 per cent and bio-diesel nearly halved to 255 thousand tonnes[1]. Sales through supermarkets increased by 3.8 per cent for petrol and fell by 9.9 per cent for diesel, but total sales remained at 31 per cent overall, stable on the year before. Just over 40 per cent of petrol and around a quarter of diesel sales were through supermarkets.

Chart 3.5 Demand for transport fuels (Energy Trends Table 3.5)



The UK held 10.3 million tonnes of stock at the end of Quarter 2 2024, 19 per cent more than the previous year. Primary and product stocks increased by 18 and 21 per cent, respectively. Net bilaterals were negative in the second quarter of 2023, meaning there was more stock held in the UK for other countries than there was

[1] Bioethanol and biodiesel figures are based on Road Transport Fuel Obligation data for the prior calendar year, and HMRC growth rates for quarters in the current year. Data are subject to revision in June of the following year. HMRC data is from the hydrocarbon oils bulleting quarterly: https://www.uktradeinfo.com/Statistics/Pages/TaxAndDutybulletins.aspx

held abroad for the UK. In contrast, in Quarter 2 2024 net bilaterals were positive and at 1.8 million tonnes were the highest levels since the UK left the EU. Current stocks held abroad remain less than half compared to historic levels when the UK was part of the EU stockholding system, and a smaller share of total stocks held. Stocks held in the UK were up by 7.2 per cent at 9.5 million tonnes compared to 8.8 million tonnes in quarter 2 2023.

UK stocks were equivalent to over 150 days of net imports, well above the IEA requirement to hold 90 days' worth of net imports.

Section 4: Gas

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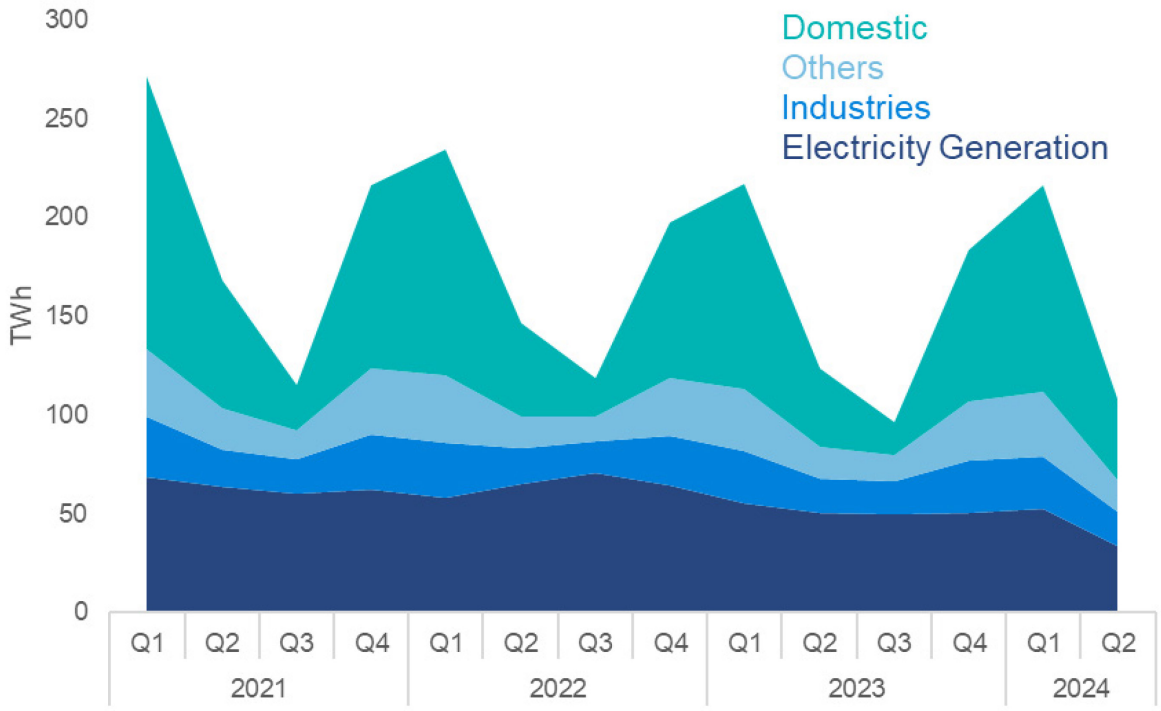
Key headlines

Demand for natural gas was down 12 per cent in Quarter 2 2024, compared with the same period last year. This was largely due to record lows in gas used for electricity generation a result of low demand and high imports. Gas used by final consumers saw little change compared to Quarter 2 2023, with industrial use and domestic consumption rising slightly whilst the services sector remained stable.

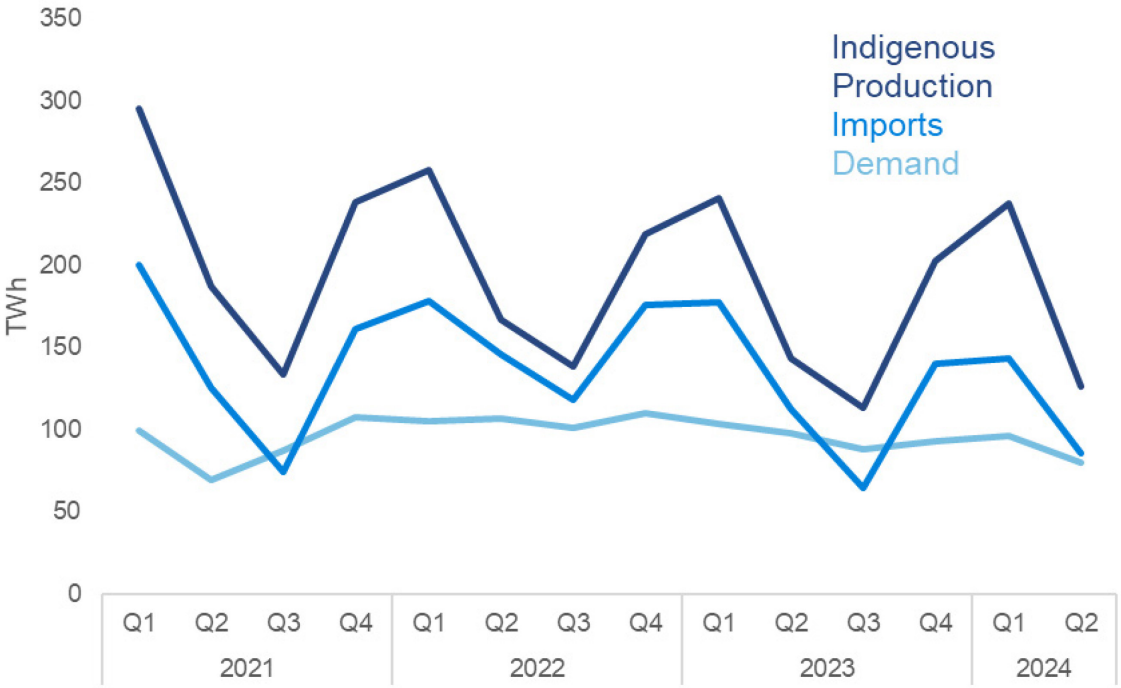
Imports and exports saw a return to pre-2022 trading patterns after a period of highs. In Quarter 2 2024, imports and exports fell by 24 and 46 per cent respectively, partially a result of lower European demand and high gas storage levels on the continent.

Chart 4.1 UK demand for natural gas (Energy Trends Table 4.1)



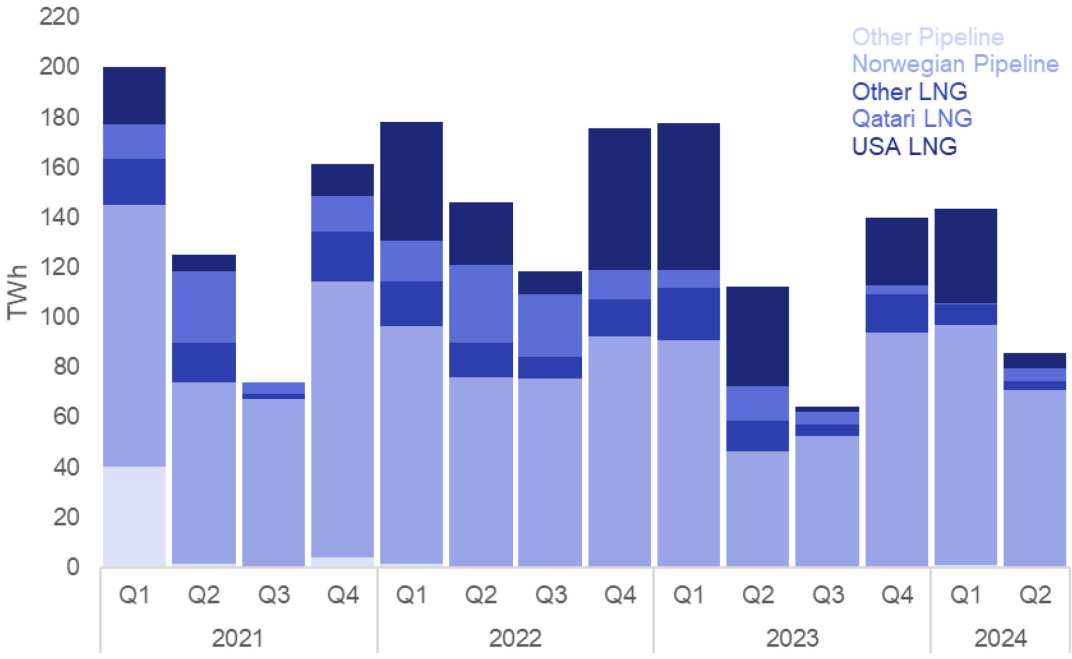
Gas demand fell by 12 per cent in Quarter 2 2024, compared to the same quarter in 2023. This decrease was driven by record low amounts of gas used for electricity generation, due to lower demand for electricity than last year and higher net imports. Domestic (household) consumption of gas was up slightly compared to Quarter 2 2023, rising by 2.1 per cent, reflecting cooler temperatures over the quarter. Industrial use (including iron and steel) also increased, up by 2.0 per cent compared to Quarter 2 2023 while gas used in the services sector remained stable.

Chart 4.2 Production and trade of natural gas (Energy Trends Table 4.2)



Imports and exports of natural gas both fell, by 24 per cent and 46 per cent respectively compared to Quarter 2 2023. This indicates a return to pre-2022 (2017-2021) trading patterns and was partially driven by low European demand and high gas storage levels on the continent. Gas production was also down on Quarter 2 2023, dropping by 18 per cent to 80 TWh as output from the North Sea continues to decline.

Chart 4.3 Imports by origin (Energy Trends Table 4.3)



Pipeline imports were up while Liquified Natural Gas (LNG) imports dropped in Quarter 2 2024. Imports of LNG fell by 78 per cent after a period of consistent highs from 2022 when the UK supported European efforts to move away from Russian gas. LNG imports from the USA and Qatar were down by 85 and 63 per cent, with Peruvian imports dropping to 0. Conversely, pipeline imports increased by 52 per cent, compared to Quarter 2 2023, when facility issues at a Norwegian plant meant imports via the Langeled pipeline fell substantially.

Section 5: Electricity

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Key headlines

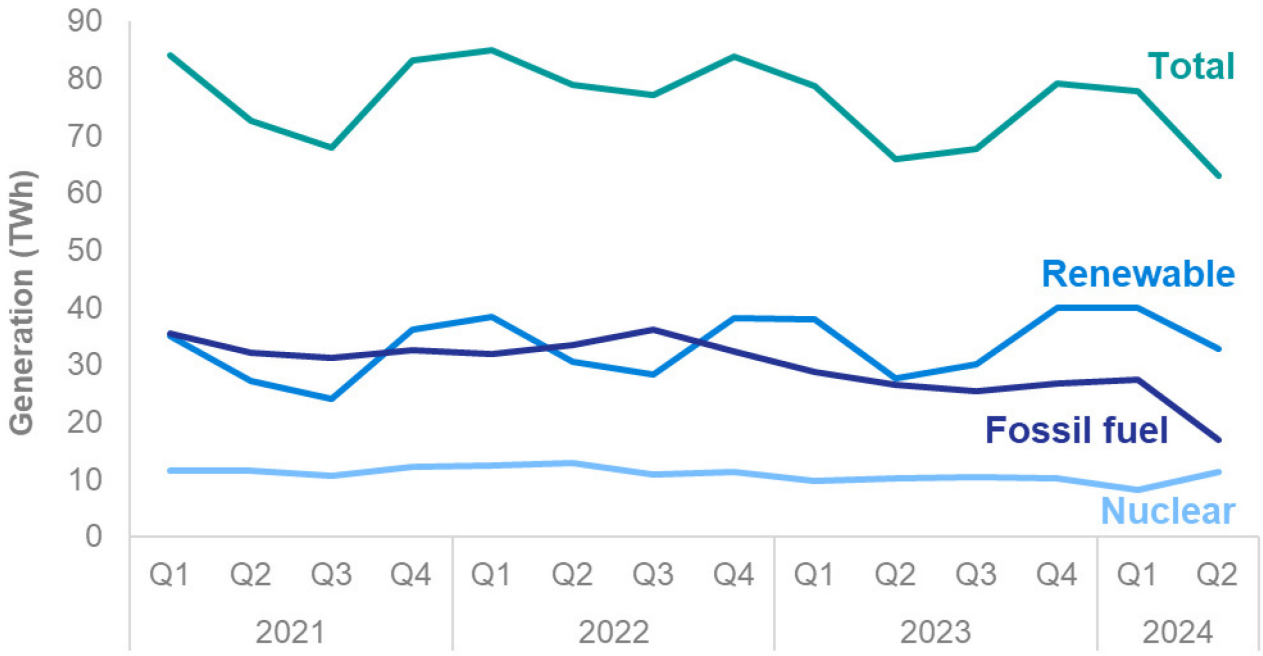
Quarter 2 of 2024 saw renewables' share of electricity generation reach a new record of 51.6 per cent. This is the third consecutive quarter that renewables' share of electricity generation has exceeded 50 per cent, after being 50.4 per cent in Quarter 4 2023 and 51.1 per cent in Quarter 1 2024. Whilst the volume of renewable electricity didn't reach the high of 40 TWh in Quarter 4 2023, at 33 TWh it was the highest Quarter 2 on record.

Net imports rose to record levels - for the second quarter in a row. Net imports rose 21 per cent from Quarter 2 2023 to reach 9.2 TWh, equivalent to 13 per cent of UK electricity demand for Quarter 2 2024. High imports contributed to the record renewables' share by reducing UK generation required to meet demand.

Fossil fuel generation fell to a record low, as generation by gas fell 37 per cent from Quarter 2 2023 to a record low of 16.1 TWh. With imports at a record high, this indicates that imports may be displacing some generation by gas due to favourable interconnector prices.

Electricity demand fell slightly, down 1.8 per cent from Quarter 2 of 2023 to 72 TWh. Total consumption of electricity by end users fell 1.2 per cent from Quarter 2 2023 to 63 TWh. Industrial consumption fell in line with this, while both domestic consumption and consumption from other users, including commercial users and transport, rose slightly.

Chart 5.1 Electricity generated, by fuel type (Energy Trends Table 5.1)



Renewable electricity generation rose 19 per cent from Quarter 2 of 2023 to 33 TWh. The share of electricity generation from renewables rose 9.9 percentage points from Quarter 2 2023 to a **new record of 51.6 per cent**. This is the third consecutive quarter that renewables share of electricity generation has exceeded 50 per cent. Wind generation rose 24 per cent from the same period last year, reaching 17 TWh, and overtaking gas as the generation method with the greatest output. This is reflected within their shares of

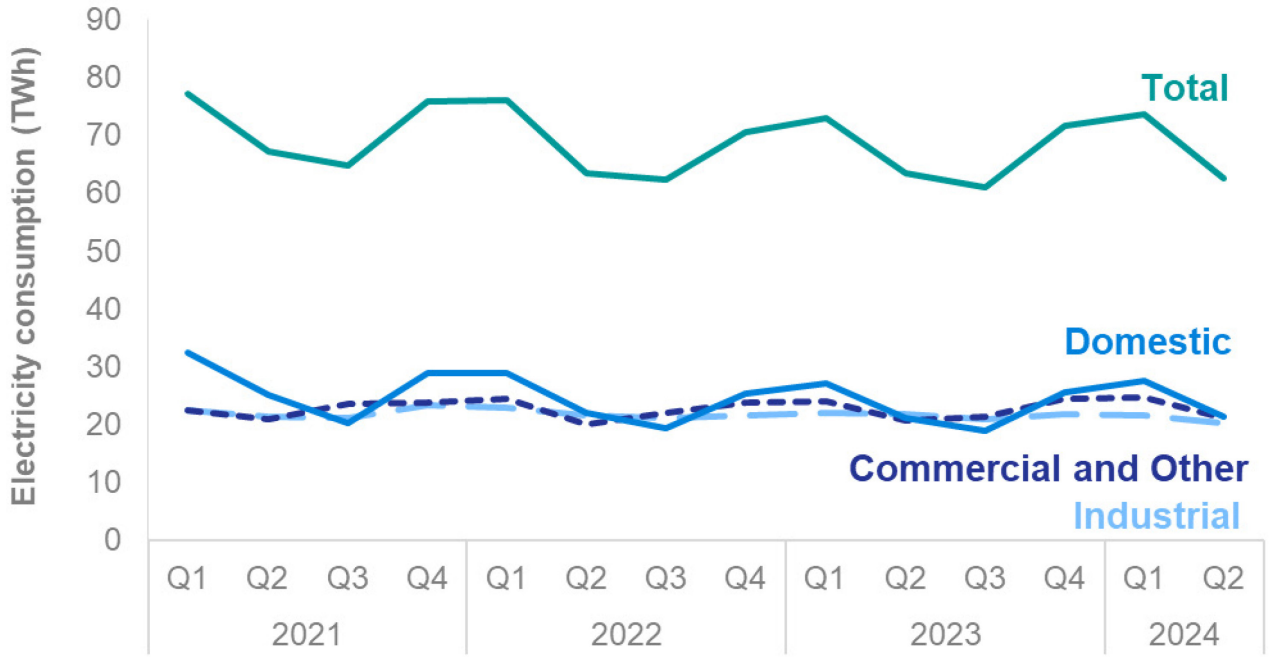
total electricity generation for Quarter 2 2024: 26.8 per cent of generation came from wind compared to 25.4 per cent from gas.

