Department for Energy Security & Net Zero

# UK ENERGY IN BRIEF 2023

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- meet identified user needs
- are well explained and readily accessible
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

# UK ENERGY IN BRIEF 2023

This booklet summarises the latest statistics on energy production, consumption, prices and climate change in the United Kingdom. Figures are primarily taken from the 2023 edition of the “Digest of UK Energy Statistics”, published on 27 July 2023. Details of the Digest and other Department for Energy Security and Net Zero (DESNZ) statistical publications on energy and climate change can be found on pages 50 and 51 of this booklet and are available at: https://www.gov.uk/government/organisations/department-for-energy-security-and-net-zero/about/statistics

CONTENTS

**INTRODUCTION TO THE CHARTS AND TABLES** 4

**ENERGY IN THE ECONOMY**
- The energy industries' contribution to the UK economy 5
- Contribution to GVA 5
- Trends in employment 6
- Investment 7

**OVERALL ENERGY**
- Production of primary fuels 8
- Inland energy consumption 9
- Final energy consumption 10
- Import dependency 11
- Key sources of imports 12
- Proportion of UK energy supplied from low carbon sources 13
- Energy and carbon ratios 14

**CLIMATE CHANGE**
- Territorial greenhouse gas emissions by gas 15
- Territorial greenhouse gas emissions by National Communication sector 16

**SECURITY OF SUPPLY**
- Reliability 17

**COAL**
- Production and imports 18
- Consumption 19

**PETROLEUM**
- Foreign trade in crude oil and petroleum products 20
- Demand by product 21
- Demand for road fuels 22

**OIL AND GAS PRODUCTION**
- UK Continental Shelf production 23
- Oil and gas production and reserves 24

**NATURAL GAS**
- Demand 25
- Trade 26

**ELECTRICITY**
- Generated 27
- Supplied 28
- Capacity 29

CONTENTS

**RENEWABLES**
- **Small scale capacity** **30**
- **Energy sources** **31**
- **Electricity generation from renewable sources** **32**
- **UK onshore and offshore wind capacity map** **33**
- **Renewable proportion of gross final consumption** **34**

**COMBINED HEAT AND POWER** **35**

**ENERGY EFFICIENCY**
- **Energy intensity** **36**
- **Energy efficiency measures delivered through Government schemes** **37**
- **Number of homes with energy efficiency measures** **38**
- **Smart meters** **39**

**FUEL POVERTY**
- **Households in fuel poverty** **40**
- **Low income households by FPEER band** **41**
- **Energy affordability metrics** **42**

**PRICES**
- **Fuel expenditure of households** **43**
- **Fuel price indices for the industrial sector** **44**
- **Fuel price indices for the domestic sector** **45**
- **Petrol and diesel prices** **46**
- **Domestic supplier transfers** **47**

**CONTACTS** **48**

**CONVERSION FACTORS AND DEFINITIONS** **49**

**REFERENCES** **50**

# INTRODUCTION TO THE CHARTS AND TABLES

UK Energy in Brief aims to provide a summary of some of the key developments in the UK energy system: how energy is produced and used and the way in which energy use influences greenhouse gas emissions. It takes data from the main Department for Energy Security and Net Zero (DESNZ) energy and climate change statistical publications; the Digest of UK Energy Statistics, Energy Trends, Energy Prices, Energy Consumption in the UK, the annual Fuel Poverty statistics report and the quarterly Smart Meters report and statistical releases on emissions, and combines these with data produced by the Office for National Statistics and other Government Departments.

The booklet contains separate sections on the economics of the energy industry, overall energy production and consumption and trends in production and consumption of the major fuel sources, climate change and fuel poverty. Also discussed are developments in combined heat and power and renewable energy. Information is also given on energy efficiency and energy prices.

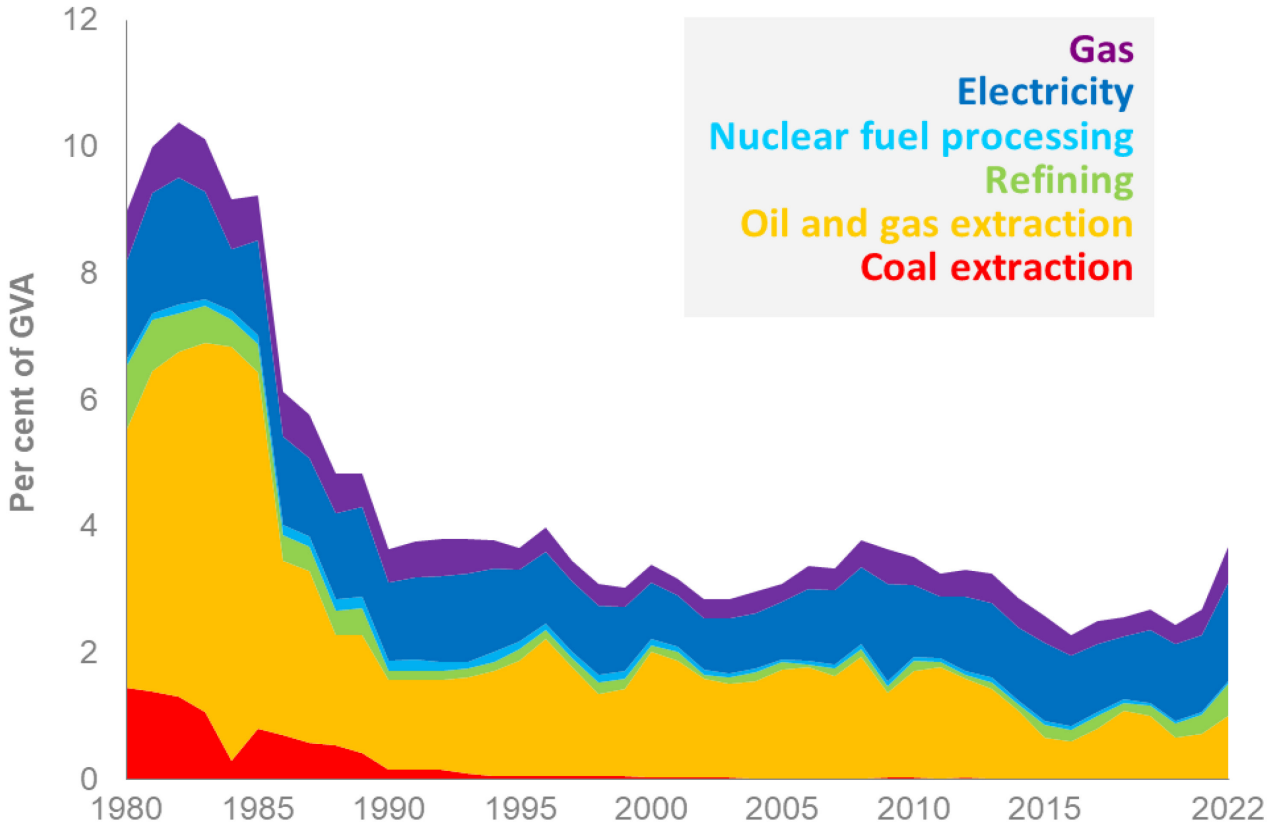
The detailed background data on energy production and consumption can be found in the Digest of UK Energy Statistics 2023 available at:
https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

Other statistical outputs produced by DESNZ and drawn on in this publication are listed on pages 50 and 51.

**THE ENERGY INDUSTRIES' CONTRIBUTION TO THE UK ECONOMY IN 2022**

- 3.6% of GVA (Gross Value Added).
- 166,400 people directly employed (5.8% of industrial employment) and more indirectly (e.g. in support of UK Continental Shelf production).
- 7.0% of total investment.
- 26.4% of industrial investment.

## Contribution to GVA by the energy industries, 1980 to 2022

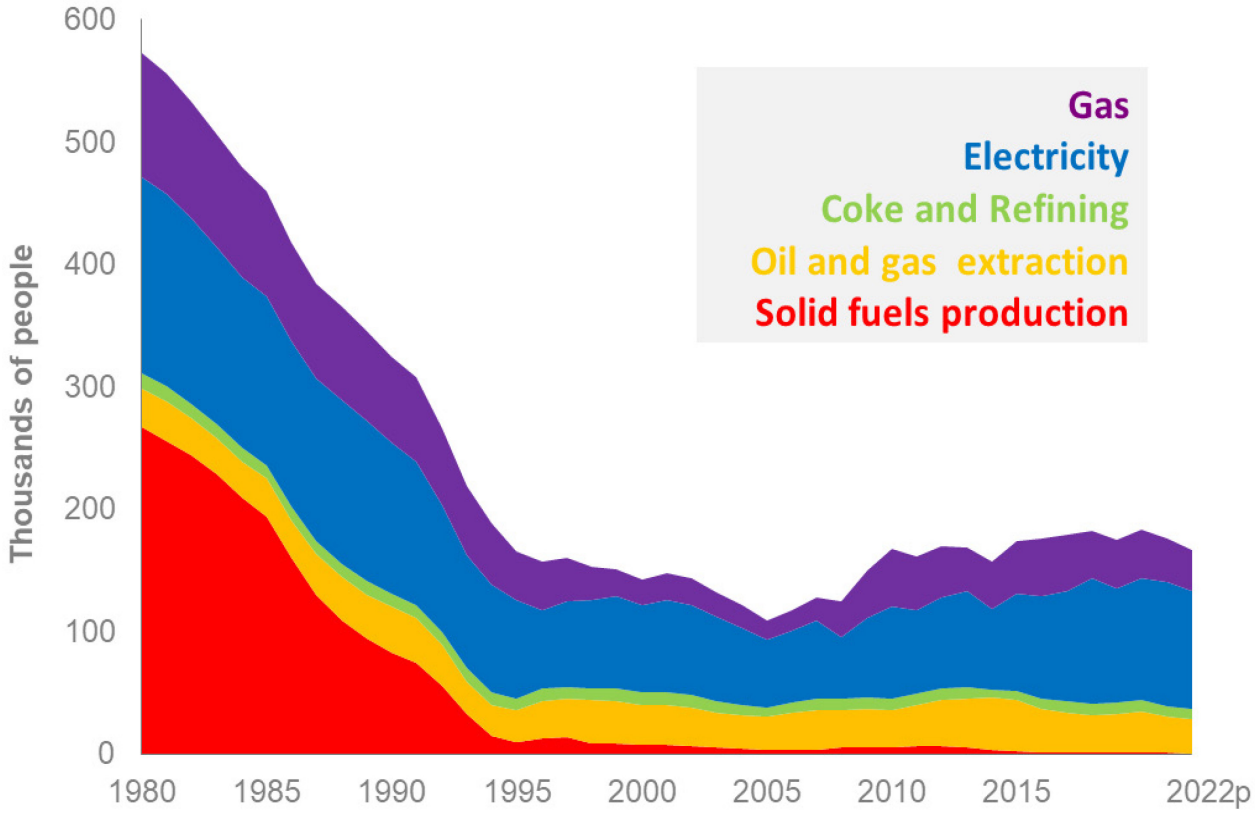



*Source: Office for National Statistics*

The contribution to the UK economy by the energy industries peaked in 1982 at 10.4%. In 2022, the contribution by the energy industries to the UK economy was 3.6% of GVA, 1.0 percentage points higher than in 2021.

Despite its significant fall in 1986, oil and gas extraction has been the major energy contributor to the UK economy (with its value dependent both on production and the price of oil and gas). However, since 2014 electricity has become the major energy contributor. Of the energy total in 2022 electricity (including renewables) accounted for 43%, oil and gas extraction accounted for 25%, and gas accounted for 15%.

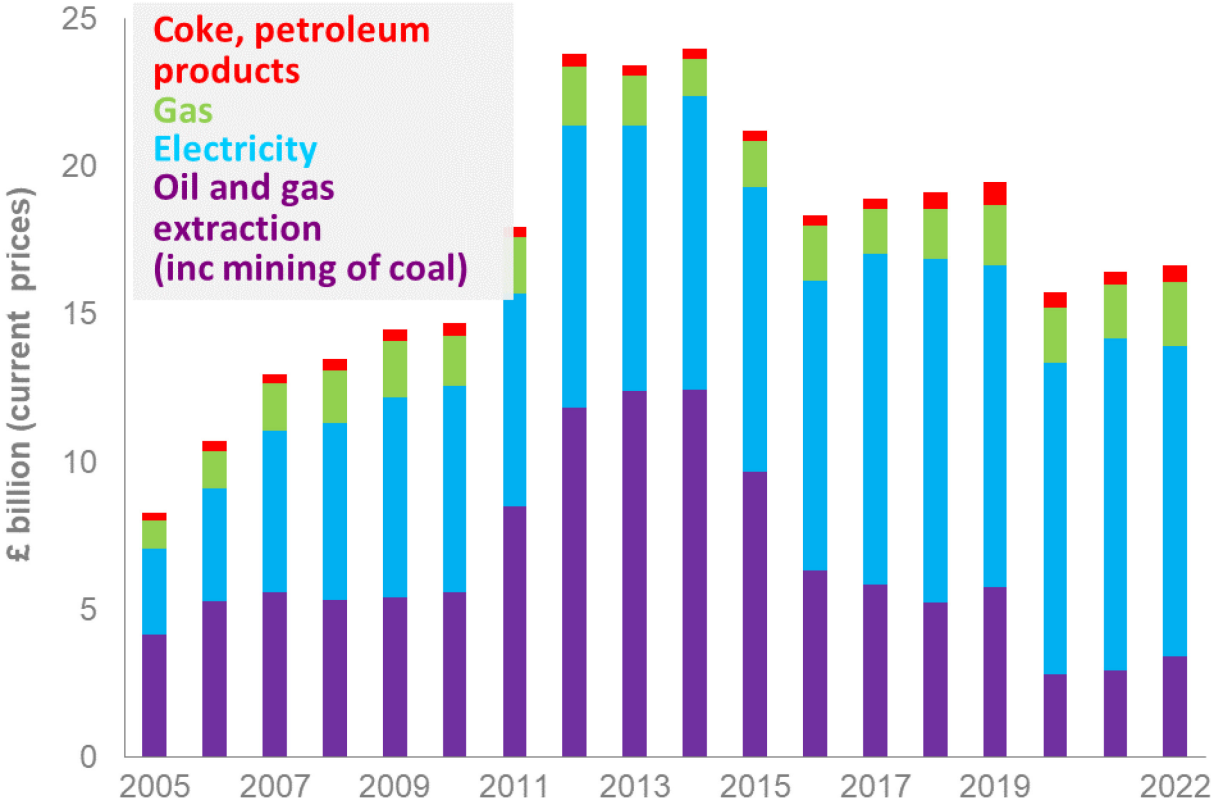
## Trends in employment in the energy industries, 1980 to 2022




*Source: Office for National Statistics (Data from 1996 onwards based on SIC 2007 classifications)*

Employment in the energy production and supply industries fell rapidly throughout the 1980s and mid-1990s largely as a result of closures of coal mines. Between 1995 and mid-2000s employment declined more slowly but since 2006 it has increased gradually, driven largely by growth in the electricity and gas sectors. However, since 2020 employment in the energy industries has fallen back. In 2022 employment fell by 5.1% on the previous year to 166,400 which was 53% above the 2005 level and accounted for 5.8% of all industrial employment. Of the energy total in 2022 electricity (including renewables) accounted for 58%, gas accounted for 20%.and oil and gas extraction accounted for 16%.

## Investment in the energy industries, 2005 to 2022

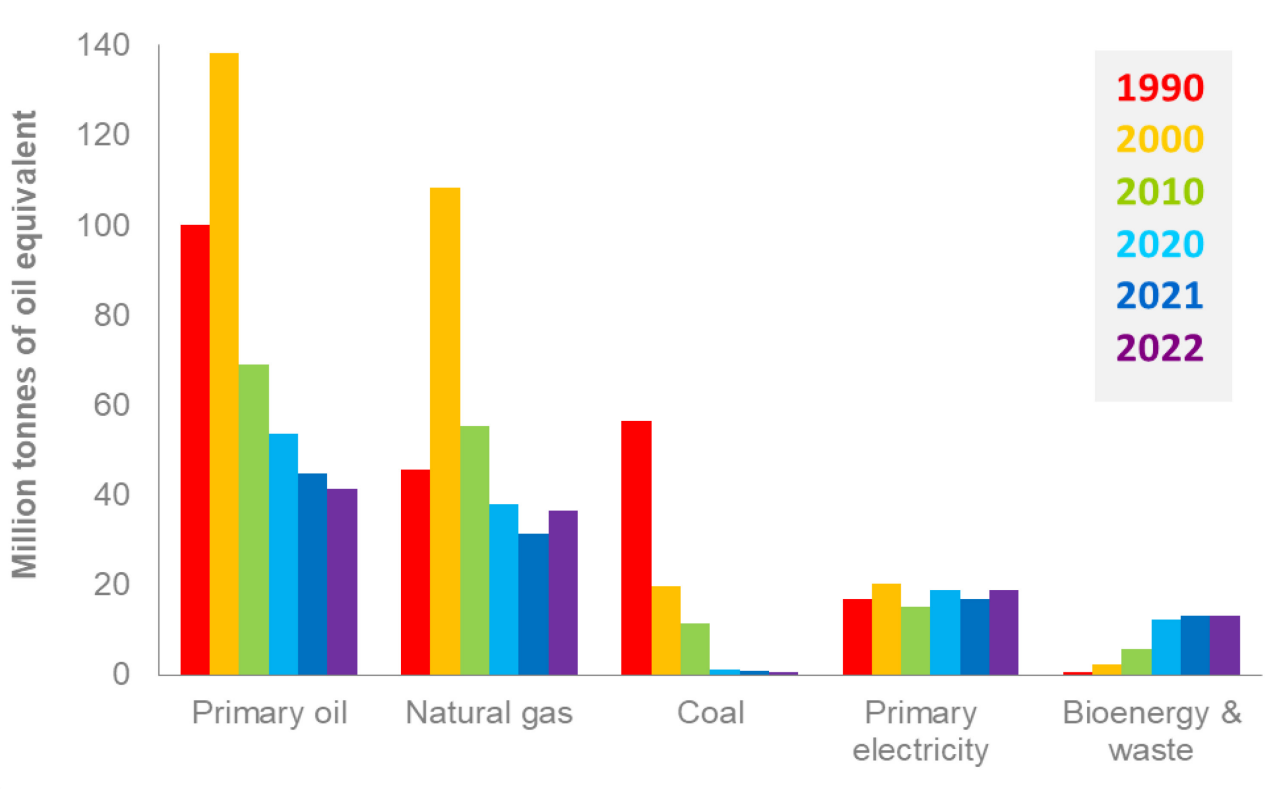



*Source: Office for National Statistics*

In 2022 investment in the energy industries at £16.7 billion (at current prices) was 1.4% higher than in 2021.

Of the total invested electricity contributed 63% (down 5.3 percentage points on 2021), oil and gas extraction (including a small proportion of less than 0.01% for coal extraction) contributed 20% (up 2.6 percentage points on 2021), gas contributed 13% (up 1.9 percentage points on 2021), with the remaining 3% in coke & refined petroleum products industries (up 0.8 percentage points on 2021).

## Production of primary fuels, 1990 to 2022



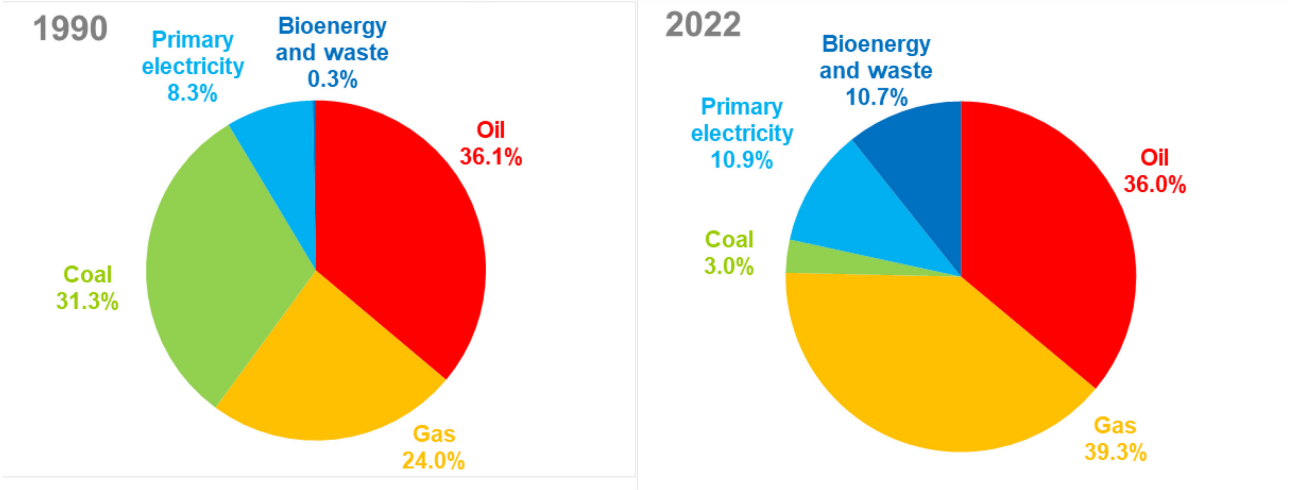

**Million tonnes of oil equivalent**

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Primary oil | 100.1 | 138.3 | 69.0 | 53.6 | 44.7 | 41.3 |
| Natural gas | 45.5 | 108.4 | 55.3 | 37.8 | 31.3 | 36.4 |
| Coal | 56.4 | 19.6 | 11.4 | 1.2 | 0.7 | 0.5 |
| Primary electricity | 16.7 | 20.2 | 15.1 | 18.9 | 17.0 | 18.9 |
| Bioenergy & waste | 0.7 | 2.3 | 5.8 | 12.3 | 13.1 | 13.1 |
| **Total** | **219.4** | **288.7** | **156.7** | **123.8** | **106.8** | **110.2** |

Total production of primary fuels, when expressed in terms of their energy content, rose by 3.1% in 2022 compared to the record low level of 106.8 million tonnes of oil equivalent in 2021. In 2022 output from gas, nuclear, wind, solar and hydro all rose, whilst bioenergy and waste output fell marginally. Oil production fell to a record low level and is still 28% below pre-pandemic (2019) levels, whilst coal production also fell to a record low level in 2022. Primary oil (crude oil and Natural Gas Liquids) accounted for 38% of total production, natural gas 33%, primary electricity (consisting of nuclear, wind, solar and hydro) 17%, bioenergy and waste 12%, while coal accounted for just 0.4%.