Net imports rose to record levels for the second quarter in a row. Net imports rose 21 per cent from Quarter 2 2023 to 9.2 TWh, equivalent to 13 per cent of UK electricity demand for Quarter 2 2024. Meanwhile, UK electricity generation fell 4.5 per cent compared to the same period last year, reaching 63 TWh as higher imports reduced the amount of UK generation needed to meet demand.

Fossil fuel generation fell 36 per cent from Quarter 2 2023 to 16.9 TWh, as generation by gas fell 37 per cent to 16.1 TWh – record low values for both. The share of electricity generation from fossil fuels fell 13 percentage points from Quarter 2 2023 to 26.6 per cent. With imports at a record high, this indicates that imports may have displaced some gas-fired generation due to favourable interconnector prices. Oil generation continued to decline, reaching 0.4 TWh. Coal generation rose 34 per cent from Quarter 2 2023, to 0.4 TWh, but remains at a historically low level.

Nuclear generation rose 12 per cent from Quarter 2 of 2023 to 11.4 TWh, comprising 17.9 per cent of UK electricity generation. As a result, generation from low carbon sources rose 17 per cent to 44 TWh, making up 69.5 per cent of total electricity generation. During Quarter 2 of 2023, nearly all of the UK's remaining nuclear sites experienced outages, so this increase in nuclear generation can be partially attributed to sites operating with fewer disruptions.

Chart 5.2 Electricity consumption by sector (Energy Trends Table 5.2)



Electricity demand fell 1.8 per cent from Quarter 2 2023 to 72 TWh. Total consumption of electricity by end users was 63 TWh in Quarter 2 of 2024, down 1.2 per cent from Quarter 2 2023. This downward trend was reflected by a 7.0 per cent fall in industrial consumption from Quarter 2 2023, to 20 TWh. Meanwhile, domestic consumption and consumption from other users, including commercial users, increased slightly.

Domestic consumption increased 1.2 per cent from Quarter 2 2023, to 21 TWh, despite warmer average temperatures. This could reflect lower energy prices, as slightly milder weather is less likely to reduce demand during the Summer. Similarly, consumption from other users, including commercial users and transport, was up 2.4 per cent, to 21 TWh.

Section 6: Renewables

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Key headlines

In Quarter 2 2024, total renewable generation increased by 19 per cent on last year to 32.8 TWh, largely due to more favourable weather conditions.

Onshore wind generation increased by 42 per cent to 7.3 TWh, the highest such figure for this time of year. Offshore wind generation increased by 13 per cent to 9.7 TWh. Generation was boosted by higher average wind speeds over the second quarter and onshore wind output had been affected by outages last year. Hydro generation increased due to higher average rainfall, while solar PV generation decreased due to lower sun hours. Generation from bioenergy increased by 29 per cent, generation had been low last year due to outages at two major plants.

Since Quarter 2 2023 there was 2.1 GW of new renewable capacity, of which arounds two thirds was solar PV and one third was wind. This represents a 3.9 per cent increase over the last year.

Renewables' share of electricity generation was a record 51.6 per cent, breaking the current record of 51.1 per cent set in the previous quarter. This was driven by lower demand for fossil fuel generation due to record levels of net imports; although renewable generation showed strong growth compared to the same quarter last year, it remained lower than the record levels observed during Quarter 4 2023 and Quarter 1 2024 (see Table 5.1). This is now the third consecutive quarter where renewables' share has exceeded 50 per cent.

Chart 6.1 Change in renewable generation and capacity between Q2 2023 and Q2 2024 (Energy Trends Table 6.1)

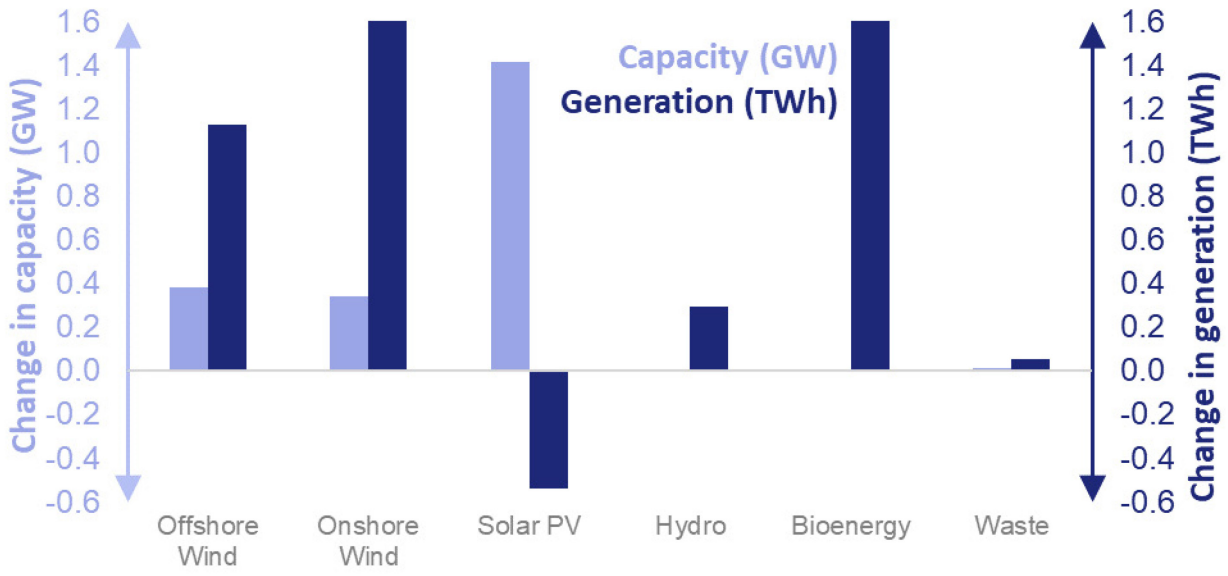


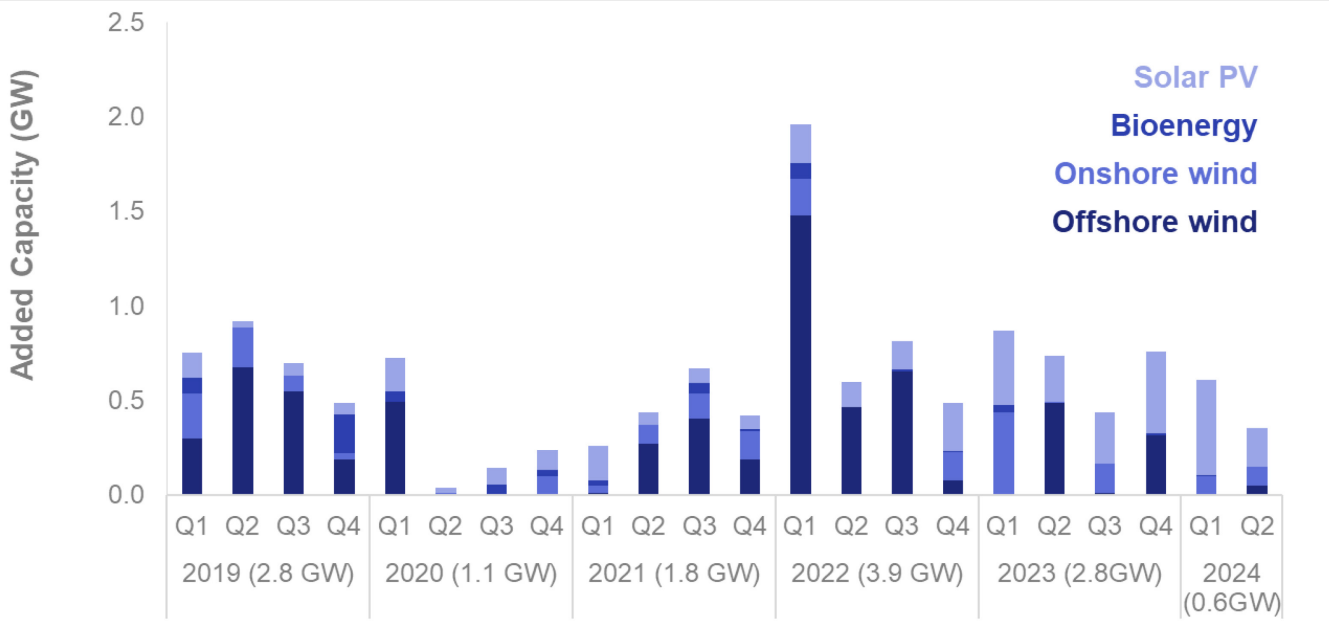
Chart 6.1 shows that there was strong growth in generation in the latest quarter from offshore wind, onshore wind and bioenergy, despite modest capacity increases. Onshore wind generation increased by around 2.1 TWh compared to last year and offshore wind generation increased by 1.1 TWh. Generation was aided by higher average wind speeds, being 8.0 knots compared to 6.9 knots in 2023. Onshore wind generation had been especially low in the second quarter of 2023 due to outages. This has contributed to the large year on year increase.

Solar generation saw a 9.5 per cent decrease despite an increase in new capacity. This was due to average sun hours being around 20 per cent down on last year.

Hydro generation was up by 38 per cent. This was largely due to an increase in rainfall, average rainfall was at its highest level for quarter 2 since 2016.

Bioenergy generation saw a large increase of 29 per cent, despite no new capacity. Within this, generation from plant biomass was 47 per cent up on last year. Generation from plant biomass has been hindered by outages at major plants since 2022 and was especially low in Quarter 2 of 2023 (4.1 TWh, the lowest quarterly figure since 2016 Quarter 3). This increase to plant biomass dwarfed changes seen in the other bioenergy categories. Generation from sewage sludge fell by 6.4 per cent.

Chart 6.2 Added capacity since 2019 for the leading technologies (Energy Trends Table 6.1)

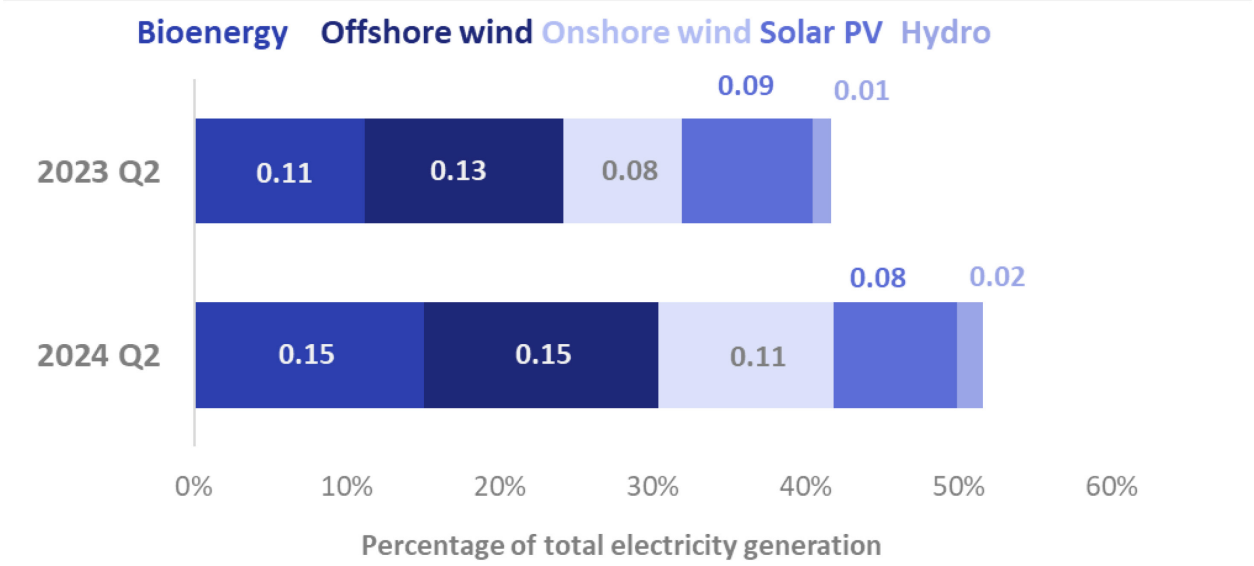


Installed capacity increased by 3.9 per cent (2.1 GW) in Quarter 2 2024 compared to the same quarter in 2023, bringing the total to 57.5 GW. This is lower than the average growth for 2022 (7.5 per cent) and 2023 (5.2 per cent). During this period the share of new capacity across the technologies has also shifted; in 2022, over two thirds of added capacity was in offshore wind but by the first two quarters of 2024, solar PV represented over 80 per cent of added capacity with offshore wind's share at just 6.3 per cent. Growth in new offshore wind capacity however tends to be volatile due to the relatively small number of large scale sites.

Of the 2.1 GW new capacity installed since Quarter 2 2023, 1.4 GW was solar PV (1.4 GW). This includes several new sites each consisting of roughly 50 MW; Litchardon Cross, Gorse Lane, Sutton Bridge, Burwell, Porth Wen and Thaxted.

In addition, there was 0.3 GW of new onshore wind capacity, and 0.4 GW of offshore wind including the first stages of Dogger Bank A, which is expected to be one of the largest offshore wind farms in the world once fully operational.

Chart 6.3 Renewables' share of electricity generation – Q2 2023 and Q2 2024 (Energy Trends Table 6.1)



In Quarter 2 2024, renewables' share of generation was 51.6 per cent, 9.9 percentage points higher than Quarter 2 2023. This is the highest percentage share on record. The share of renewables in the current quarter was higher than for fossil fuels (26.1 per cent) for the seventh consecutive quarter. Whilst renewable generation increased on last year, the share of generation attributed to renewables increased at a greater rate due to lower indigenous production as a result of higher net imports and reduced demand for electricity (see Chapter 5 for more details). Onshore wind's share of generation increased from 7.8 per cent to 11.5 per cent. Taken together, wind accounted for 26.8 per cent of total generation, an unusually high share for the second quarter when wind speeds tend to be lower than average.

Data tables and special articles

Data in this release

Data are collected by DESNZ through surveys of energy suppliers. This publication highlights key stories in energy in the UK for the specified period. Additional data are available in the quarterly and monthly statistical tables for each fuel and total energy. The tables are generally in commodity balance format, showing the flow from the sources of supply through to final use.

Special articles

Special articles that explore current topics of interest are available alongside this summary report. Included in this publication are:

Competition in UK electricity markets, 2023

Competition in UK gas markets, 2023

Diversity of supply for oil and oil products in OECD countries in 2023

Statistical tables*

Data tables available as part of the Energy Trends series:

Total energy

Solid fuels and derived gases

Oil and oil products

Gas

Electricity

Renewables

The full range of special articles is available here: https://www.gov.uk/government/collections/energy-trends-articles

Additional sources of information

Index of Production, published by the Office for National Statistics:
https://www.ons.gov.uk/economy/economicoutputandproductivity/output/bulletins/indexofproduction/previousReleases

Index of Services, published by the Office for National Statistics:
https://www.ons.gov.uk/economy/economicoutputandproductivity/output/bulletins/indexofservices/previousReleases

Detailed annual Digest of UK Energy Statistics:
http://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

Tables showing foreign trade flows of energy:
https://www.gov.uk/government/statistics/dukes-foreign-trade-statistics

Weather tables produced by DESNZ using Met Office data:
https://www.gov.uk/government/collections/weather-statistics

Information on Energy Prices:
http://www.gov.uk/government/collections/quarterly-energy-prices

*Hyperlinks will open the most recently published table. If you require a previously published version of a table, please contact DESNZ at: energy.stats@energysecurity.gov.uk

Technical information

Methodology and revisions

More detailed notes on the methodology used to compile the figures and data sources are available on the collection pages for each fuel. The figures have not been adjusted for temperature or seasonal factors except where noted.

Percentage changes relate to the corresponding period a year ago. They are calculated from unrounded figures. They are shown as (+) or (-) when the percentage change is very large. Quarterly figures relate to calendar quarters. All figures relate to the United Kingdom unless otherwise indicated. Further information on Oil and Gas is available from the North Sea Transition Authority at https://www.nstauthority.co.uk/

Table of conversion factors

To	ktoe	TJ	GWh	million therms	To	toe	GJ	kWh	therms
From	Multiply by				**From**	Multiply by			
ktoe	1	41.868	11.63	0.39683	**toe**	1	41.868	11,630	396.83
TJ	.023885	1	0.27778	0.0094778	**GJ**	0.023885	1	277.78	9.4778
GWh	.085985	3.6	1	0.034121	**kWh**	0.000085985	0.0036	1	0.034121
million therms	2.52	105.51	29.307	1	**therms**	0.00252	0.105510	29.307	1

ktoe = thousand tonne of oil equivalent toe = tonne of oil equivalent

Sector breakdowns

Categories for final users are defined by Standard Industrial Classification 2007:

Fuel producers	05-07, 09, 19, 24.46, 35
Final consumers	
Iron and steel	24 (excluding 24.4, 24.53 and 24.54)
Other industry	08, 10-18, 20-23, 24.4 (excluding 24.46), 24.53, 24.54, 25-33, 36-39, 41-43
Transport	49-51 (part*)
Other final users	
Agriculture	01-03
Commercial	45-47, 52-53, 55-56, 58-66, 68-75, 77-82
Public administration	84-88
Other services	90-99
Domestic	Not covered

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

Revisions policy

Figures for the latest periods are provisional and are liable to subsequent revision. The DESNZ statistical revisions policy sets out the revisions policy for these statistics, which has been developed in accordance with the UK Statistics Authority Code of Practice for Statistics.