Total production increased rapidly between 1990 and 2000, mainly due to the growth of oil and gas. Production in 2000 was at record levels for natural gas, whilst in 1999 it was at record levels for overall energy and petroleum. Production has been on a general decline since 2000, but increased between 2015 and 2018, before falling again from 2019 onwards. The growth in 2022 was due to the rises in gas and nuclear output, with renewables output boosted by increased capacity for wind and solar technologies. Production is now 63% lower than its peak in 1999. Since 2000, oil and gas production levels have fallen by 70% and 66% respectively.

## Inland energy consumption, 1990 and 2022




Note: Primary electricity includes nuclear, wind, solar, hydro and net imports.

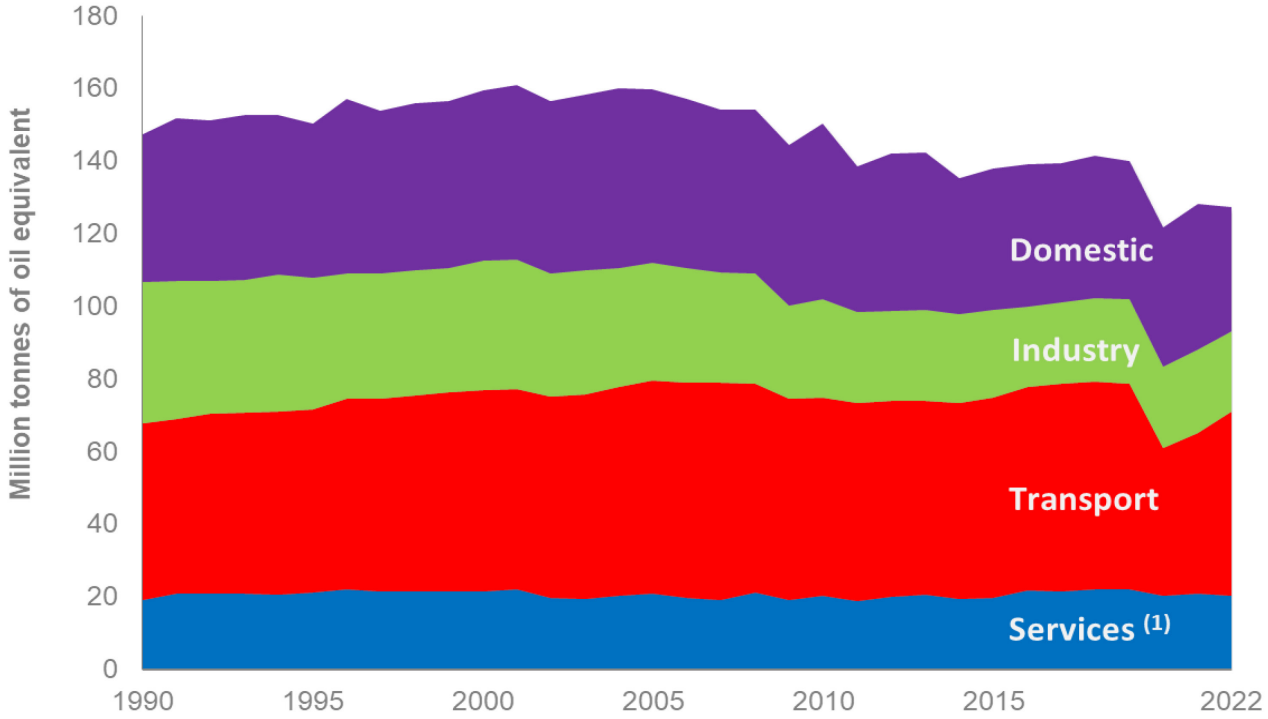
**Million tonnes of oil equivalent**

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **Total inland primary energy consumption[1]:** | 213.6 | 234.8 | 219.3 | 164.1 | 170.7 | 169.2 |
| **Conversion losses:** | | 53.8 | 50.3 | 28.0 | 29.4 | 29.2 |
| **Distribution losses and energy industry use:** | 66.4 | 20.7 | 18.0 | 13.9 | 12.9 | 12.9 |
| **Total final energy consumption:** | 147.3 | 159.4 | 150.3 | 121.8 | 128.1 | 127.4 |
| **Final consumption of which:** | | | | | | |
| Industry | 38.7 | 35.5 | 27.0 | 22.2 | 22.9 | 22.0 |
| Domestic | 40.8 | 46.9 | 48.4 | 38.5 | 40.1 | 34.3 |
| Transport | 48.6 | 55.5 | 54.6 | 40.8 | 44.2 | 50.9 |
| Services[2] | 19.2 | 21.5 | 20.2 | 20.3 | 21.0 | 20.2 |
| **Temperature corrected total inland consumption:** | 221.6 | 240.2 | 210.6 | 166.6 | 170.8 | 172.3 |

(1) Excludes non-energy use.
(2) Includes agriculture, commercial, public administration and miscellaneous.

Primary energy consumption fell by 0.8% in 2022 compared to 2021, with the fall due to households reducing consumption for heating due to higher energy prices and warmer temperatures. In 2022, the average temperature was 0.8 degrees Celsius higher than 2021; on a temperature corrected basis, primary energy consumption was 0.9% higher than in 2021. In the last 33 years, consumption of natural gas and primary electricity have risen, whilst consumption of oil and coal have fallen. However, over the past decade, the growth in consumption of bioenergy and waste has more than doubled.

## Final energy consumption, 1990 to 2022




**2022** **Million tonnes of oil equivalent**

| | Industry | Domestic | Transport | Services[1] | Total |
|---|---|---|---|---|---|
| Coal & manufactured fuels | 1.1 | 0.5 | 0.0 | 0.0 | **1.6** |
| Gas | 8.5 | 21.9 | 0.1 | 7.6 | **38.1** |
| Oil | 2.8 | 2.2 | 46.8 | 3.5 | **56.2** |
| Electricity | 7.3 | 8.3 | 0.7 | 7.3 | **23.6** |
| Bioenergy and heat | 2.4 | 1.4 | 2.3 | 1.7 | **8.0** |
| **Total** | **22.0** | **34.3** | **50.9** | **20.2** | **127.4** |

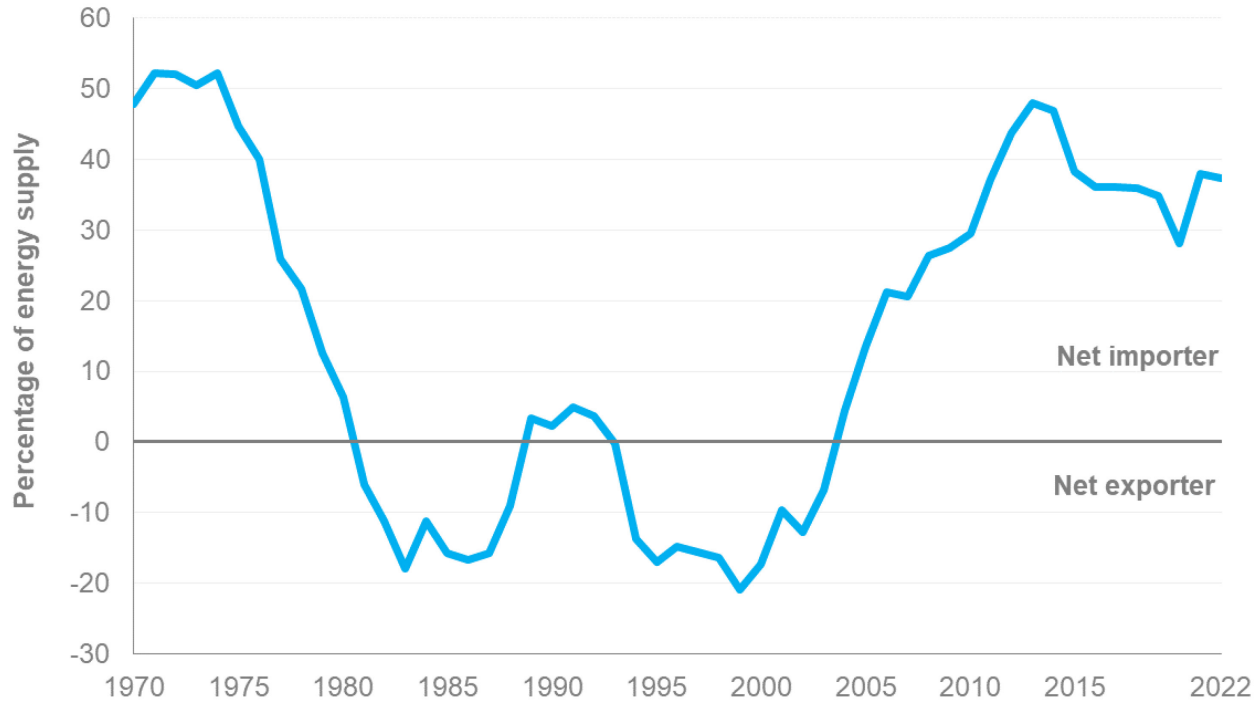
(1) Includes agriculture, commercial, public administration and miscellaneous.

Total final energy consumption (excluding non-energy use) was 0.6% lower in 2022 compared to 2021, with a rise in the transport sector offset by falls in all other sectors. Transport sector consumption rose by 15 per cent, with road transport (petrol and diesel) consumption rising by 3.0 per cent and air consumption almost doubling on 2021 levels but remaining 21 per cent below pre-pandemic (2019) levels. Domestic sector consumption fell by 14 per cent due to average temperatures in 2022 reaching a record high as well changes in consumer behaviour arising from higher energy prices. Industrial sector consumption fell by 3.8 per cent to a record low level and service sector consumption fell by 3.9 per cent with the impact of higher energy prices likely a key factor in the reduced consumption levels.