Glossary

Tonne of Oil Equivalent

A common unit of measurement which enables different fuels to be compared and aggregated, and equal to 41.868 gigajoules. Usually expressed in Trends as ktoe (Thousand tonnes of oil equivalent) or Mtoe (Million tonnes of oil equivalent).

Indigenous production

The extraction or capture of primary fuels: for oil this includes production from the UK Continental Shelf, both onshore and offshore. Production by fuel is shown in Table 1.1. As with all data in Tables 1.1 to 1.3, these data are presented in either Million tonnes of oil equivalent or Thousand tonnes of oil equivalent. Various conventions are involved in the presentation of these data (e.g. for nuclear production the energy input is the heat content of the steam leaving the reactor) and these conventions are detailed in the Table notes and methodology documents (see link at end of glossary).

Primary supply

Primary supply is the sum of production, other sources, imports (+), exports (-), stock change, marine bunkers and transfers. A breakdown of supply by fuel is shown in Table 1.3.

Primary demand

Primary demand is the sum of the transformation, energy industry use, losses and final energy consumption by the industry sectors including non-energy use. A breakdown of demand by fuel is shown in Table 1.3.

Primary inland energy consumption

The sum of primary supply less non-energy use (Table 1.2).

Final energy consumption

Energy consumption by final user, i.e., which is not being used for transformation into other forms of energy. Final energy consumption is shown by sector and for individual fuels in Table 1.3.

Non-energy use

Includes fuel used for chemical feedstock, solvents, lubricants, and road making material, see Table 3.2.

Imports

Goods entering the UK, e.g. via pipeline from Norway or LNG cargoes from Qatar and the US for gas (Table 4.3) and interconnectors for electricity from The Netherlands (Table 5.6).

Exports

Goods leaving the UK, e.g. via LNG regassification cargoes to Europe for gas (Table 4.4) and interconnectors for electricity to France (Table 5.6).

Transformation

Transformation covers those activities that transform fuels into a form which is better suited for specific uses. Most of the transformation activities correspond to particular energy industries whose main business is to manufacture the product associated with them. Certain activities involve transformation to make products that are only partly used for energy needs (e.g. coke and oven coke) or are by-products of other manufacturing processes (e.g. coke oven and blast furnace gases). A breakdown of transformation by fuel is shown in Table 1.3.

Seasonally and temperature adjustment

The temperature corrected series of total inland fuel consumption, Table 1.2 indicates what annual consumption might have been if the average temperature during the year had been the same as the average for the years 1991 to 2020. Table 1.3 shows seasonal and temperature adjusted final consumption.

Primary oil

Crude oil, natural gas liquids and feedstocks. (Table 3.1)

Petroleum products

Motor spirit, diesel, gas oil, aviation turbine fuel, fuel oils, petroleum gases, burning oil and other products. (Table 3.4)

Transport fuels

Motor spirit and diesel for road and aviation turbine fuel for aviation. (Table 3.4)

Electricity generation

Electricity generation represents the quantities of fuels burned for the generation of electricity. The activity is divided into two parts, covering the Major Power Producers such as those generating electricity for sale, as their main business activity, and autogenerators such as those generating electricity for their own needs but who may also sell surplus quantities (Table 5.1).

Fossil fuels

Coal, oil and natural gas. The percentage share of electricity generation by fossil fuels is shown in Table 5.1.

Renewables

Renewable energy includes solar power, wind, wave, tidal, hydroelectricity, and bioenergy. Solid biomass includes wood and wood pellets, straw, short rotation coppice, and the biodegradable component of wastes (the non-biodegradable component is shown as a memo item in Table 6.1). Liquid biofuels include bio diesel and bioethanol, along with new and emerging fuels such as bio LPG (liquified petroleum gas). Biogases include landfill gas, sewage gas, and anaerobic digestion. The percentage share of electricity generation by renewables is shown in Table 5.1.

Low carbon

Nuclear and renewables. The percentage share of electricity generation by low carbon sources is shown in Table 5.1.

Additional information

A more detailed glossary is available in The Digest of United Kingdom Energy Statistics (DUKES), Annex B, whilst the energy balance methodology note provides background detail on the compilation of an energy balance, as well as an explanation of each of the key energy balance flows. Notes in individual Energy Trends tables and individual fuel methodology notes (see links below) provide further detail.

Coal methodology note

Oil methodology note

Gas methodology note

Electricity methodology note

Renewables methodology note

Related publications

Recent publications of interest

Energy Consumption in the United Kingdom (ECUK)
Detailed data on end use estimates of energy in the UK: www.gov.uk/government/collections/energy-consumption-in-the-uk

Sub-national total final energy consumption
Findings of the sub–national energy consumption analysis in the UK for all fuels, for the period covering 1 January to 31 December, with gas consumption covering the annual period from mid-May:
www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level

Sub-national electricity consumption
Electricity consumption by consuming sector for Great Britain and devolved administration areas. Data are based on the aggregation of Meter Point Administration Number readings as part of DESNZ's annual meter point electricity data exercise: www.gov.uk/government/collections/sub-national-electricity-consumption-data.

Sub-national gas consumption
Gas consumption by consuming sector for Great Britain, and devolved administration areas. Data are based on the aggregation of Meter Point Reference Number readings throughout Great Britain as part of DESNZ's annual meter point gas data exercise. Data are subject to a weather correction factor to enable comparison of gas use over time:
www.gov.uk/government/collections/sub-national-gas-consumption-data.

Sub-national road transport consumption
Road transport fuels consumption in the UK at regional and local authority level. Data is modelled and provided to DESNZ by Ricardo Energy & Environment, with estimates based on where the fuel is consumed, rather than where it is purchased.
www.gov.uk/government/collections/road-transport-consumption-at-regional-and-local-level

Sub-national consumption of residual fuels
Non-gas, non-electricity and non-road transport fuels consumption in the UK. Includes coal, petroleum, solid fuels, and bioenergy not for generation or road use: www.gov.uk/government/collections/sub-national-consumption-of-other-fuels

Further information

Accredited official statistics

These statistics are accredited official statistics. Accredited official statistics are called National Statistics in the Statistics and Registration Service Act 2007.

These accredited official statistics were independently reviewed by the Office for Statistics Regulation (OSR) in June 2014. They comply with the standards of trustworthiness, quality and value in the Code of Practice for Statistics.

Our statistical practice is regulated by the Office for Statistics Regulation.

OSR sets the standards of trustworthiness, quality and value in the Code of Practice for Statistics that all producers of official statistics should adhere to.

You are welcome to contact us by emailing energy.stats@energysecurity.gov.uk with any comments about how we meet these standards.

Alternatively, you can contact OSR by emailing regulation@statistics.gov.uk or via the OSR website.

Pre-release

Some ministers and officials receive access to these statistics up to 24 hours before release. Details of the arrangements for doing this and a list of the ministers and officials that receive pre-release access to these statistics can be found in the DESNZ statement of compliance with the Pre-Release Access to Official Statistics Order 2008.

User engagement

Users are encouraged to provide comments and feedback on how these statistics are used and how well they meet user needs. Comments on any issues relating to this statistical release are welcomed.

This publication is available from: https://www.gov.uk/government/collections/energy-trends

If you need a version of this document in a more accessible format, please email energy.stats@energysecurity.gov.uk

Please tell us what format you need. It will help us if you say what assistive technology you use.

Competition in UK electricity markets, 2023

Hugo Neely **07745 736270** electricitystatistics@energysecurity.gov.uk

Key headlines

Following privatisation in 1990, the number of UK major electricity suppliers has increased from 16 in 1989 to 32 in 2023. In 2023, 1 company DESNZ surveyed fell below the 0.1% market share threshold required for inclusion, while 1 new supplier was added to the survey.

In 2023, market concentrations remained relatively stable. This is against the trend seen from 2019 to 2021, when electricity market concentration increased across all sectors as more companies entered the market.

The market share of smaller suppliers (outside the top nine) has risen from 2.7 per cent in 2010 to 20.2 per cent in 2023, as new suppliers entered the market and others grew.

The number of major power producers has increased from 6 in 1989 to 56 in 2023.

The top nine MPPs' share of generation decreased to 75.1 per cent in 2023, down 0.4 percentage points on 2022 levels. Their share of capacity additionally decreased from 68.1 per cent to 67.9 per cent, primarily due to the decommissioning of nuclear power sites.

Background

This article includes information relating to competition in the UK electricity markets, examining the two parts of the industry where there is competition for provision: generation and sales. For both markets, the article describes the number of companies operating, and the market concentrations. The electricity sales market is examined in more detail due to the distinct sectors suppliers sell electricity to – domestic consumers, industrial consumers, and commercial consumers. This article covers the major suppliers surveyed by DESNZ comprising approximately 96% of the market, and generating companies classed as Major Power Producers (MPPs). Major electricity suppliers are classed as those which sold over 0.1% of traded electricity in the reference year; MPPs are defined as companies whose primary purpose is the generation of electricity. Further information on the definition of major suppliers and MPPs is given in the methodology note at the end of this article.

The Herfindahl-Hirschman index is used to provide the market concentration of the electricity sales market as it provides extra emphasis on the contribution of participants with the largest shares; for more information on this measure see the methodology note at the end of this article.

Competition in electricity sales

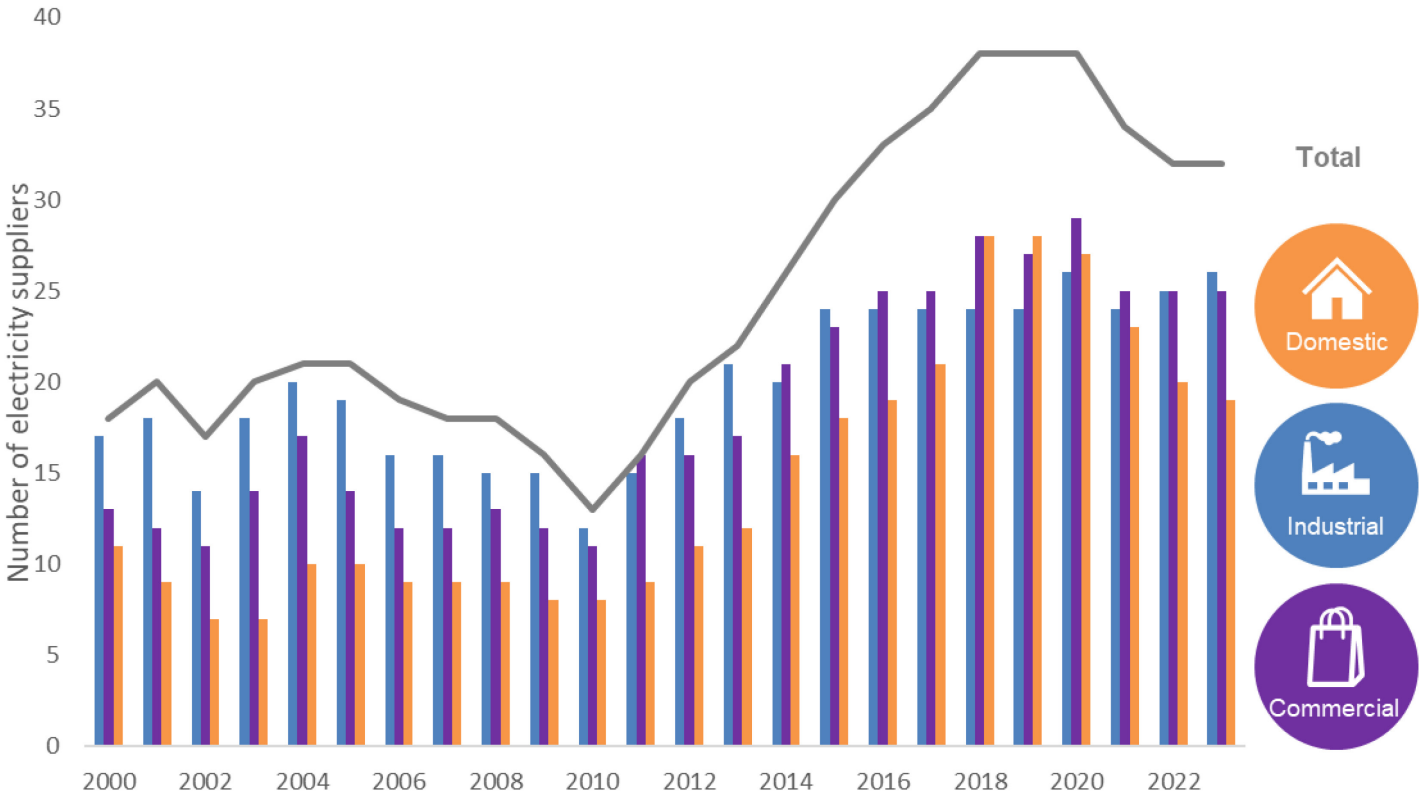
Number of major UK electricity suppliers

Following privatisation in 1989, the number of major electricity suppliers initially rapidly increased from 16 to an early peak of 21 in 2004. From 2004 to 2010, the number of companies reduced to 13, as despite new market entrants, other companies were either taken over or bought additional power stations to add to their portfolios. After 2010, the number of companies increased again, reaching their highest level in 2018 at 38 companies, as the market fragmented further.

From 2021 to 2022, sharply rising wholesale gas prices significantly increased the cost of generation for electricity. This led to widespread disruption in the UK electricity market and contributed to the discontinuation of 3 energy suppliers with over 0.1 per cent of the market share, reducing the number of major companies to 32. In 2023, one supplier fell below the 0.1 per cent threshold while another began supply, resulting in the total number of major suppliers remaining unchanged.

The number of companies supplying electricity to each sector along with the total number of companies supplying electricity between 2000 and 2023 is shown below in Chart 1.

Chart 1: Number of companies supplying electricity, 2000 to 2023 [note 1]



[note 1] Companies can supply into more than one market and are counted in each market they supply to. Only includes companies that sold over 0.1% of total traded electricity in the reference year.

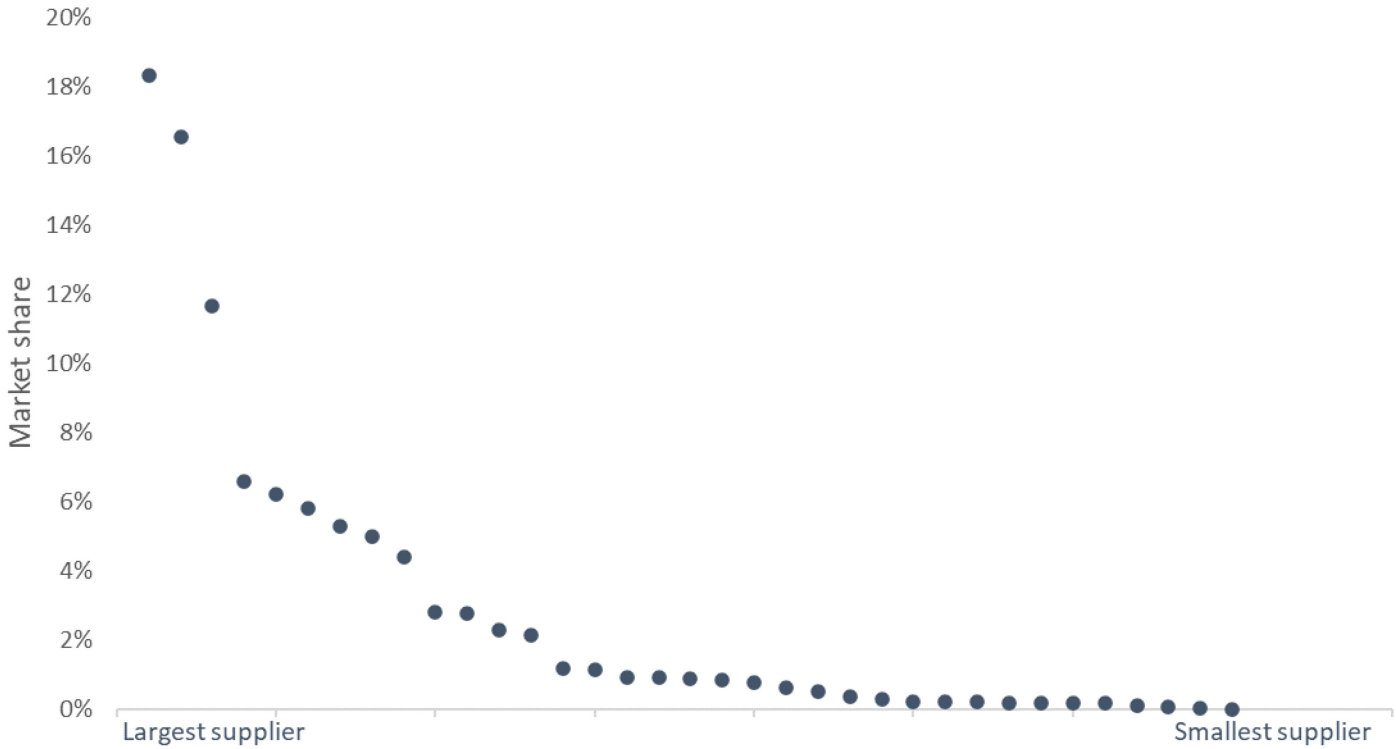
In 2023, one new electricity supplier was surveyed by DESNZ with a market share over 0.1 per cent of total supply. This company supplied to the industrial and commercial sectors. One supplier's market share fell below the 0.1 per cent threshold, this supplier supplying commercial and domestic consumers.