Overall final energy consumption, when adjusted for temperature, was up by 1.6 per cent (mainly due to increased transport demand), but domestic consumption was down by 7.9 per cent.

In terms of fuel types, final consumption of gas, the main fuel used for heating, fell by 14%. Oil use rose by 12%, bioenergy use rose by 10%, but electricity use fell by 4.3%.

## Import dependency, 1970 to 2022

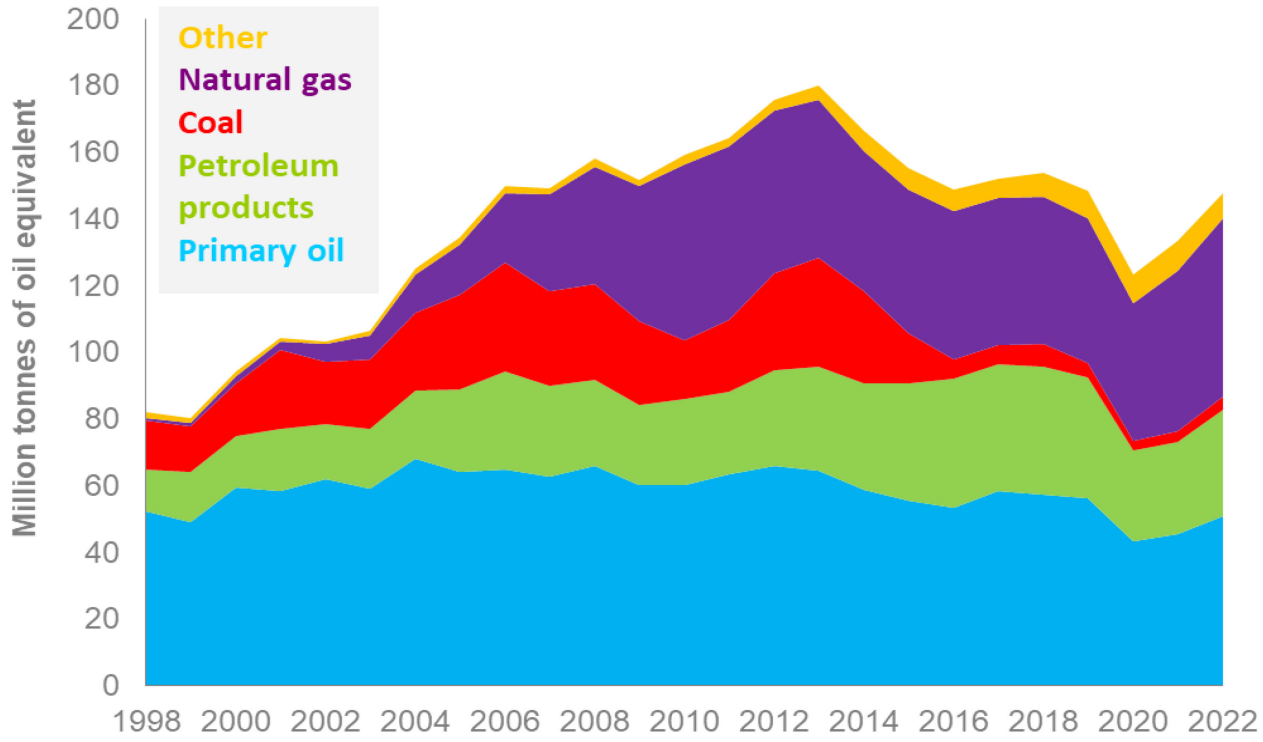



**Percentage**

| | 2000 | 2005 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Coal | 39% | 71% | 52% | 47% | 51% | 94% |
| Gas | -11% | 7% | 40% | 46% | 57% | 46% |
| Oil | -55% | -3% | 14% | 11% | 25% | 38% |
| **Total** | **-17%** | **13%** | **29%** | **28%** | **38%** | **37%** |

In the 1970's the UK was a net importer of energy. Following development of oil and gas production in the North Sea, the UK became a net exporter of energy in 1981. Output fell in the late 1980's following the Piper Alpha disaster, with the UK regaining a position as a net exporter in the mid 1990's. North Sea production peaked in 1999, and the UK returned to being an energy importer in 2004. In 2013 imports of petroleum products exceeded exports following the closure of the Coryton refinery. The UK is now a net importer of all main fuel types, although in 2022 became a net exporter of electricity for the first time in over 40 years to help meet demand in France from reduced nuclear output there. Exports of gas to Europe also reached a record high in response to the curtailment of Russian gas to Europe. In 2022, 37.3% of energy used in the UK was imported, down 0.6 percentage points on 2021.

## Key sources of imports, 1998 to 2022




Note: Other includes manufactured solid fuels, bioenergy & waste and electricity.

Since 1999, when UK energy production peaked, there has been a sharp rise in imports. Over this period imports doubled, reaching a peak in 2013. In 2010 imports exceeded UK production, but because the UK still exports large volumes net imports remain below production levels. However, in 2021 imports exceeded UK production as the UK imported more fuel to meet increased demand following the Covid-19 pandemic, and again in 2022 as the UK's substantial Liquefied Natural Gas (LNG) regasification infrastructure operated as a land-bridge for increased imports, which were then exported to mainland Europe to help reduce its dependence on Russian gas.

In 2022 imports rose by 11%, with rises in imports of coal, primary oil, petroleum products and gas, but a fall in imports of bioenergy and waste and electricity.

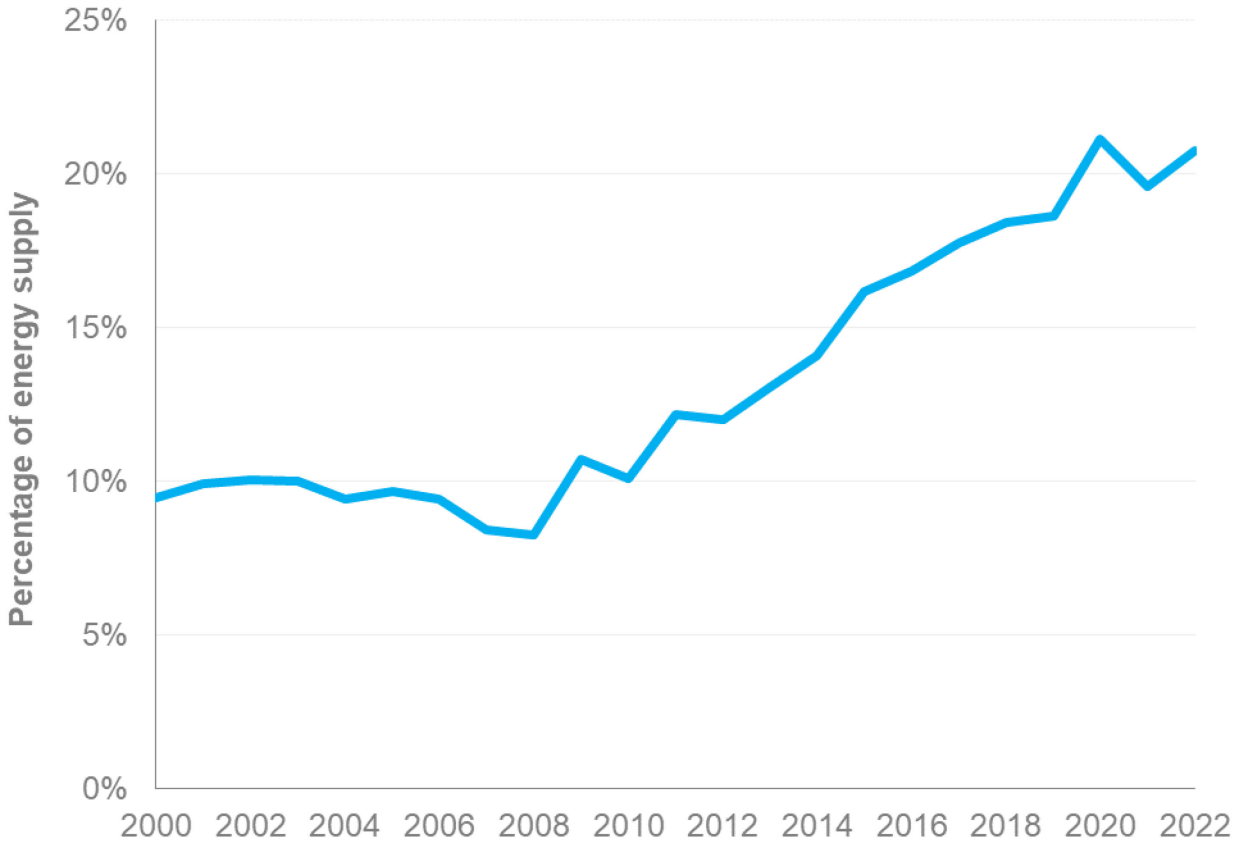
Imports are sourced from a wide variety of countries.

**Crude oil**: The key source of imports has historically been Norway, but its share of UK imports decreased from 36% in 2021 to 33% in 2022, whilst the share of US imports rose from 30% in 2021 to 36% in 2022 to become the key source of crude oil imports.

**Petroleum products:** The UK imports a wide variety of petroleum products, while remaining a net exporter of certain fuels including petrol. Traditionally the Netherlands, which acts as a major trading hub, has been the largest source of imports. As such, the Netherlands is the largest supplier of transport fuels. Aviation turbine fuel is generally sourced from the Middle East.

**Gas**: Norway accounted for 55% of UK gas imports in 2022, down from 63% in 2021, with the pipelines from Belgium and The Netherlands used to export rather than import for the majority of the year. The remaining 45% arrived as LNG of which 50% was from the US, 30% was from Qatar and 9% was from Peru.