Market share of UK electricity suppliers

Since privatisation, the electricity supply market has been characterised by the majority of supply being controlled by a handful of large suppliers. In 2010, the top 6 suppliers controlled a combined total of 91 per cent of total supply. Over time, this share has fallen as smaller suppliers have grown. In 2023, the top 6 suppliers now hold 65 per cent of the total market share, down 1 per cent on 2022 levels. The only time the share of the top 6 suppliers has grown since 2010 was from 2020 to 2021, when it rose by 4.4 percentage points as two companies within the top 6 merged and rising wholesale electricity prices contributed to some smaller suppliers ceasing trade.

Chart 2 below shows the percentage market share of electricity suppliers above the threshold in 2023. Here we can see the top 3 suppliers control a large portion of the market – 47 per cent of the total. Across the sectors, these suppliers hold 42 per cent of supply to industrial consumers, 46 per cent of supply to commercial consumers and 46 per cent of supply to the domestic market.

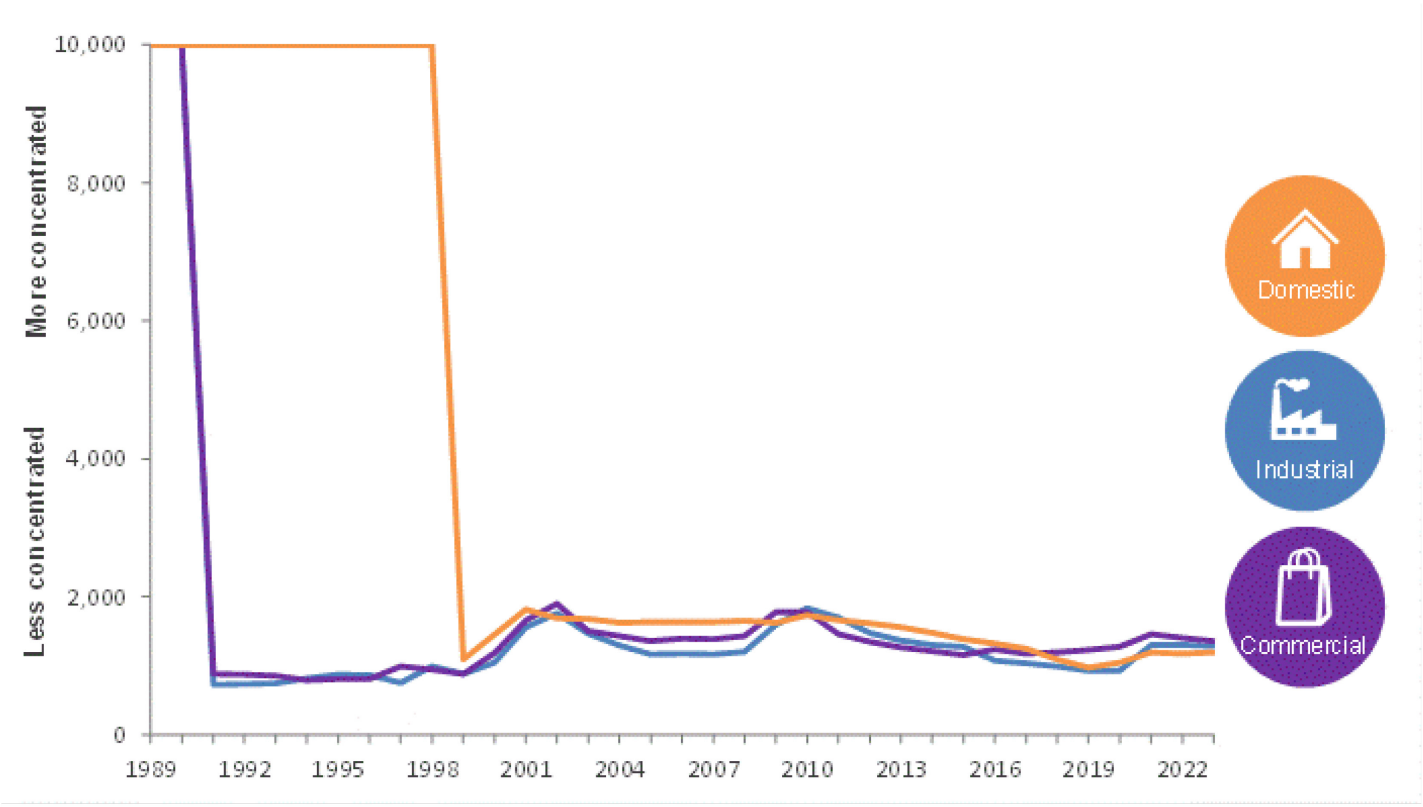
Chart 2: Market share of electricity suppliers, all sectors, 2023



Market concentration of UK electricity suppliers

Chart 3 below shows the market concentration as expressed through the Herfindahl-Hirschman Index. In the chart, higher numbers show more concentration while lower numbers indicate a more diverse market. Further information on the Herfindahl-Hirschman index can be found at the end of this article.

Chart 3: Herfindahl-Hirschman Index for electricity sales market concentration, 1989 to 2023



Following privatisation, the industrial and commercial market concentrations saw initial sharp decreases followed by rises between 1998 and 2002, caused primarily by a spate of mergers. The domestic market's concentration remained at 10,000 before 1999, being dominated by the Regional Electricity Companies (RECs) which each had regional monopolies on the market. Market concentration fell in 1999 as domestic sales became more competitive, then rose until 2001 due to mergers between former RECs. Between 2002 and 2008 there was little variation in the domestic market's index, however the industrial and commercial indexes fell in this period. The market concentration of all sectors then rose in 2008 spurred by the closure of several market participants. From 2010 to 2019, market concentration declined in the domestic and industrial sectors as many new smaller suppliers entered the market.

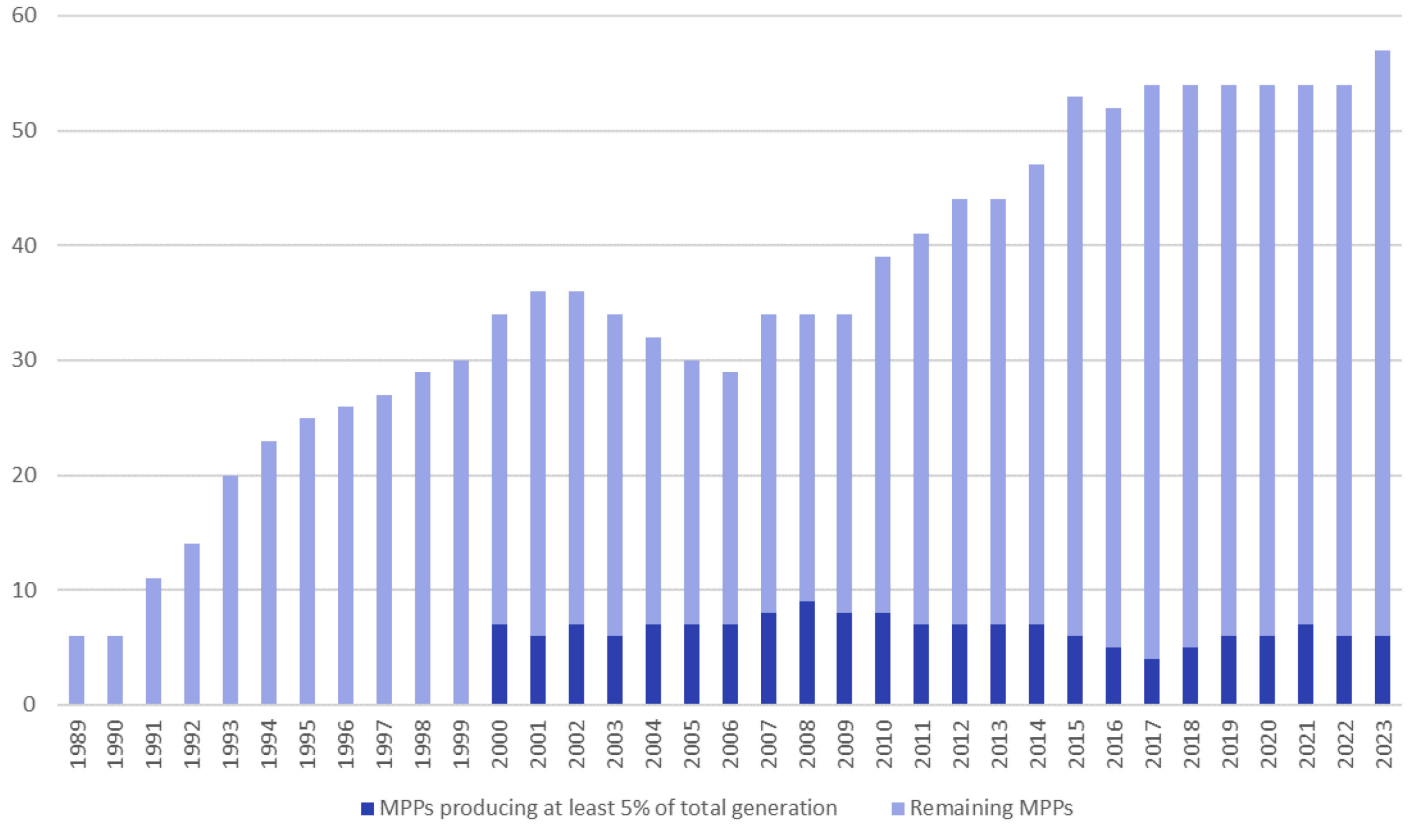
From 2019 to 2021 both the domestic and commercial market concentration increased due to mergers between large suppliers and suppliers exiting the market. The industrial market concentration remained stable between 2019 and 2020, however sharply increased in 2021 due to mergers between large suppliers and another exiting the market. From 2021 to 2023, all market concentrations remained relatively stable. The commercial market saw the most notable change, reducing by 104 points as the market share of the largest suppliers fell and the share of their smaller competitors grew.

Competition in electricity generation

Number of Major Power Producers

Chart 4 shows the number of companies that are counted as MPPs since 1989. The number of companies increased rapidly, from six before privatisation up to an early peak of 36 in 2001, before mergers caused numbers to fall back to 29 in 2006. Starting in 2007, several renewable generators were reclassified as MPPs, leading to an increase in the number of MPPs to 34; this remained stable through to 2009. Since 2010, the number of MPPs has steadily increased as new generators came online, reaching a peak in 2017 of 54. This remained stable up to 2023, when 2 additional MPPs came online.

Chart 4: Number of Major Power Producers, 1989 to 2023 [note 2]

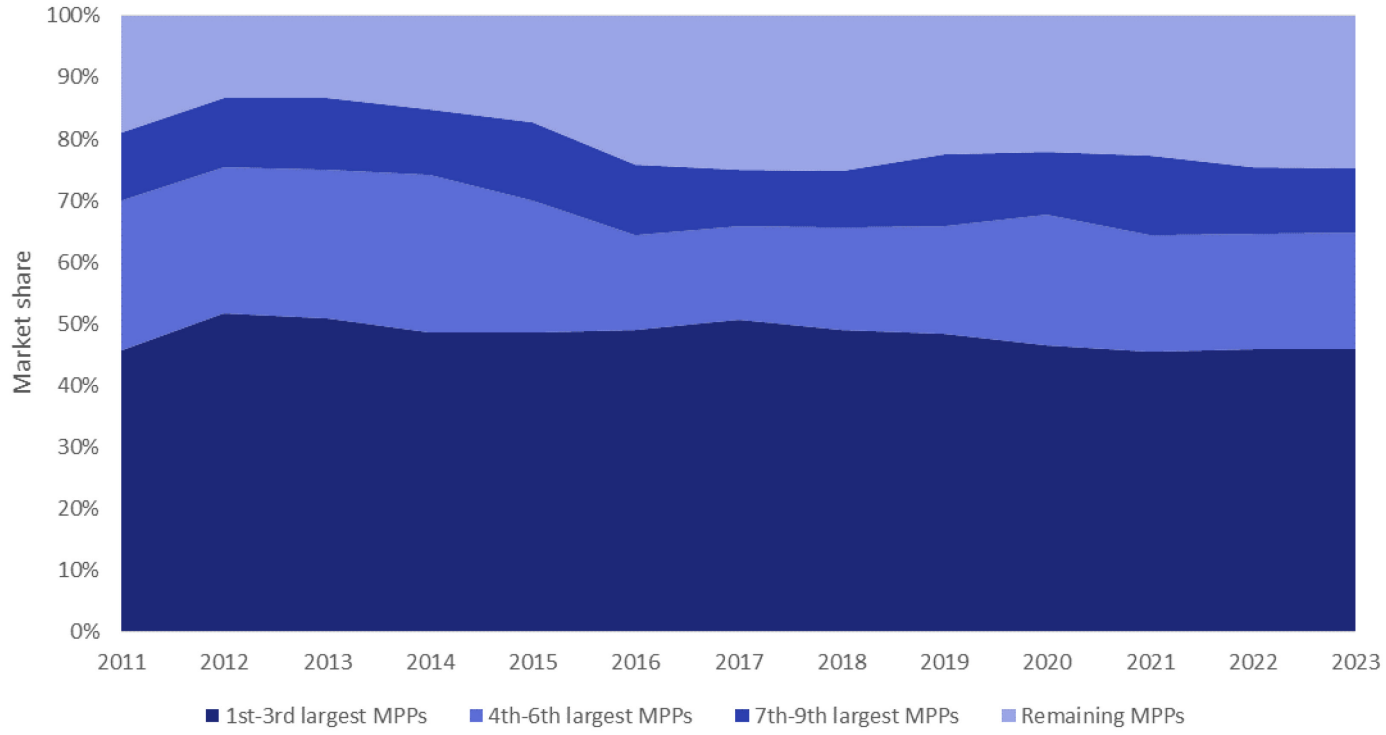


[note 2] Data on the number of MPPs producing at least 5% of total generation is not available from 1989-1999. During this period, all MPPs are shown under 'Remaining MPPs'.

Market share of Major Power Producers

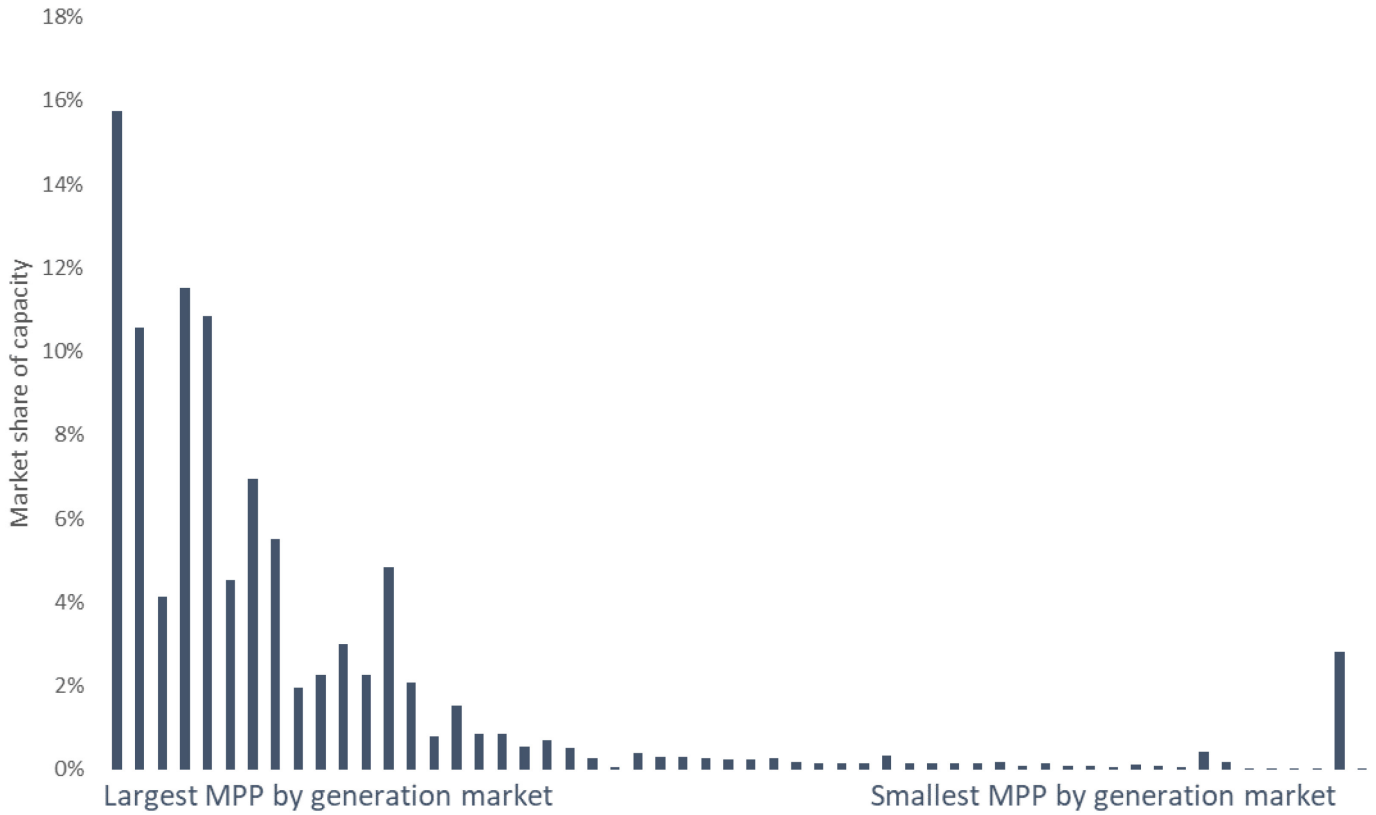
Chart 5 shows the MPPs aggregated share of generation from 2011 to 2023. The market share of the top 9 generators in this period peaked in 2013 at 86.7 per cent declining to 74.8 per cent in 2018, as new smaller companies entered the market. This share increased in 2019 and 2020, before decreasing again for the past three years, reaching 75.1 per cent in 2023.