## Proportion of UK energy supplied from low carbon sources, 2000 to 2022




**Percentage**

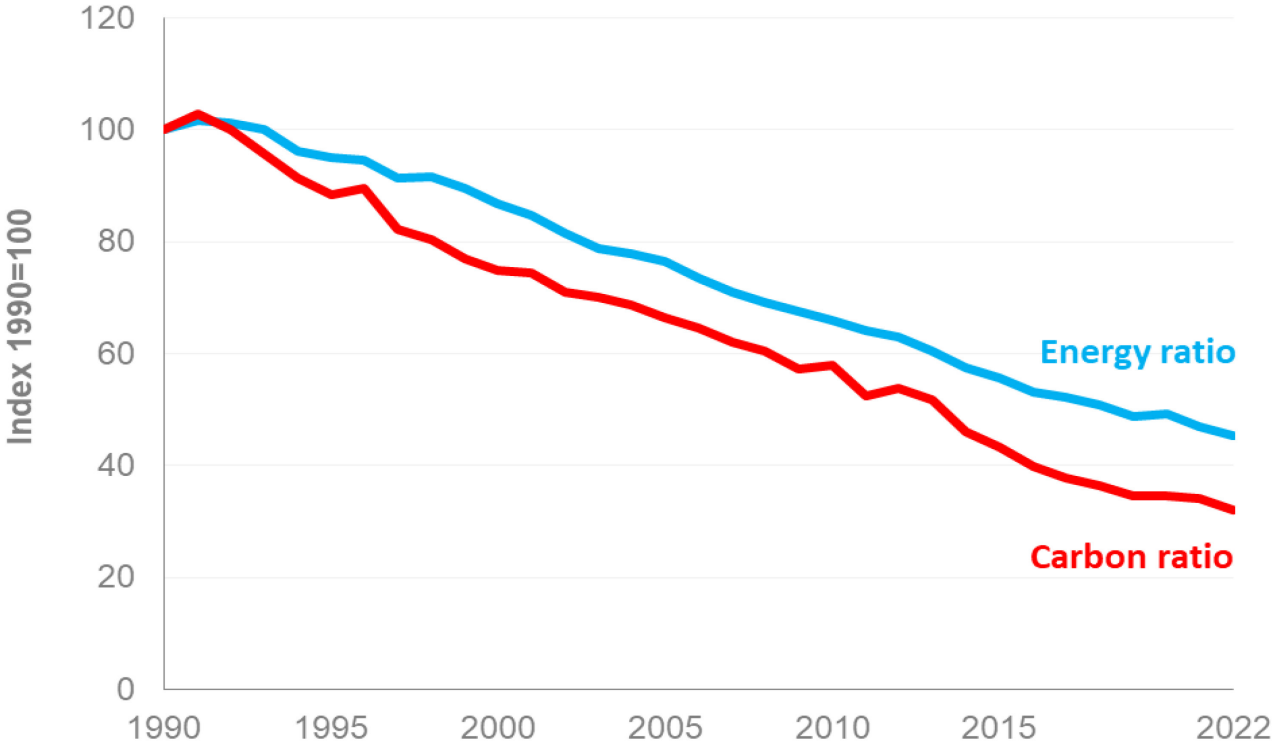
| | 2000 | 2005 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Nuclear | 8.4% | 7.8% | 6.4% | 6.5% | 5.8% | 6.1% |
| Wind | 0.0% | 0.1% | 0.4% | 3.9% | 3.3% | 4.1% |
| Solar | 0.0% | 0.0% | 0.0% | 0.7% | 0.6% | 0.7% |
| Hydro | 0.2% | 0.2% | 0.1% | 0.4% | 0.3% | 0.3% |
| Bioenergy | 0.9% | 1.6% | 2.3% | 7.5% | 7.6% | 7.1% |
| Transport fuels | 0.0% | 0.0% | 0.6% | 1.1% | 1.1% | 1.4% |
| Heat pumps | 0.0% | 0.0% | 0.4% | 0.7% | 0.7% | 0.7% |
| Other | 0.0% | 0.0% | 0.0% | 0.3% | 0.3% | 0.3% |
| **Total** | **9.4%** | **9.7%** | **10.1%** | **21.1%** | **19.6%** | **20.7%** |

In 2022 the UK obtained 20.7% of its primary energy from low carbon sources, with 34% of this from bioenergy, 30% from nuclear, and 20% from wind.

Energy supply from bioenergy fell by 7.3% due to outages, whilst nuclear rose by 4.6% despite operational capacity having decreased. Heat pumps rose by 5.5% and solar rose by 10% with capacity up by 5.3% and more sun hours than in 2021.

Energy supply from wind rose by 24% in 2022, with capacity up by 12% and wind speeds 0.7 knots higher than in 2021. Five named storms affected the UK during 2022, all occurring in January and February 2022.

## Energy and carbon ratios, 1990 to 2022




Index 1990=100

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Primary energy consumption* | 100 | 108.4 | 95.0 | 75.2 | 77.1 | 77.7 |
| Carbon dioxide emissions | 100 | 93.7 | 83.6 | 52.7 | 56.2 | 54.9 |
| GDP | 100 | 125.0 | 144.1 | 153.0 | 164.6 | 171.4 |
| **Energy ratio** | **100** | **86.7** | **65.9** | **49.1** | **46.8** | **45.4** |
| **Carbon ratio** | **100** | **75.0** | **58.0** | **34.5** | **34.2** | **32.0** |

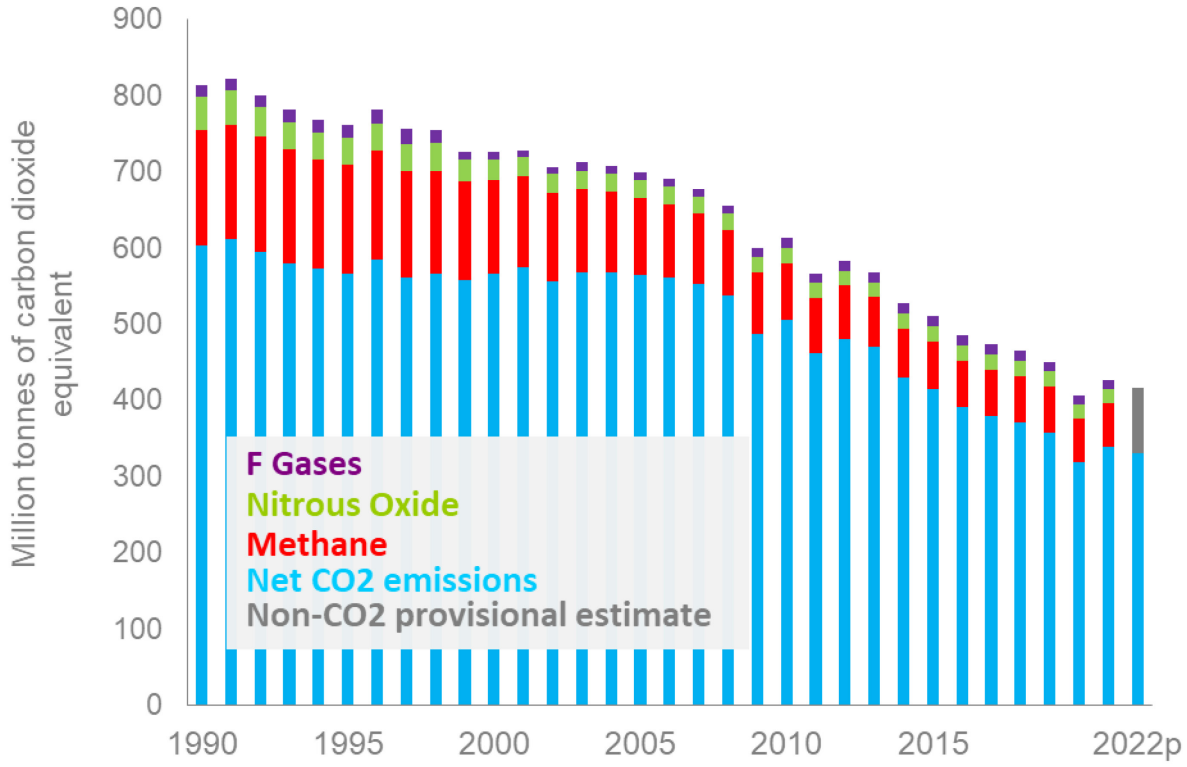
* Temperature corrected primary energy consumption.

The energy ratio is calculated by dividing temperature corrected primary energy consumption by GDP at constant prices, with the carbon ratio similarly calculated by dividing carbon dioxide emissions by GDP. Both ratios have fallen steadily, with the energy ratio declining by around 2½% per year and the carbon ratio declining at a faster pace of 3½% per year.

The downward trends are due to several factors, with improvements in energy efficiency and the decline in the relative importance of energy intensive industries affecting both ratios.

Carbon dioxide emissions were 2.4% lower than 2021 and are still 7.5% lower than 2019. In 2022 transport emissions were up 4%, energy supply (including power stations) were up 2% and public emissions were up 1%, whilst business emissions were down 4% and residential emissions were down 16%. The largest driver of the long-term fall in emissions has been the decrease of emissions from power stations, due to the shift in fuel use from coal to gas and renewables.

## Territorial greenhouse gas emissions by gas, 1990 to 2022




**Million tonnes of carbon dioxide equivalent**

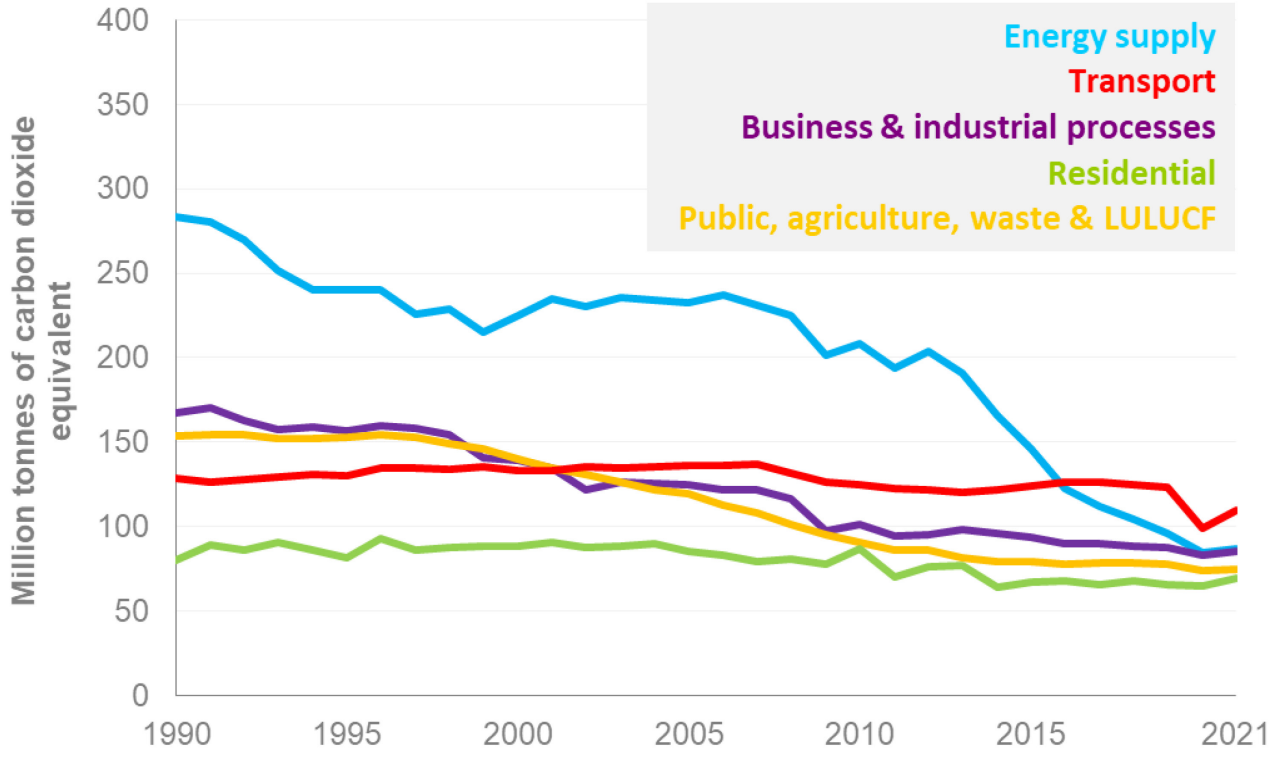
| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022p[1] |
|---|---|---|---|---|---|---|
| Net carbon dioxide ($CO_2$) emissions | 604.0 | 566.0 | 505.0 | 318.5 | 339.5 | 331.5 |
| Methane ($CH_4$) | 150.3 | 123.8 | 75.2 | 57.5 | 57.0 | : |
| Nitrous oxide ($N_2O$) | 44.3 | 26.7 | 20.6 | 18.6 | 19.1 | : |
| Hydrofluorocarbons (HFC) | 12.1 | 6.9 | 11.2 | 11.0 | 10.3 | : |
| Perfluorocarbons (PFC) | 1.5 | 0.5 | 0.3 | 0.2 | 0.2 | : |
| Sulphur hexafluoride ($SF_6$) | 1.2 | 1.9 | 0.7 | 0.4 | 0.4 | : |
| Nitrogen trifluoride ($NF_3$) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | : |
| Non-$CO_2$ provisional estimate | : | : | : | : | : | 85.6 |
| **Total greenhouse gas emissions** | **813.4** | **725.8** | **613.0** | **406.3** | **426.5** | **417.1** |

*Source: DESNZ (2021 final UK figures and 2022 provisional UK figures)*
*1 Provisional estimates are not made for individual non-$CO_2$ gases separately.*
*: data not available.*

Despite rises in some emissions as the UK continued to recover from the Covid-19 pandemic, 2022 saw a fall in greenhouse gas emissions in the UK, largely due to a reduction in fuel use to heat buildings.

Carbon dioxide ($CO_2$) emissions in the UK are provisionally estimated to have decreased by 2.4% in 2022 from 2021, to 331.5 million tonnes (Mt), and total greenhouse gas emissions by 2.2% to 417.1 million tonnes carbon dioxide equivalent ($MtCO_2e$). Total greenhouse gas emissions were 48.7% lower than they were in 1990.

## Territorial greenhouse gas emissions by National Communication sector, 1990 to 2021




**Million tonnes of carbon dioxide equivalent**

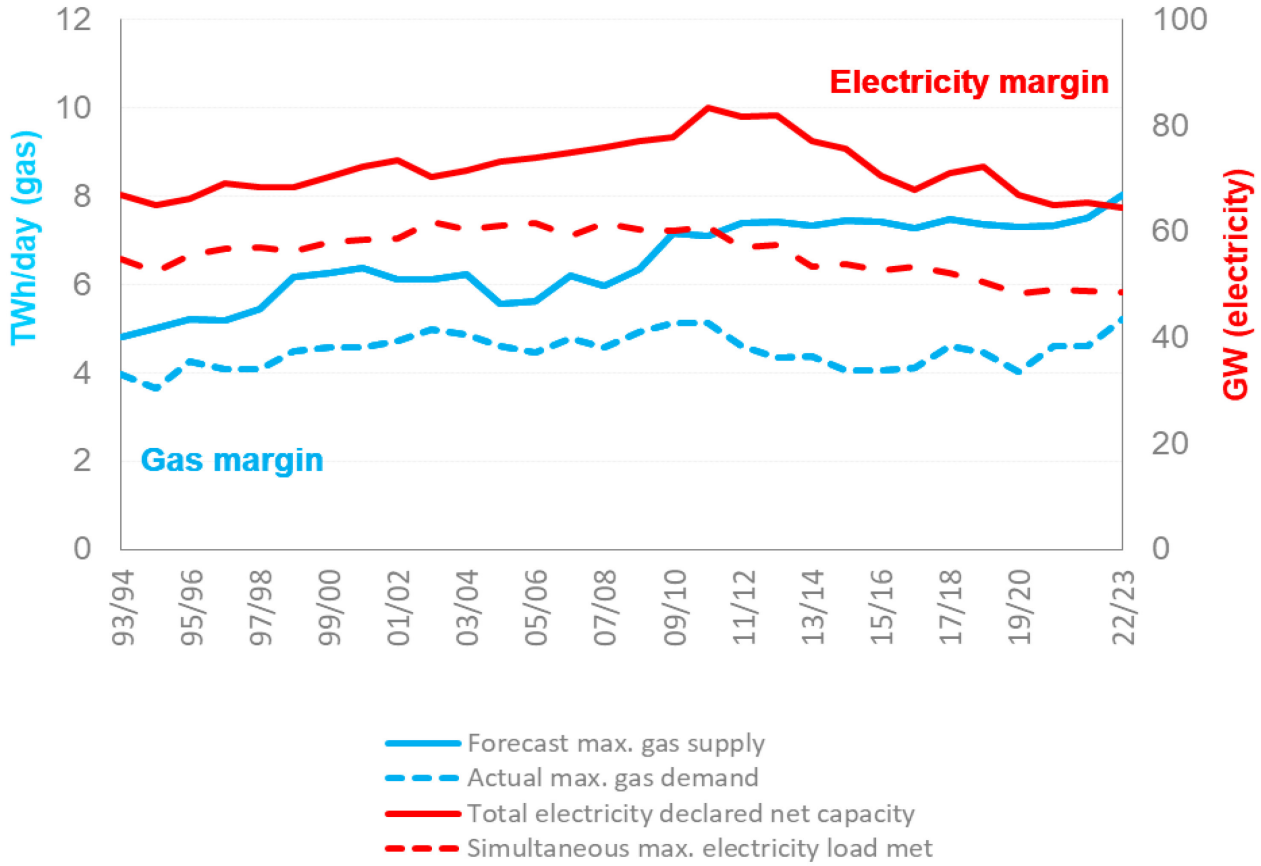
| | 1990 | 2000 | 2010 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Energy supply | 283.5 | 224.7 | 208.4 | 96.2 | 84.5 | 86.9 |
| Residential | 80.3 | 88.6 | 87.3 | 65.5 | 65.2 | 69.4 |
| Public, Agriculture, Waste management and LULUCF | 153.6 | 140.1 | 91.0 | 78.1 | 73.9 | 75.2 |
| Business and Industrial processes | 167.4 | 139.3 | 101.2 | 87.5 | 83.4 | 85.6 |
| Transport | 128.6 | 133.2 | 125.0 | 123.1 | 99.3 | 109.5 |
| **Total greenhouse gas emissions** | **813.4** | **725.8** | **613.0** | **450.4** | **406.3** | **426.5** |

*Source: DESNZ (2021 final UK figures)*
*LULUCF – land use, land use change and forestry*

In 2021, net territorial greenhouse gas emissions in the UK were estimated to be 426.5 $MtCO_2e$, an increase of 5.0% compared to the 2020 figure of 406.3 $MtCO_2e$ and 47.6% lower than they were in 1990. Transport was the largest sector of greenhouse gas emissions in 2021, accounting for 26% of total emissions. Emissions from transport increased by 10% in 2021 from 2020 as Covid-19 restrictions were eased, although were still 11% lower than in 2019. They were down 15% from 1990 levels.

In 2021 GHG emissions from the energy supply sector accounted for 20% of emissions and have decreased by 69% since 1990 due to changes in the mix of fuels being used for electricity generation. Emissions from the residential sector accounted for around 16% of emissions in 2021 and since 1990 emissions from this sector have decreased by 14%.

## Reliability – gas and electricity capacity margins – maximum supply and maximum demand 1993/94 to 2022/23




*Source: National Grid and DESNZ*

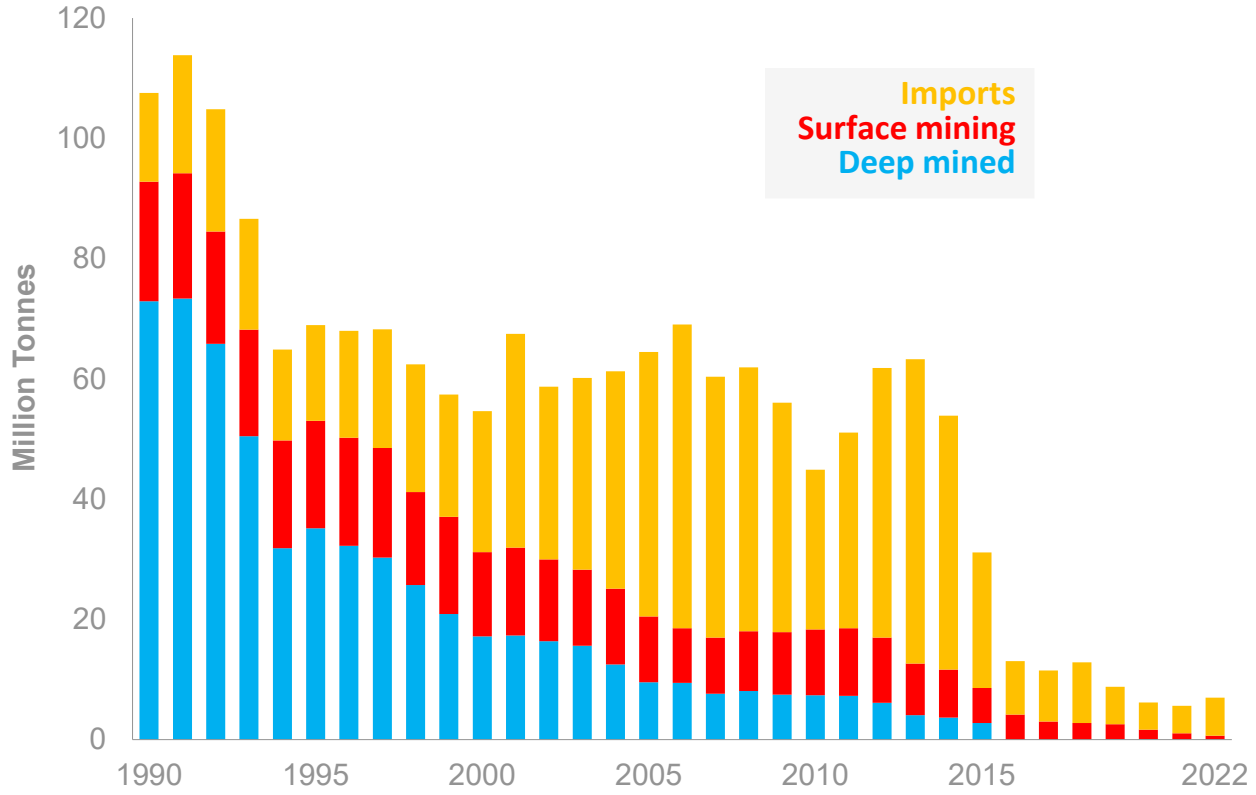
Whilst energy security is complex to measure and subsequent charts on individual fuels provide fuller insight, this chart aims to provide a view on it by looking at the difference between maximum supply and demand for gas and electricity.