Chart 5: Percentage shares of total MPP generation, 2011 to 2023



Over all periods, the top 9 generators have held a lower share of capacity (67.9 per cent in 2023) compared to generation. This indicates a greater proportion of their generation came from non-renewable sources, which operate at a higher load factor than renewable generation (or more information on load factors, please see DUKES Table 5.10 and DUKES Table 6.3).This, alongside factors such as outages, is a primary reason for the low correlation between capacity market share and generation market share shown in Chart 6 below.

Chart 6: MPP capacity market share vs generation market share, 2023



Data for this article

The data used to produce this article can be found in Tables 1 to 6 of the associated Competition in UK Electricity Markets workbook. Revisions to data in this article are noted here.

Further Sources of Information on competition in UK electricity markets

Ofgem release their own statistics on competition in GB generation and the domestic suppliers' market.

Ofgem list all companies that hold licenses in generation and supply.

The Competition and Markets Authority published a report on competition in energy.

Methodology notes

In this article, **'electricity supplier'** refers to the major electricity suppliers surveyed by DESNZ, covering approximately 96% of all UK electricity sales in 2018. '**Major electricity suppliers'** include suppliers that sold over 0.1% of traded electricity in the reference year, this was 237 GWh in 2023. This differs from previous editions of this article where all suppliers surveyed by DESNZ were included. The change allows DESNZ to increase its survey coverage whilst still presenting comparable trends in this article. Please see the DESNZ Electricity statistics data sources and methodologies for more details.

Major Power Producers (MPPs) are companies whose primary purpose is the generation of electricity. They represent around 80 per cent of generation. For the current list of MPPs and the sites they own, please see DUKES Table 5.11. For thermal generation, there is no minimum size but solar and wind farms are only included where a company owns more than 50 MW of capacity, which can be across multiple sites. Note some smaller thermal generators are also counted as 'other generators' even though their main activity is electricity generation.

The Herfindahl-Hirschman measure attempts to measure market concentration. It places extra emphasis on the contributions of participants with the largest shares. The measure is commonly used to assess whether mergers should go ahead and whether they will significantly affect the balance of the market in a particular sector. It is expressed by the following equation: Herfindahl-Hirschman measure = the square of each participant's market share added together across all participants in the market. Values vary between zero, which signifies a perfectly competitive industry, and ten thousand, for a pure monopoly.

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Competition in UK gas markets, 2023

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Key headlines

In 2023, the number of large gas suppliers decreased to 23, from 28 in 2022, due to market exits and some suppliers reducing in size. The number of large suppliers fell in the domestic, industrial and commercial sectors as high gas prices in 2022 continued into 2023. The biggest reductions were seen in the industrial and commercial sectors which has previously been impacted, although to a lesser extent, by the Covid-19 pandemic.

Consequently, in 2023 the top three suppliers accounted for 45 per cent of the market (with the top two accounting for 37 per cent), the highest share in ten years. The commercial and industrial sectors reached their highest levels of concentration since the 1990s, driven by considerable increases in market share for the top three suppliers in these sectors.

Background

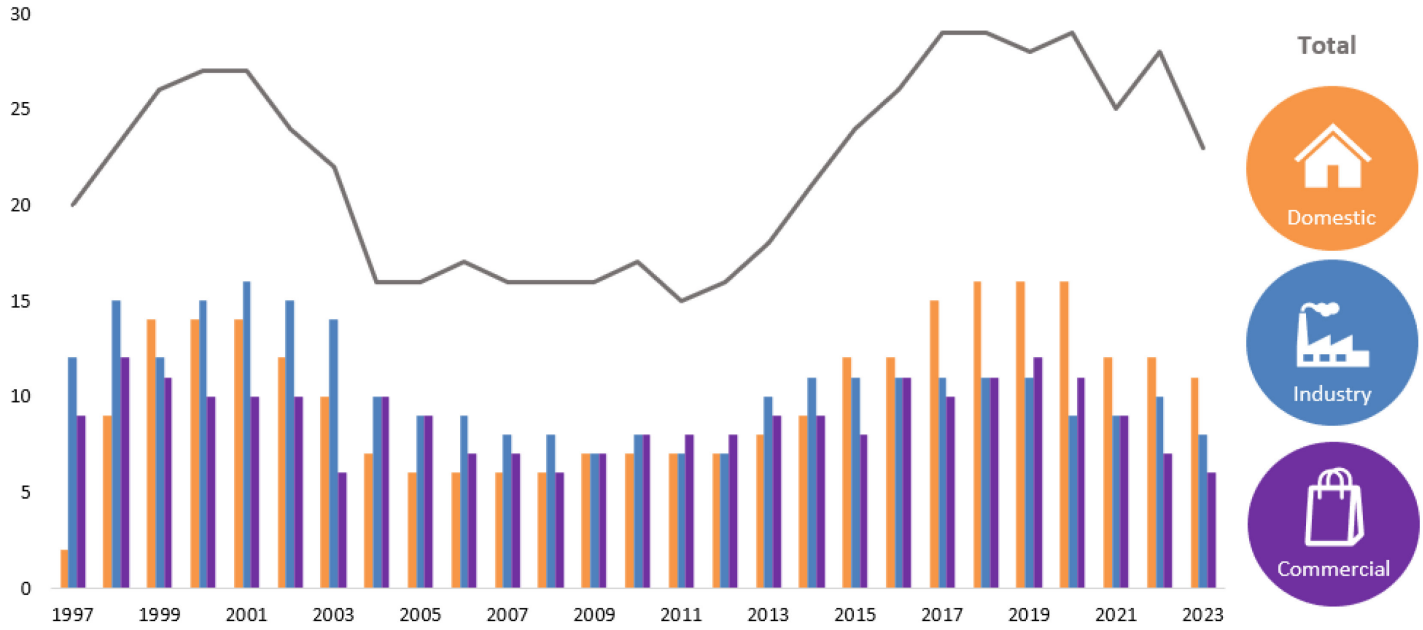
The Department for Energy Security and Net Zero (DESNZ) collect data from companies who are licensed to supply gas. Large suppliers are defined as those who supply more than 1,750 GWh of gas per year; large suppliers' data are collected monthly. For small suppliers (those who supply less than 1,750 GWh of gas per year), a sample provide data annually.

Gas is used by many sectors of the UK economy; generally gas demand can be split into three with electricity generation, domestic users and other sectors each making up around a third of demand. This article considers gas supplied for final consumption therefore does not include electricity generation and further disaggregates 'other' into industrial and commercial sectors.

The aim of this article is to analyse the number and size of companies supplying gas to the UK and the market concentration of the domestic, industrial and commercial sectors. Market concentration is assessed using the Herfindahl-Hirschman index; for more information see the methodology note at the end of the article.

Number of UK gas suppliers

Chart 1: Number of large gas suppliers, split by sector, 1997 to 2023[1,2]



Gas supply in the UK was denationalised between 1986 and 1992. This restructuring of the gas market led to an increase in the number of gas suppliers until 2000 from which point numbers decreased due to company mergers. From 2008, favourable market conditions meant numbers generally increased, with the number of large suppliers peaking at 29 in 2017. They then remained relatively stable until 2021 when the number of large suppliers fell to 25 due to record high gas prices which contributed to market exits. Despite increasing in 2022, the number of suppliers fell again in 2023, to 23, due to market exits and some suppliers reducing in size. Note that some change is driven by suppliers moving into and out of the large supplier category as they move above and below the 1,750 GWh threshold.

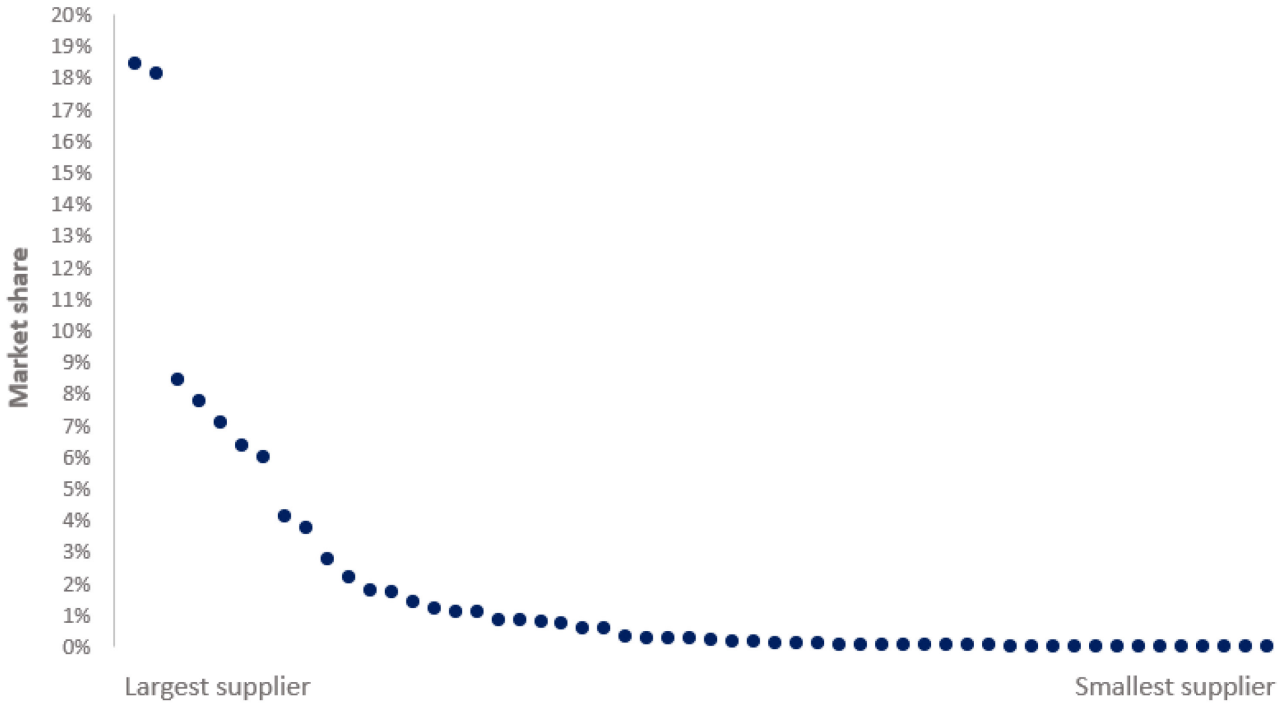
The number of large **domestic** suppliers has generally followed the same trend as the total number of large suppliers. In the domestic sector, the number of large suppliers steadily increased between 2005 and 2020 as smaller suppliers entered the market and gained market share. In 2021, the number of large domestic suppliers fell from 16 to 12 because of market exits, largely the result of market conditions. The number of large domestic suppliers fell by one to 11 in 2023, supplying 98 per cent of the UK's domestic demand.

In the **industrial** and **commercial** sectors the number of large suppliers peaked in 2019 at 11 and 12 respectively. From this point the number of suppliers has fallen each year as the impact of the Covid-19 pandemic and then to a greater extent market conditions meant suppliers reduced in size or exited the market. In 2023, there were 8 large industrial suppliers accounting for 92 per cent of the market; for the commercial sector there were 6 accounting for 83 per cent of the market.

[1] Note some suppliers appear in more than one sector
[2] Large suppliers are those that supplied more than 1,750 GWh in the reference year

Market share of UK gas suppliers

Chart 2: Market share of all gas suppliers, all sectors, 2023



Historically, the gas market has been dominated by a few major suppliers and to some extent this remains the case today. The two largest gas suppliers each make up around 18 per cent of the market, around 10 percentage points higher than the third largest supplier. Around five suppliers each make up between 6 and 8 per cent of the market, with a further six suppliers each making up between 2 to 4 per cent of the market. Over 40 suppliers each make up less than 2 per cent of the market.

In 2023, the market share of the top three largest suppliers was 45 per cent, the highest share in ten years. This is similar across the sectors with the top three suppliers holding the least market share in the **domestic** sector which has more suppliers in total. The top three suppliers hold the most market share in the **commercial** sector at 71 per cent, followed by **industrial** at 66 per cent.

To assess the competitiveness of a market, it is useful to examine a standardised measures of market concentration. One such metric is the Herfindahl-Hirschman index, where higher numbers show more concentration, and lower numbers indicate a more diverse market. Further information on the Herfindahl-Hirschman index can be found at the end of this article.

Chart 3: Herfindahl-Hirschman Index for market concentration, 1986 to 2023

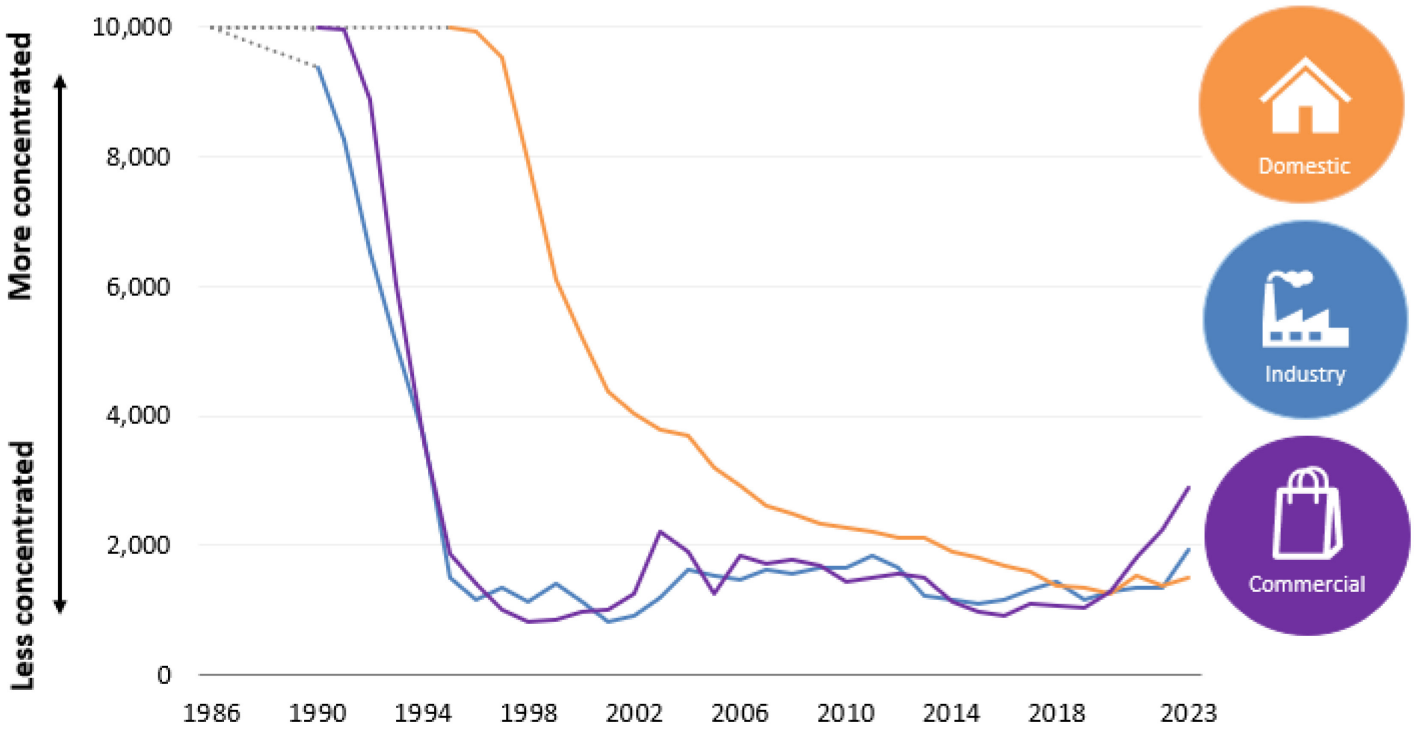


Chart 3 shows gas market concentration as expressed through the Herfindahl-Hirschman index, across the domestic, industrial and commercial sectors. Following the denationalisation of the gas market from 1986 there has been a substantial reduction in market concentration across all three sectors.

The **domestic** sector saw a consistent year-on-year decrease in concentration until 2021, when the concentration of the domestic market increased reflecting market exits and increased market share of large suppliers. In 2023, the concentration increased slightly on 2022 as the number of large suppliers fell but is still consistent with the trend over recent years.