From 2007/08 to 2014/15 the electricity capacity margin mainly increased year on year, due to both a decrease in peak demand and an increase in capacity. However, from 2013/14 to 2016/17 the capacity of major power producers fell faster than peak demand due to plant closures and conversions. This resulted in the capacity margin falling from a peak of 44% in 2013/14 to 27% in 2016/17, the lowest since 2008/09. Whilst embedded renewables capacity increased over that period, the intermittent nature of solar and wind meant it did not cover the drop due to closures of major power producers. A drop in peak demand in 2018/19 and an increase in renewable generation capacity saw the margin rise to 43% before falling back around 32% in 2020/21 to 2022/23 as additional renewables, particularly offshore wind, did not fully offset the closure of coal-fired and nuclear plants.

Since 2008/ 2009 the gas capacity margin has been wider than historically seen because of increased supply from three Liquefied Natural Gas (LNG) terminals which came onstream in 2008. A recent peak in maximum demand was seen in 2017/18, the highest since the winter of 2010/11 and following severe weather brought over by the 'Beast from the East'. Despite this the capacity margin remained one-third higher than demand. The supply margin in 2022 remains over 60 per cent of maximum capacity[1].

[1] Forecast max. Gas supply is NTS Peak Supply Margin 'Consumer Transformation'

## Coal production and imports, 1990 to 2022



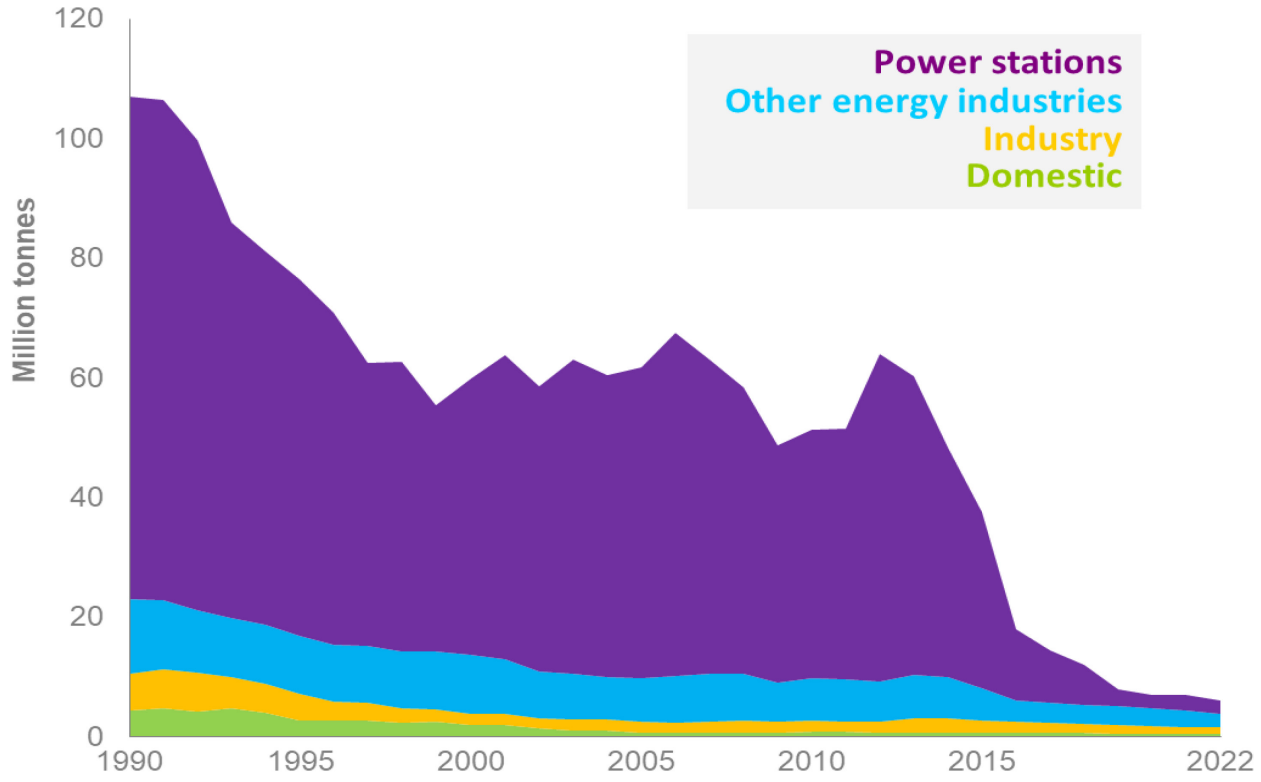

**Million tonnes**

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Deep mined | 72.9 | 17.2 | 7.4 | 0.1 | 0.1 | 0.1 |
| Surface mining (including slurry) | 19.9 | 14.0 | 11.0 | 1.6 | 1.0 | 0.6 |
| **Total** | **92.8** | **31.2** | **18.4** | **1.7** | **1.1** | **0.7** |
| Coal imports | 14.8 | 23.4 | 26.5 | 4.5 | 4.6 | 6.4 |

In 2022 UK coal production fell to an all-time low of 651 thousand tonnes, 38% lower than in 2021. Following closure of the last three deep mines in 2015 (Hatfield, Thoresby and Kellingley), production fell to a fraction of the previous values. At 63 thousand tonnes, deep mined coal comprises 10% of total production. In 2022 surface mine production fell by 39% to a new record low of 588 thousand tonnes, being further affected by mine closures and declining demand for coal use.

Imports of coal began in 1970 and grew steadily. In 2001 imports exceeded the level of UK production for the first time. As annual levels of UK coal production continued to fall, imports continued to grow and in 2006 reached a new record of 50.5 million tonnes. Demand from electricity generators declined over the next five years and imports fell accordingly. However, in the three years from 2011, higher gas prices led to greater demand for coal from electricity generators and imports rose again up to 2013 when they stood at 50.6 million tonnes, just above the 2006 record. From 2014 to 2017 imports fell once more, rose in 2018 before falling again in 2019 and 2020. After a 37-year low in 2020, imports have risen again in the last two years and were 6.4 million tonnes in 2022.

## Coal consumption, 1990 to 2022



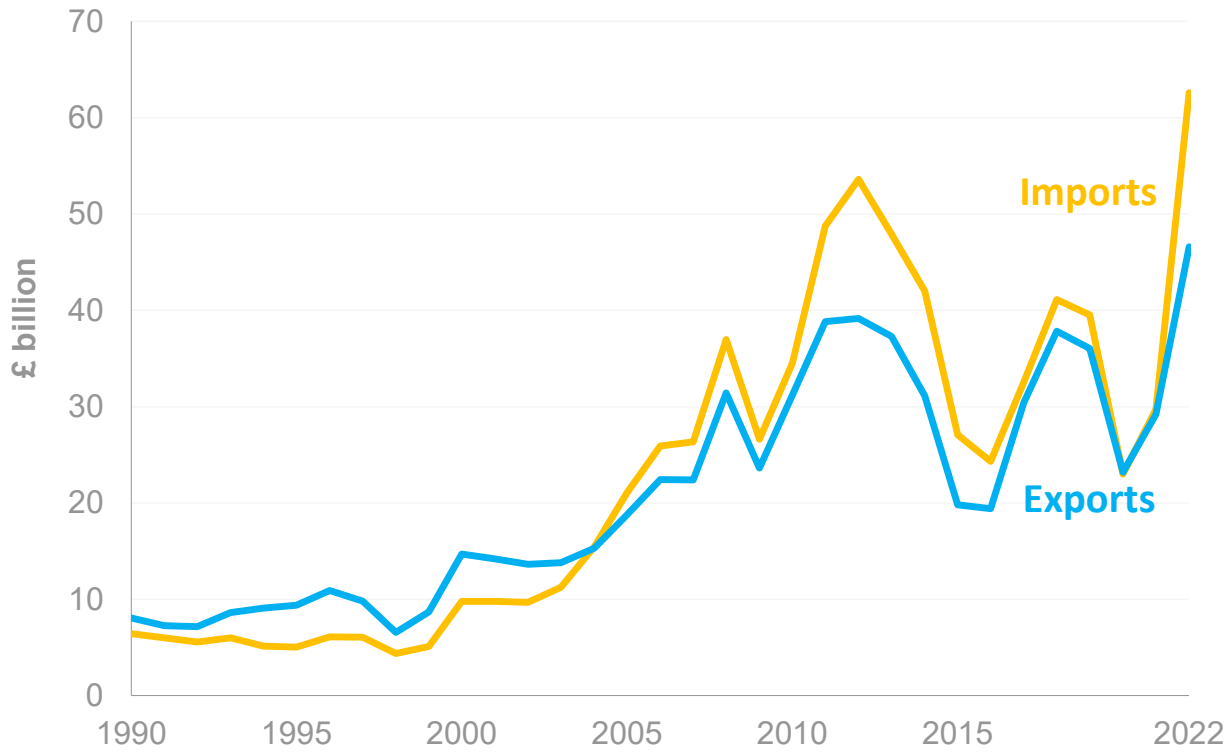

Million tonnes

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Power stations | 84.0 | 46.2 | 41.5 | 2.3 | 2.6 | 2.3 |
| Domestic | 4.2 | 1.9 | 0.7 | 0.5 | 0.5 | 0.4 |
| Industry | 6.3 | 1.9 | 2.0 | 1.2 | 1.1 | 1.1 |
| Services | 1.2 | 0.1 | 0.1 | 0.04 | 0.04 | 0.04 |
| Other energy industries | 12.5 | 9.8 | 7.1 | 2.9 | 2.7 | 2.3 |
| **Total consumption** | **108.3** | **59.9** | **51.4** | **6.9** | **6.9** | **6.1** |

In 1990 coal generation was 84 million tonnes and fell steadily after 1991 until 1999. Following an 11 year high in 2006 (57 million tonnes), coal used by generators fell steadily between 2006 and 2009 before stabilising then increasing sharply in 2012 due to high gas prices. Coal use in electricity generation has fallen since 2012, due to an overall decline in coal power station capacity. After falling to a record low in 2020, coal for electricity generation fell rose to 2.6 million tonnes in 2021, although this was from a low baseline following record periods without coal generation in Great Britain in 2020. In 2022 coal for electricity generation fell again to a new record low of 2.3 million tonnes, while the fuel mix continues its shift towards other sources of fuel as coal is being phased out.