Concentration in the **commercial** sector has been increasing year-on-year since 2019 and in 2023, the sector reached its highest Herfindahl-Hirschman score since the 1990s, reflecting a drop in large suppliers to six, the lowest number since 2008.

Concentration in the **industrial** sector has been relatively stable in recent years. However, like commercial, 2023 saw the highest Herfindahl-Hirschman score since the 1990s for industry caused by a drop in large suppliers from ten to eight and a considerable increase in market share for the top three suppliers.

Methodology Note

The data used to produce this article are published in Competition in UK gas markets 2023 - data tables.

The Herfindahl-Hirschman index

The Herfindahl-Hirschman measure attempts to measure market concentration. It places extra emphasis on the contributions of participants with the largest shares. The measure is commonly used to assess whether mergers should go ahead and whether they will significantly affect the balance of the market in a particular sector.

It is expressed by the following equation:

Herfindahl-Hirschman index = the square of each participant's market share added together across all participants in the market.

Values vary between zero, which signifies a perfectly competitive industry, and ten thousand, for a pure monopoly.

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Diversity of supply for oil and oil products in OECD countries in 2023

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Key headlines

Security of supply in 2023 was affected by two key factors – the continuing impact of trade sanctions implemented by some countries against Russia affecting trade patterns, as well as increases in transport fuel demand due to fewer travel restrictions in place to curb the spread of Covid-19.

The UK remained self-sufficient for petrol. Indigenous production was over 20 per cent above demand making the UK a net exporter in 2023, one of the 16 OECD countries who were self-sufficient for petrol.

The UK continues to be reliant on imports of crude, producing two-thirds of domestic demand in 2023. Five of 38 countries in the OECD were self-sufficient for crude, far fewer than for oil products. Norway had the highest self-sufficiency score, producing more than 11 times that consumed.

There was not a country in the OECD that was self-sufficient in all four oil types.

The UK continues to import crude and oil products from a diverse range of countries, staying above OECD diversity averages for all oil types.

Background

Countries meet their oil needs through a combination of indigenous production and trade. This article compares how OECD countries manage crude oil and transport fuel demand, including biofuels, using data from the International Energy Agency (IEA). The aim is to determine how the UK compares with other OECD countries in how it secures oil supply.

Oil supply in 2023 was affected by the implementation of sanctions against Russia in 2022 following the illegal invasion of Ukraine (announced by several countries including the UK and EU). In the UK there were no imports from Russia in 2023; the Government declared its intention to end imports of oil from Russia shortly after the invasion and worked with an industry task force to implement this. A statutory ban on the import of oils from Russia came into effect in December 2022: https://www.gov.uk/government/publications/uk-ban-on-russian-oil-and-oil-products/uk-ban-on-russian-oil-and-oil-products.

The last cargo of primary oils to arrive in the UK from Russia was in October 2022 and the last cargo of finished products was in November 2022. More recent data on oil imports to the UK are published in Energy Trends Table 3.14.

In addition to the impacts of the sanctions on supply, 2023 saw further recovery in demand across OECD countries following the ending of travel restrictions to curb the Covid-19 pandemic. In the UK transport demand bounced back in a period where the UK did not have travel restrictions, with road fuel demand up by 7.4 per cent and jet fuel demand up by 16 per cent. UK production of crude oil fell to a record low of 31 million tonnes following the pattern of decline from the mature North Sea basin. This article seeks to unpack these changes in relation to other OECD countries and trends.

The analysis showed that the UK remains well-positioned to meet demand for crude oil and transport fuels. The UK self-sufficiency score for crude remains higher than the OECD country average and the OECD EU average, meeting two-thirds of refinery demand with indigenous production. The UK also scores favourably for petrol, producing a fifth more than needed to meet demand. The UK is less self-sufficient for diesel and jet fuel (meeting 49 per cent and 30 per cent of demand with production, respectively), but scores very highly on the

diversity component of these scores despite trade sanctions ending supply from Russia. Diesel was imported from 23 countries in 2023, with 80 per cent coming from the Netherlands, Belgium and the US combined – each politically stable sources. There is strong jet fuel demand in the UK because Heathrow is one of the busiest airports in the world, and the diversity score in 2023 was 0.72, more than double the average OECD and EU OECD scores of 0.31 and 0.35, respectively.

Charting oil self-sufficiency and diversity of supply

- **Self-sufficiency** is the proportion of a country's demand that could be met through indigenous production (as shown on the vertical axis). A score of one indicates that a country produces as much oil as it uses, a score of 0 indicates that no demand was met with indigenous production.
- **A diversity score** is calculated using the number of sources in which a country imports oil, and their respective political stability – defined by the World Bank's governance indicators (See Appendix 3 for methodological note).
- **Consumption** is represented by the circle or bubble, the area of which indicates the level of consumption for 2023 for each OECD country.

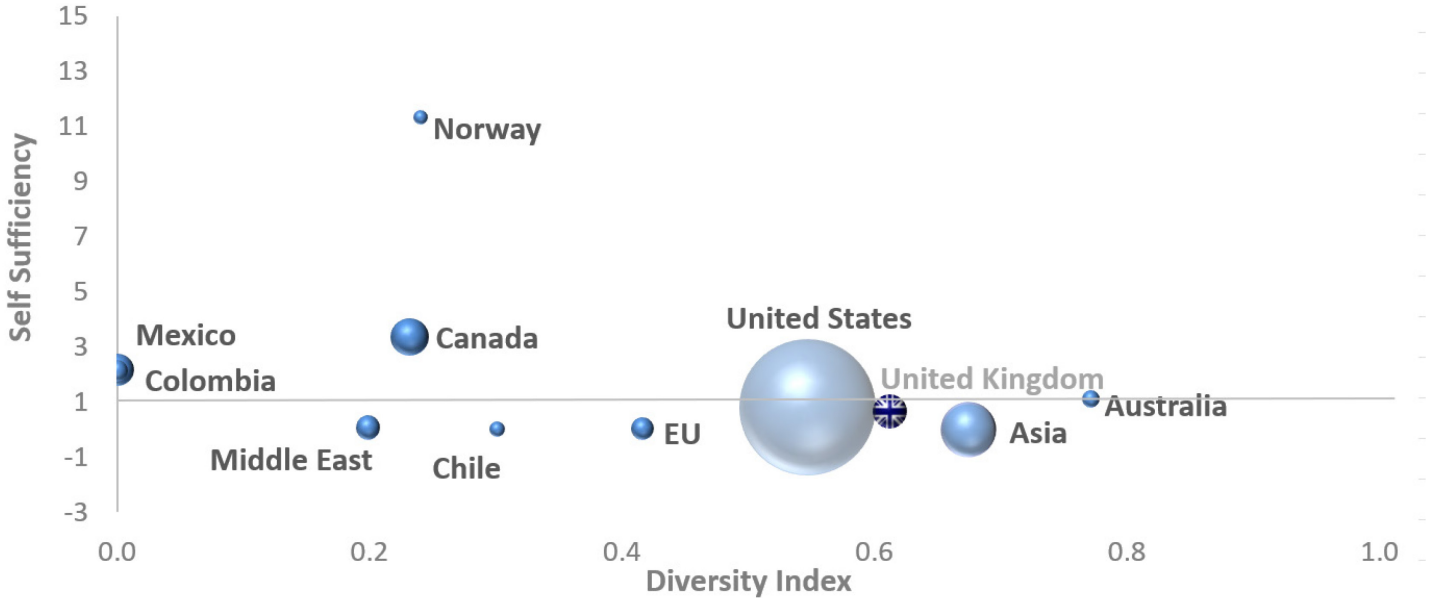
Bubble charts show the relationship between consumption (size of the bubble), indigenous production (self-sufficiency) and the diversity and political stability of import sources.

Choropleth maps show a visual representation of where OECD countries' oil imports come from. Variable quantities are shown according to colour; darker shades represent a higher proportion of imports originate from that country.

Bar charts provide a means of comparing OECD countries by self-sufficiency and diversity of imports. The sum of these two components is used as a simplified metric for security of supply, and thus does not represent a full description of security of supply beyond import diversity, stability and self-sufficiency. Appendix 2 shows the underlying data.

Crude Oil

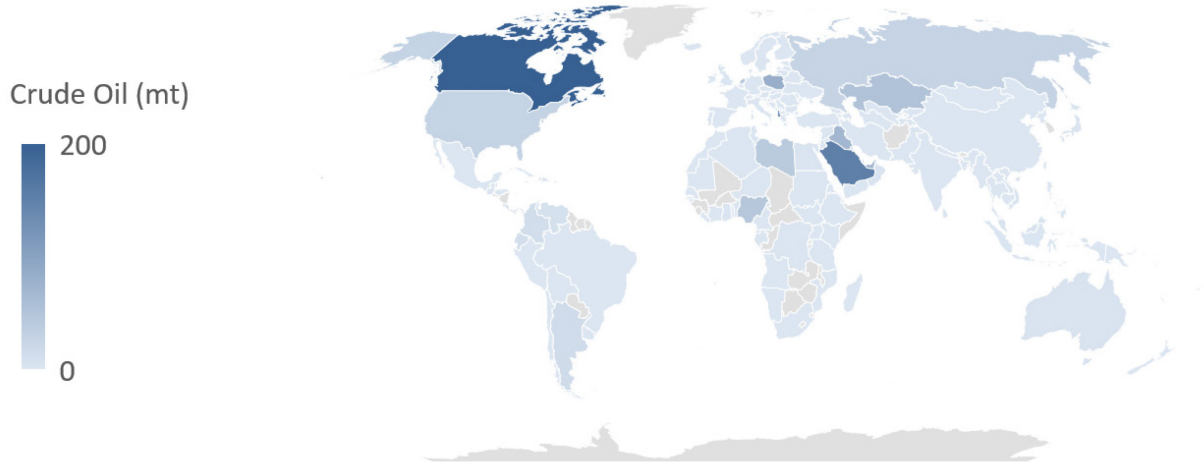
Chart 1: Diversity and self-sufficiency of crude oil for OECD countries, 2023



With an average self-sufficiency score of 0.59, OECD countries were generally reliant upon imports of crude to meet refinery demand in 2023. Chart 1 shows that in 2023, five OECD countries were self-sufficient in terms of crude oil production. Norway remained a net exporter of crude oil and the country with the highest self-sufficiency score, producing more than eleven times its consumption. The UK had a self-sufficiency score of 0.66, down slightly (4.9 per cent) on the year before, but was still able to meet two-thirds of demand for crude

with North Sea production. The UK ranked seventh out of all OECD countries, above the average of 0.59. This was despite the continued decline in production from the North Sea, which reached a record low in 2023.

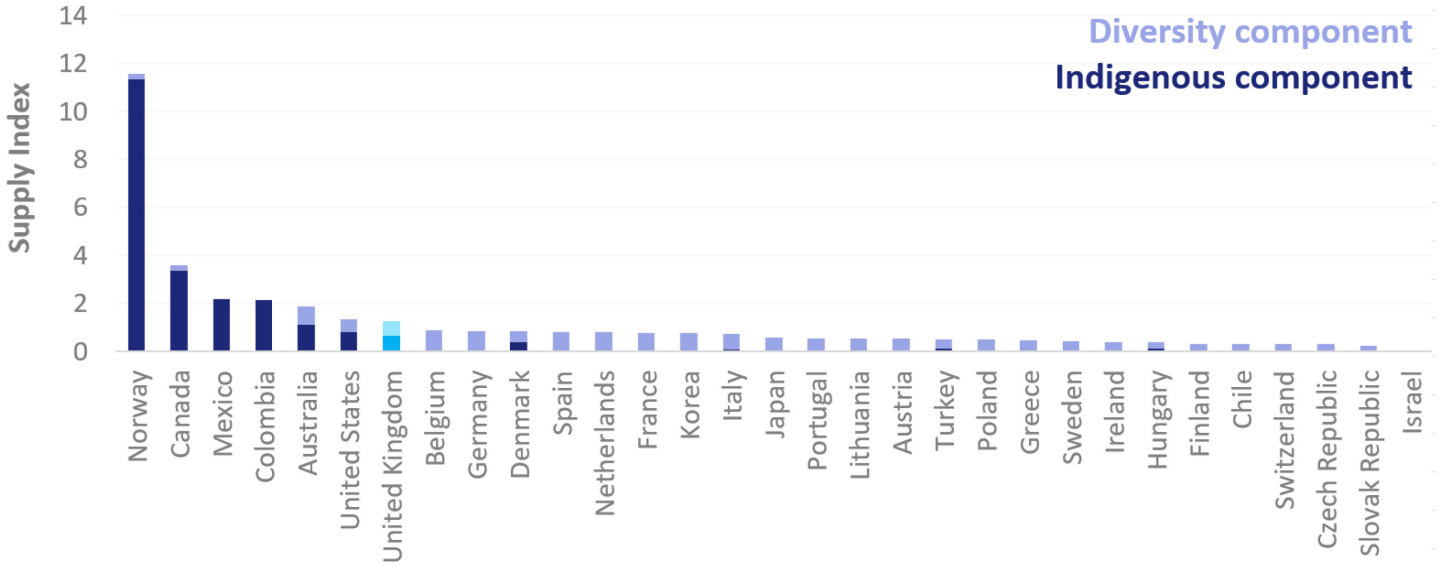
Map 1: Worldwide crude oil exports to OECD countries (million tonnes), 2023



Map 1 illustrates where crude oil exports originated in 2023. Canada, Saudi Arabia and the US were the largest exporters of crude to OECD countries, Canada exporting the most at 200 million tonnes. Of exporters to OECD countries, the UK ranked fifth, supplying 27.6 million tonnes.

The UK had a diversity score of 0.61, above the OECD average of 0.38 due to its diverse range of import sources. In 2023, the UK imported crude oil from 18 countries (a decrease from 23 in 2022). Norway overtook the US to return to being the UK's largest import source, at 36 per cent and 34 per cent, respectively. This was largely a result of shared infrastructure in the North Sea. Following Russia's illegal invasion of Ukraine, Russian crude oil imports were banned in the UK from the 5th of December 2022. In 2023, the UK did not import any oil from Russia. As a result, imports from current OPEC countries increased. For more information on energy imports please see Energy Trends Table 3.14.

Chart 2: Security of supply of crude oil for OECD countries, 2023

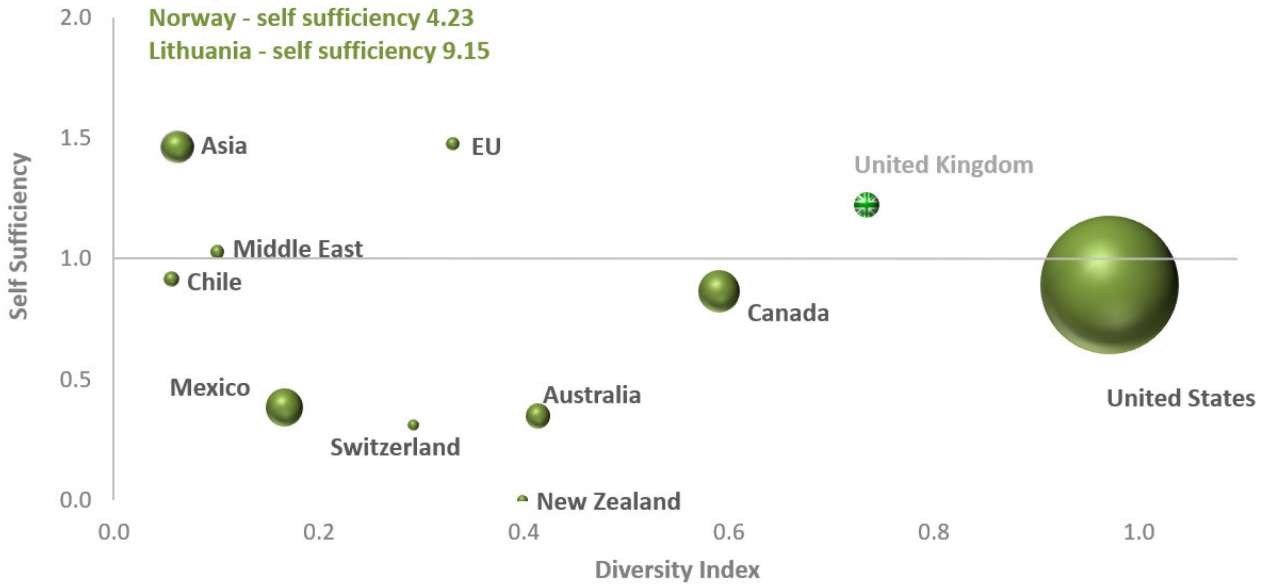


Data not available for Costa Rica, Estonia, Iceland, Latvia, Luxembourg, New Zealand, and Slovenia

The simplified index of security of supply shows that most OECD countries fulfil supply of crude oil through trade, with a relatively small contribution from indigenous production; seven of the 32 OECD countries for which data was available had no indigenous component to their crude supply (14 including countries with missing data). Chart 2 shows that the UK has substantial indigenous crude production.

Petrol

Chart 3: Diversity and self-sufficiency of petrol for OECD countries, 2023



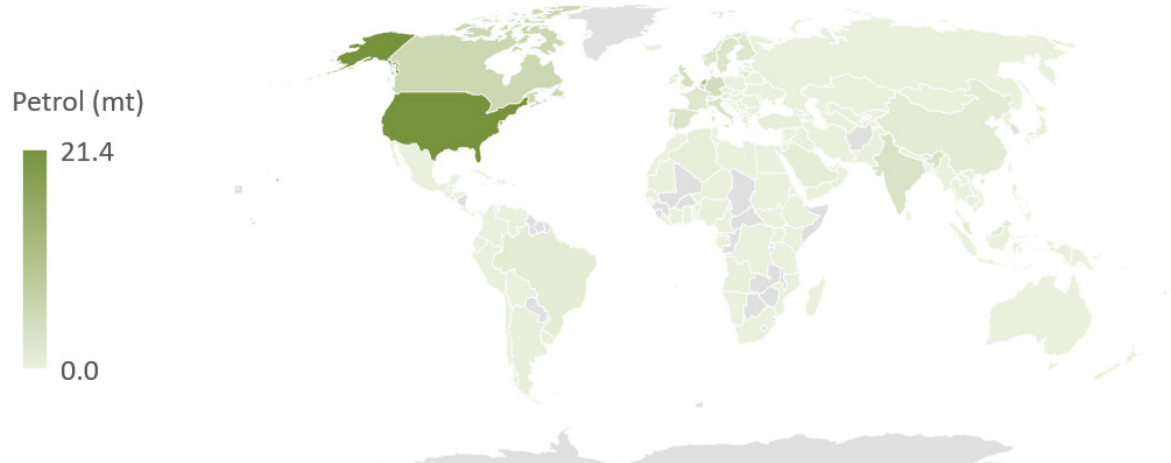
No Diversity Index data available for Israel.

OECD countries were generally self-sufficient in petrol, with an average score of 1.28, above the self-sufficiency threshold of one. Chart 3 shows that, unlike crude, 16 of the 38 OECD countries were self-sufficient in terms of petrol supply.

Lithuania had the highest self-sufficiency score of 9.15 showing that it produced more than nine times the amount of petrol it consumed. Lithuania's Mazeikiai refinery is the only one in the Baltic region and has capacity to produce oil products well in excess of domestic demand, making Lithuania a net exporter of refined products, principally to neighbours Latvia and Estonia but equivalent to just 0.5 per cent of OECD imports[1].

The US constituted 63 per cent of total OECD petrol consumption and 60 per cent of total OECD petrol production, but despite this it wasn't self-sufficient in 2023 with a score of 0.89. The UK had a self-sufficiency score of 1.22, meaning that the UK more than met demand with indigenous production in 2023.

Map 2: Worldwide petrol exports to OECD countries (million tonnes), 2023



The average diversity score for petrol imports was 0.32, down from 0.43 in 2022. The largest exporter of petrol to OECD countries globally was the US, exporting 21.4 million tonnes of petrol in 2023; the US made up 30 per cent of OECD petrol imports and 24 per cent of global petrol imports.

[1] https://www.iea.org/articles/lithuania-oil-security-policy

EU countries also play a significant role exporting petrol; in 2023 EU countries exported 39.2 million tonnes, almost half of the OECD total petrol exports of 80.4 million tonnes. More than 40 per cent of EU exports went to EU countries in the OECD. The Netherlands is one of the largest global oil trading hubs, exporting 10.8 million tonnes of petrol in 2023. The UK is the ninth largest exporter of petrol in the OECD, exporting 4.1 million tonnes to other OECD countries. Globally, the UK exported 9.0 million tonnes of petrol (including biofuel component).

Chart 4: Security of supply of petrol for OECD countries, 2023

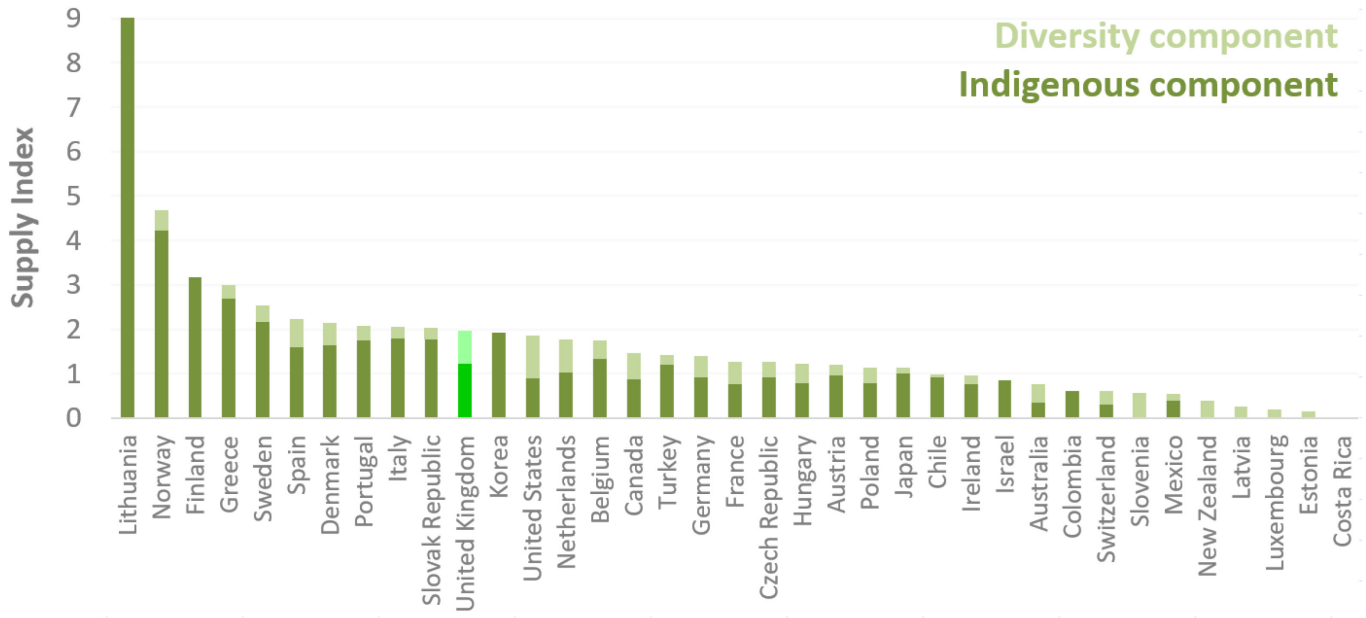
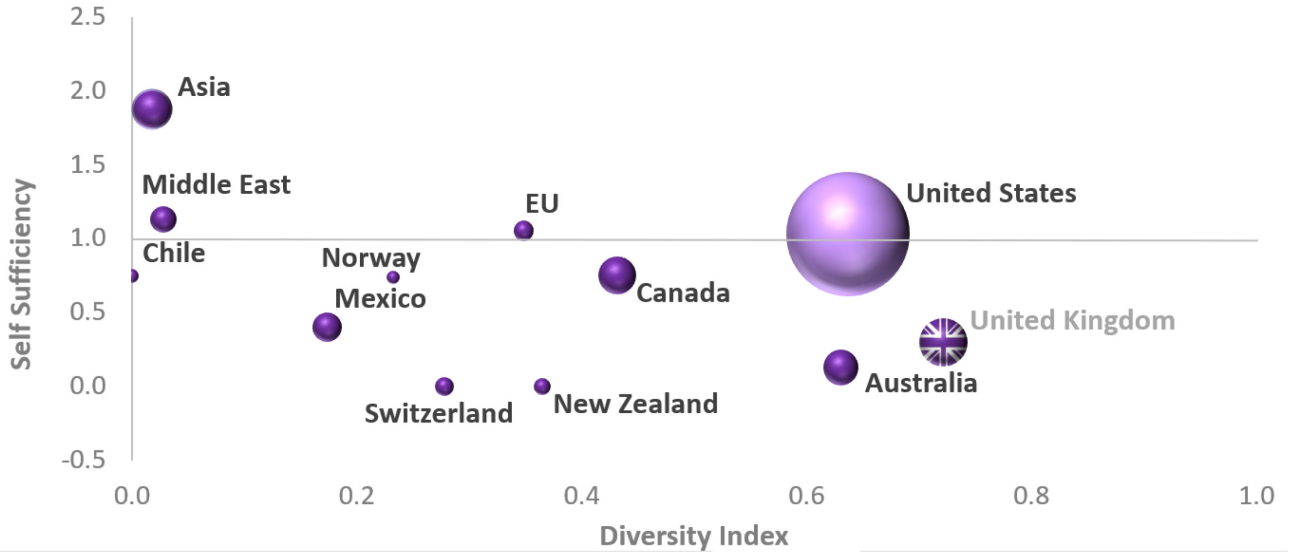


Chart 4 shows that most OECD countries produce a large proportion of the petrol they consume, unlike the pattern for crude oil. The UK ranks eleventh for security of petrol supply in this simplified index with a score of 1.96.

Jet Fuel

Chart 5: Diversity and self-sufficiency of jet fuel for OECD countries, 2023

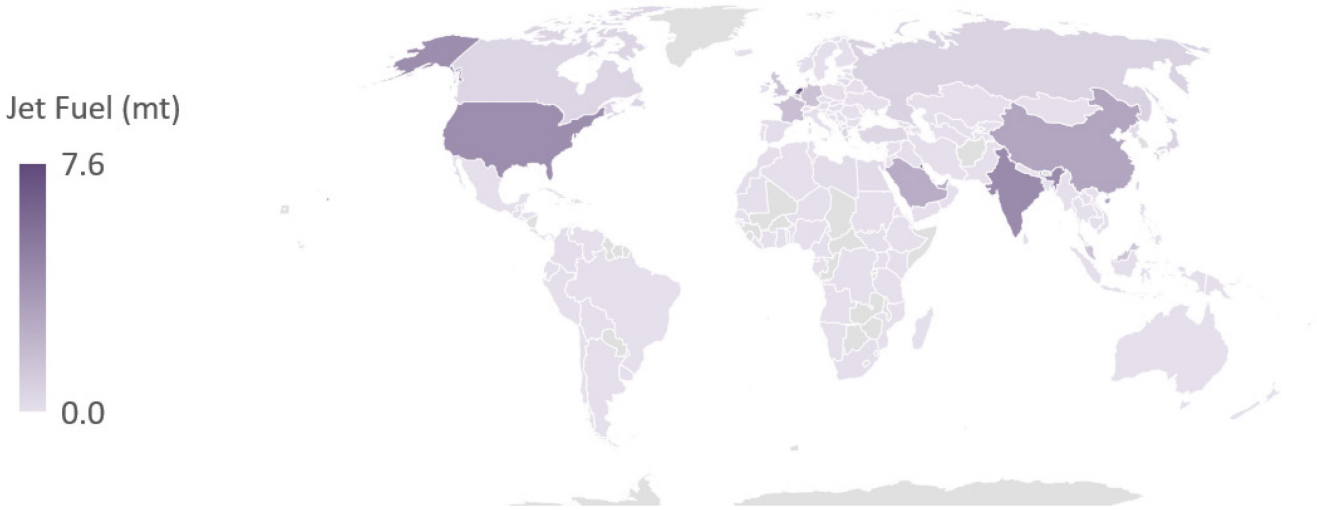


No data available for Costa Rica

Demand for jet fuel within the OECD increased in 2023 by 11 per cent as international travel continued to recover after the travel restrictions in place to curb the spread of Covid-19. Lithuania was the most self-sufficient with a score of 8.57 meaning it produced over eight times its own consumption, followed by the Slovak Republic and Korea. The average of individual country scores was 0.95, up from 0.89 the year before, meaning on average countries could meet 95 per cent of demand. However, this increase in average country self-sufficiency was driven mainly by an increase in production and fall in demand in some smaller producing countries, notably Chile and the Slovak Republic. These two combined only account for 0.5 per cent of demand and thus disproportionately affect the unweighted average used in this methodology. Within the OECD, the self-sufficiency scores for individual countries ranged from 0.00 to 8.57.

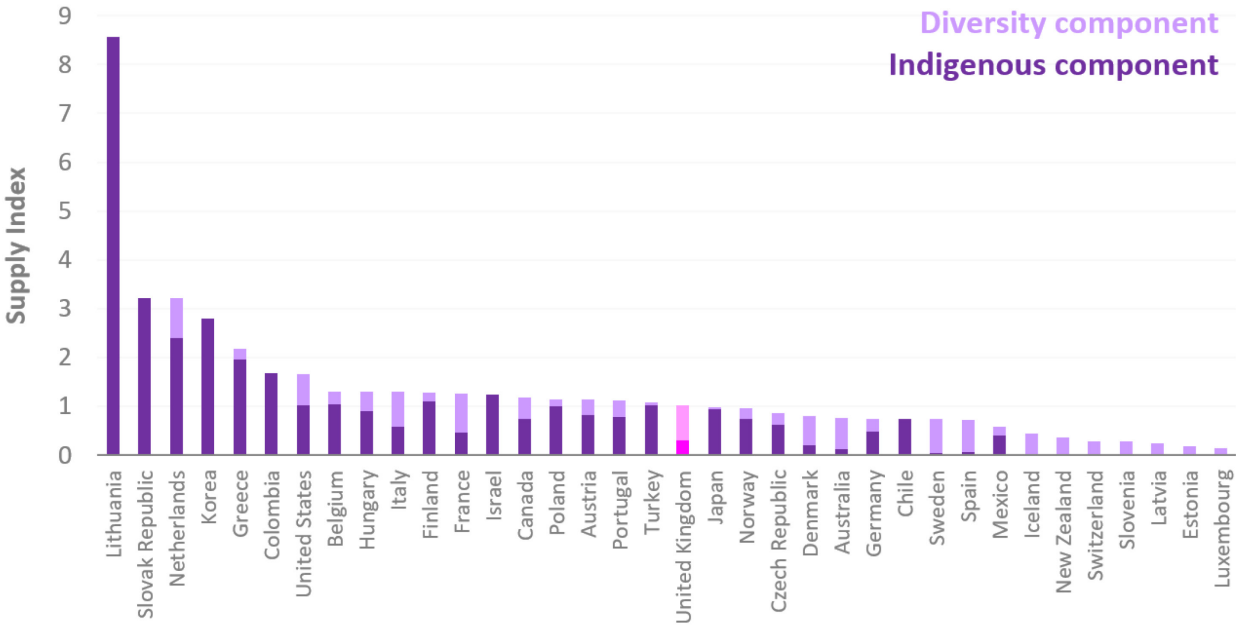
Another way to view security of supply to OECD countries is to take average overall production and demand to calculate a global self-sufficiency score. This method shows that as a bloc OECD countries could meet 88 per cent of total jet demand with production, down from 91 per cent in 2022 following a greater increase in total consumption (11 per cent) than production (9 per cent). The remainder of demand was supplied through imports from 36 unique countries outside the OECD.

Map 3: Worldwide jet fuel exports (million tonnes), 2023



Jet fuel imports were the least diverse of the four oil types because fewer countries produce and export jet fuel in large quantities. The average diversity score for jet fuel was 0.31. The largest exporters to OECD countries were the Netherlands, Kuwait, and Korea. The Netherlands exported 7.6 million tonnes in 2023, followed by Kuwait who exported 7.3 million tonnes. The UK exported 1.4 million tonnes of jet fuel to other OECD countries and was the thirteenth largest exporter.

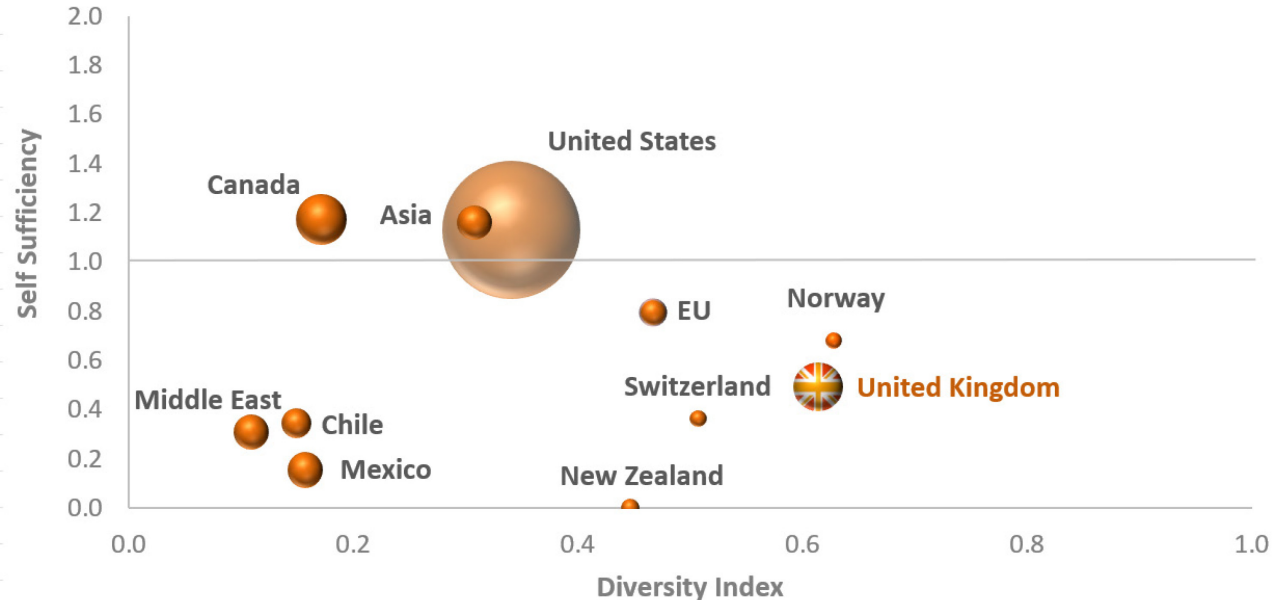
Chart 6: Security of supply of jet fuel for OECD countries, 2023



Heathrow is one of the busiest airports in the world, contributing to the UK's high demand for jet fuel. The UK had the second highest demand in 2023, behind only the US. The UK's small indigenous production results in a relatively small self-sufficiency score of 0.30, down from 0.36 in 2022, but this is secured with imports from a diverse range of stable countries, evidenced in the UK diversity score of 0.72 compared to the average of 0.31.

Road Diesel

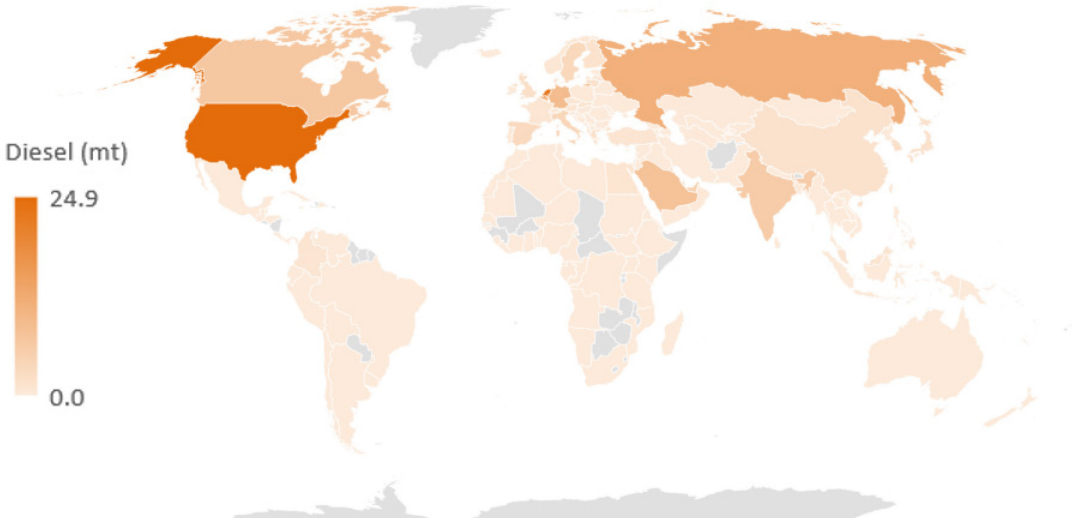
Chart 7: Diversity and self-sufficiency of diesel for OECD countries, 2023



No data available for Australia, Colombia, Costa Rica, Israel, and Sweden. No diversity score available for Denmark.

OECD countries remain reliant on imports to meet demand for diesel, with the average self-sufficiency score of 0.77. In 2023, nine countries were self-sufficient in terms of diesel supply, and six countries did not produce any diesel at all. Chart 7 shows that the UK's self-sufficiency score was 0.49 in 2023, down from 0.59 in 2022 and remaining below the OECD average, EU average and below the self-sufficiency threshold of 1.0. This followed the UK's indigenous diesel production falling 9 per cent in 2023 compared to 2022 with demand remaining stable. Despite this, the UK had a diversity index of 0.61, above the OECD average of 0.44.

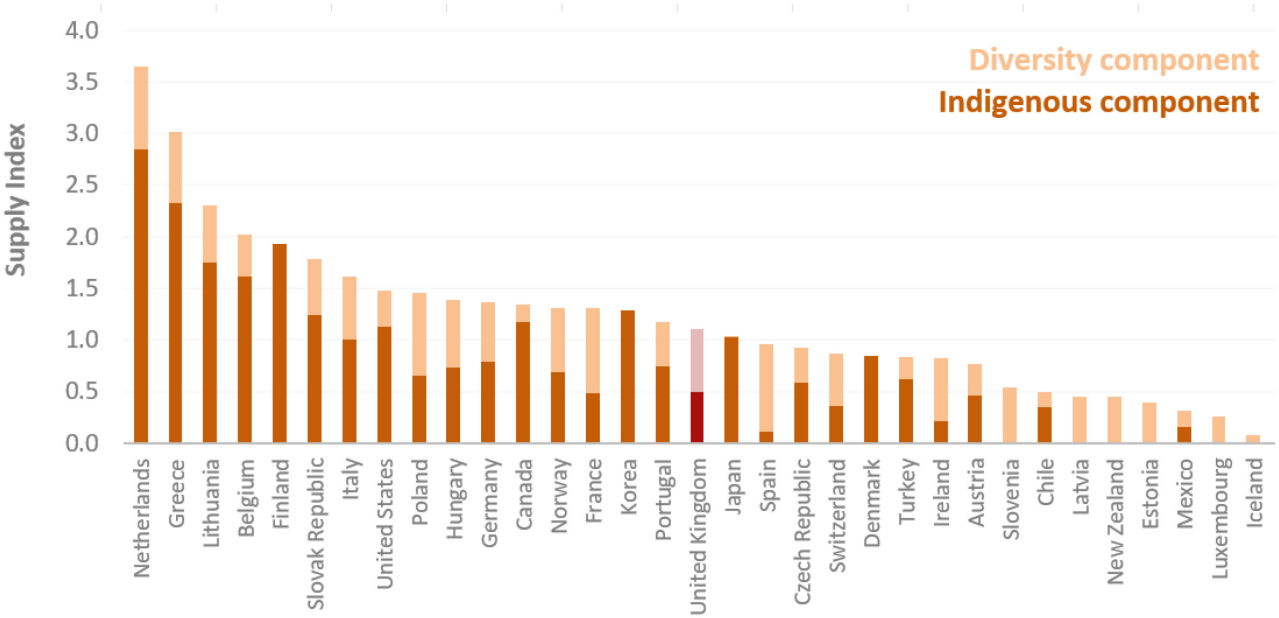
Map 4: Worldwide diesel exports to OECD countries (million tonnes), 2023



Historically Russia has been a key supplier of diesel to the UK, EU, and OECD. Following sanctions, in 2023 Russia was no longer the largest exporter of diesel to the OECD, falling to fourth place exporting 11.4 million tonnes behind the US (24.9 million tonnes), the Netherlands (22.4 million tonnes), and Belgium (12 million tonnes).

Although Russia remains a large import source for the OECD, imports had nearly halved from 23.3 to just 11.9 million tonnes in 2023 compared to 2022. Several countries implemented sanctions against Russian oil imports in 2022: the UK banned Russian oil imports on 5th December 2022; Canada, Australia, and other members of the G7 banned Russian oil imports in March 2022 and imposed a price cap in December 2022[2]; and the EU imposed a ban and price cap on Russian crude oil in December 2022, and on products in February 2023[3]. To compensate, imports of diesel were up from the US by 2.3 million tonnes, the Netherlands by 6.1 million tonnes, and Belgium by 3.3 million tonnes as the OECD sought alternative supply.

Chart 8: Security of supply of diesel for OECD countries, 2023



[2] https://www.canada.ca/en/department-finance/news/2022/12/g7-and-australia-move-forward-with-price-cap-on-russian-oil.html
[3] https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/#sanctions

Chart 8 shows that a large proportion of diesel demand was met through indigenous production, but many countries relied upon a combination of both indigenous and diversity components. While Denmark did import diesel, the source country breakdown was not available meaning the diversity score could not be calculated. Finland and Korea did not import any diesel and exported a combined 3.4 million tonnes. The UK ranked seventeenth out of all OECD countries for security of diesel supply with a score of 1.1, just below the OECD average of 1.2.

Summary

The OECD has a higher security of supply for oil products compared to crude oil. This is because of higher levels of refinery production compared to crude extraction. Nevertheless, the scores for transport fuels are dependent on refining crude oil and therefore should only be considered independently with caution. The average self-sufficiency score for crude oil was 0.59 shows OECD countries are still dependent on imports of crude oil to meet refinery demand. The average diversity score for crude oil of 0.38 was much more comparable to transport fuels showing that the OECD has a consistent, wide range of sources of imports.

As demand for petrol continued to increase in 2023 compared to 2022, its average self-sufficiency score decreased. However, out of the three transport fuels petrol had the highest average self-sufficiency score. Sixteen of the 38 were self-sufficient and the average score of 1.28 suggests that OECD countries are well-placed to meet demand for petrol. Due to this high self-sufficiency, countries on average do not have a wide range of import sources of petrol. This meant its average diversity score was only slightly above that of jet fuel (0.32 compared to 0.31).

Jet fuel demand continued to rise in 2023 as international travel recovered following restrictions previously in place to curb the spread of Covid-19. With the second highest average self-sufficiency score (0.95) of the oil types, OECD countries were on average almost self-sufficient in jet fuel supply. However, jet fuel had the lowest diversity score of all oil types because fewer countries export jet fuel at high quantities. Nonetheless, with a diversity score of 0.72 the UK remains in a relatively secure position compared to the OECD average with imports from 18 countries in 2023.

The supply of diesel was the least secure transport fuel in 2023. Ten OECD countries were self-sufficient, but the average self-sufficiency score was 0.77 which is below the sufficiency threshold of 1.0.

The UK consistently has diversity scores higher than the OECD average for all oil types considered here. The UK is self-sufficient in petrol (and a net exporter). The UK is not self-sufficient for crude oil, diesel or jet fuel, but meets its needs through a diverse range of import sources as well as indigenous production.

Appendix 1 – List of OECD countries in category averages

Asia
Japan
Korea

EU (excluding UK)
Austria
Belgium
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Latvia
Lithuania
Luxembourg
Netherlands
Poland
Portugal
Slovak Republic
Slovenia
Spain
Sweden

Middle East
Israel
Turkey

Appendix 2 – Provisional data for 2023

	CRUDE			PETROL			JET FUEL			DIESEL		
	DI	S-S	Demand	DI	S-S	Demand	DI	S-S	Demand	DI	S-S	Demand
Australia	0.77	**1.11**	12,186	0.41	0.35	12,020	0.63	0.13	5,948	-	-	-
Austria	0.47	0.06	8,022	0.25	0.95	1,702	0.31	0.83	852	0.31	0.46	5,819
Belgium	0.90	0.00	30,185	0.41	**1.34**	2,435	0.26	**1.04**	1,699	0.40	**1.61**	5,791
Canada	0.23	**3.36**	59,502	0.59	0.87	34,062	0.43	0.75	6,687	0.17	**1.17**	26,894
Chile	0.30	0.01	9,574	0.06	0.92	4,101	0.00	0.75	821	0.15	0.34	8,921
Colombia	0.00	**2.14**	18,559	0.00	0.62	6,924	0.00	**1.67**	1,601	-	0.00	-
Costa Rica	0.00	0.00	0	0.00	0.00	937	-	-	246	-	0.00	994
Czech Republic	0.29	0.01	7,491	0.36	0.91	1,679	0.26	0.61	351	0.33	0.59	5,136
Denmark	0.46	0.39	7,449	0.52	**1.63**	1,288	0.59	0.21	877	-	0.84	2,218
Estonia	0.00	0.00	0	0.16	0.00	207	0.18	0.00	52	0.39	0.00	610
Finland	0.32	0.00	9,629	0.00	**3.18**	1,295	0.17	**1.11**	705	0.00	**1.93**	2,215
France	0.76	0.01	45,412	0.51	0.77	10,600	0.79	0.46	7,135	0.83	0.48	33,613
Germany	0.84	0.02	79,227	0.46	0.93	20,094	0.28	0.47	9,516	0.58	0.79	33,189
Greece	0.45	0.00	23,379	0.31	**2.69**	2,269	0.22	**1.95**	1,572	0.69	**2.32**	2,962
Hungary	0.24	0.13	6,921	0.42	0.79	1,505	0.40	0.90	294	0.65	0.73	3,548
Iceland	0.00	0.00	0	0.00	0.00	134	0.45	0.00	325	0.08	0.00	378
Ireland	0.38	0.00	2,778	0.20	0.77	750	0.09	0.00	1,091	0.62	0.21	3,083
Israel	0.00	0.02	11,375	0.00	0.85	3,199	0.00	**1.23**	927	-	0.00	-
Italy	0.65	0.07	64,227	0.26	**1.80**	9,226	0.72	0.57	4,533	0.62	1.00	24,798
Japan	0.58	0.00	124,053	0.12	**1.01**	32,396	0.04	0.95	9,787	0.01	**1.03**	22,471
Korea	0.77	0.00	136,584	0.00	**1.92**	10,593	0.00	**2.80**	6,276	0.00	**1.29**	19,886
Latvia	0.00	0.00	0	0.26	0.00	161	0.24	0.00	186	0.45	0.00	788
Lithuania	0.55	0.00	9,098	0.01	**9.15**	310	0.00	**8.57**	116	0.56	**1.74**	1,633
Luxembourg	0.00	0.00	0	0.20	0.00	385	0.13	0.00	527	0.25	0.00	1,121
Mexico	0.00	**2.17**	43,134	0.17	0.38	27,305	0.17	0.40	4,145	0.16	0.15	12,786
Netherlands	0.79	0.01	53,207	0.75	**1.03**	4,369	0.81	**2.40**	3,316	0.80	**2.84**	5,399
New Zealand	0.00	0.00	0	0.40	0.00	2,145	0.37	0.00	1,243	0.45	0.00	3,237
Norway	0.24	**11.33**	7,923	0.44	**4.23**	889	0.23	0.74	758	0.63	0.68	2,573
Poland	0.46	0.03	25,000	0.34	0.80	5,477	0.13	**1.01**	1,190	0.81	0.65	18,136
Portugal	0.55	0.00	9,428	0.33	**1.75**	1,173	0.35	0.77	1,733	0.43	0.74	4,735
Slovak Republic	0.22	0.00	5,339	0.26	**1.77**	582	0.00	**3.22**	28	0.55	**1.24**	2,129
Slovenia	0.00	0.00	0	0.57	0.00	449	0.28	0.00	17	0.54	0.00	1,419
Spain	0.81	0.00	61,886	0.63	**1.60**	6,065	0.67	0.06	6,644	0.85	0.11	21,636
Sweden	0.42	0.00	17,840	0.39	**2.15**	2,202	0.70	0.05	670	-	-	-
Switzerland	0.31	0.00	2,817	0.29	0.31	2,155	0.28	0.00	1,646	0.51	0.36	2,672
Turkey	0.40	0.11	36,143	0.20	**1.21**	4,074	0.06	**1.03**	5,702	0.22	0.61	25,431
United Kingdom	0.61	0.66	47,035	0.73	**1.22**	12,608	0.72	0.30	11,179	0.61	0.49	25,047
US	0.55	0.81	787,325	0.97	0.89	382,499	0.64	**1.03**	76,541	0.34	**1.13**	199,653
OECD Asia average	**0.67**	**0.00**	**130,319**	**0.06**	**1.46**	**21,495**	**0.02**	**1.87**	**8,031**	**0.01**	**1.16**	**21,179**
OECD EU average	**0.42**	**0.03**	**20,283**	**0.33**	**1.48**	**3,233**	**0.35**	**1.05**	**1,888**	**0.51**	**0.83**	**8,198**
OECD Middle East average	**0.20**	**0.06**	**23,759**	**0.10**	**1.03**	**3,637**	**0.03**	**1.13**	**3,314**	**0.11**	**0.31**	**12,715**
OECD country average	**0.38**	**0.59**	**46,388**	**0.32**	**1.28**	**16,060**	**0.31**	**0.95**	**4,656**	**0.44**	**0.77**	**15,615**

Items in bold highlight those countries where indigenous production exceeded domestic consumption.

DI = Diversity Index
S-S = Self-sufficiency

Demand is in thousand tonnes (kt)

Source IEA (http://data.iea.org/)

Appendix 3 – Methodology

Data for crude oil and transport fuel self-sufficiency

Data for crude oil, petrol and jet fuel were extracted from the IEA database. For diesel, data were provided on request from the IEA. Self-sufficiency was determined from data on indigenous production and consumption (production (kt) ÷ consumption (kt)).

Crude oil and transport fuel diversity indices

The diversity index used here is a product of a standard diversity index and an index for political stability. As a basic index for measuring diversity, we used the Shannon-Wiener diversity index. The Shannon-Wiener index is of the form:

$$\sum_{i=1}^{n} -x_i \ln(x_i)$$

Where x is the proportion of total fuel supply represented by the ith source country and n represents the final source country. A value below 1 signifies a country that is dependent on a small range of import sources, a value above 2 represents a country with a wide range of import sources. The minimum value of zero denotes a country that has one imported fuel source or relies entirely on indigenous production.

A previous comparative study on import diversities in Energy Trends March 2011 used the Herfindahl Index as the basic diversity index. Although both indices have their advantages, the Shannon-Wiener was chosen here as this represents the data with less skew, as well as placing more weight on the diversity of contributions from smaller countries and lessening the impact of larger nations.

Political stability was determined using data from the World Bank worldwide governance indicators. Specifically, the index reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. These data were standardised between 0 and 1.

Source: World Bank (http://info.worldbank.org/governance/wgi/index.aspx#home)

Once Shannon-Wiener and political stability indices were determined, these were multiplied and summed:

$$\sum_{i=1}^{n} -x_i \ln(x_i)\, b_i$$

Where b is an index of political stability of the country exporting. This is called the SWNI (Shannon-Weiner-Neumann index), in line with previous work.

Each SWNI index was normalised for each petroleum product between 0 and 1, to have a standardised index. This was done by working out a maximum diversity score, by assuming maximum diversity was equivalent to importing products in line with proportional contributions of exporting countries (e.g. if a single country were responsible for exporting 50 per cent of all product, and five other countries were responsible for 10 per cent each, we assumed maximum import diversity at a ratio of 5:1:1:1:1:1). This maximum diversity score then acted as our upper score of 1, with all other scores divided by this maximum to standardise the data.

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