Demand for coal-fired electricity generation had continued to fall as production favoured gas, partly due to the carbon price per GWh being higher for coal. The carbon price is a charge on companies emitting CO2. The increase in other sources of energy for electricity also contributed to the fall in coal-fired electricity. Wind generation was up 25 per cent due to higher than average wind speeds. Total renewable generation was up by 13 per cent in 2022, while nuclear energy was also up. With the Drax and West Burton coal units closed in Spring 2023, just two coal plants remain operational in the UK, with coal use for electricity generation expected to cease completely by October 2024.

## Foreign trade in crude oil and petroleum products, 1990 to 2022




**Crude oil and petroleum products** **£ billion**

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Exports | 8.1 | 14.7 | 31.2 | 23.2 | 29.2 | 46.6 |
| Imports | 6.4 | 9.8 | 34.5 | 23.0 | 29.7 | 62.6 |
| **Net Imports** | **-1.6** | **-4.9** | **3.3** | **-0.2** | **0.5** | **16.0** |

*Source: Office for National Statistics*

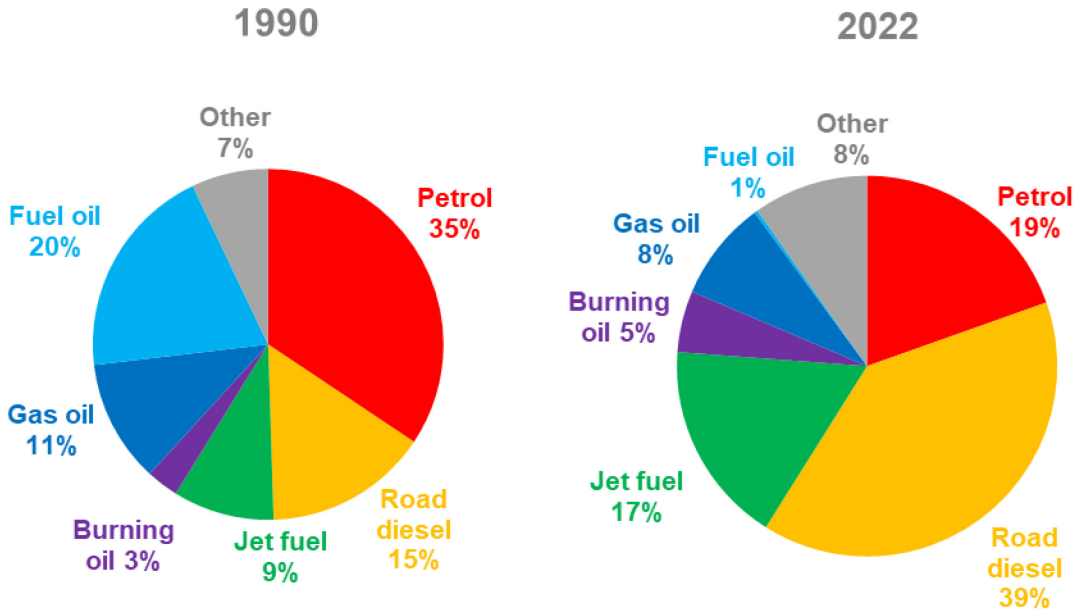
Between 1980 and 2003, a surplus in trade led to oil contributing more than £87 billion to the UK balance of payments. The largest surplus of £8 billion in 1985 reflected high crude oil production and prices.

However, from 2004 to 2019, the UK became a net importer of oils, though still an exporter of some oil products. Between 2004 and 2019 the cumulative deficit amounted to just under £89 billion.

Since the peak of £14.5 billion in 2012, the deficit fell steadily. The UK briefly returned to being a net exporter in 2020 as both imports and exports fell (by £16.5 billion and £12.8 billion respectively) due to the Covid-19 pandemic. There was also a sharp fall of 34 per cent in crude oil price (in £ terms) in the same period.

Both imports and exports grew since 2021 with and the UK becoming a net importer again. In 2022, UK net imports were £16 billion, higher than the previous peak in 2012.

## Demand by product, 1990 and 2022



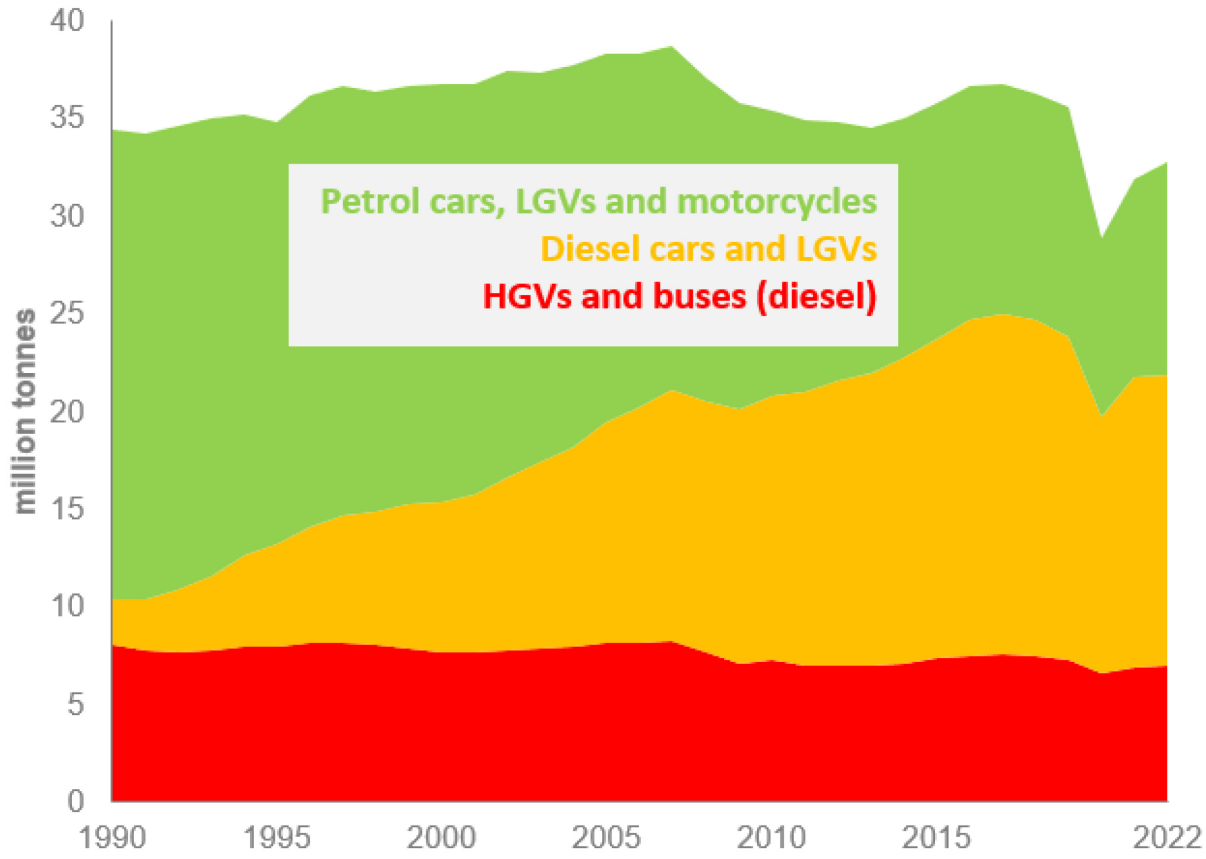

Million tonnes

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **Energy uses*** | | | | | | |
| Petrol | 24.3 | 21.4 | 14.6 | 9.1 | 10.2 | 10.9 |
| Road diesel | 10.7 | 15.6 | 20.7 | 19.7 | 21.7 | 21.9 |
| Jet fuel | 6.6 | 10.8 | 11.1 | 5.1 | 4.9 | 9.6 |
| Burning oil | 2.1 | 3.8 | 4.0 | 3.5 | 3.2 | 2.9 |
| Gas oil | 8.0 | 6.8 | 5.1 | 4.2 | 4.4 | 4.7 |
| Fuel oil | 14.0 | 3.3 | 1.9 | 0.1 | 0.1 | 0.2 |
| Other | 5.0 | 5.3 | 6.1 | 5.1 | 5.3 | 5.4 |
| **Total energy uses** | 70.7 | 67.1 | 63.6 | 46.9 | 49.8 | 55.6 |
| Of which: | | | | | | |
| Transport fuels | 43.5 | 49.5 | 48.1 | 35.0 | 37.9 | 43.7 |
| Industry | 7.2 | 5.5 | 5.1 | 2.6 | 2.6 | 2.5 |
| Refinery fuel use | 5.1 | 5.3 | 4.4 | 2.6 | 2.6 | 2.9 |
| **Non-energy uses** | 9.2 | 10.1 | 7.1 | 6.0 | 4.8 | 4.4 |
| **Total demand** | **79.8** | **77.2** | **70.7** | **52.9** | **54.5** | **60.0** |

* Energy uses includes uses for transformation (e.g., electricity generation) and energy industry own use (e.g., refinery fuels)

Demand for oil products has declined since 1990; this trend was accelerated by the Covid-19 pandemic. The mix of products consumed has changed over time and total demand increased by 12 per cent on 2021. Most of this increase was from the transport sector, where demand for jet fuel doubled as the international aviation demand increased following the lifting of Covid-19 restrictions. The share of total oil demand for transport increased to almost 80 per cent. Transport's share of total oil demand is substantially larger than in 1990 because the use of fuel oil for electricity generation has declined.

## Demand for road fuels, 1990 to 2022




Since the early 1990s demand for diesel has increased whilst for petrol this has decreased, and in 2005 demand for diesel became larger than the demand for petrol. This was caused by an increase in use of diesel-fuelled cars and increase in light goods vehicles (LGVs). However, demand started to decline from 2018 following tax increases on diesel vehicles. In 2020 this fall in diesel demand was exacerbated by the Covid-19 pandemic and subsequent restrictions on travel. In 2021, diesel and petrol demand increased as restrictions eased in the latter half of the year and in 2022 total diesel consumption remained stable, but petrol demand continued to increase by 7.2 per cent. Diesel demand was less affected by the pandemic as commercial motor fleets (light and heavy goods vehicles) continued to operate during periods of restricted travel.

**Demand for road diesel by vehicle type** — **Thousand tonnes**

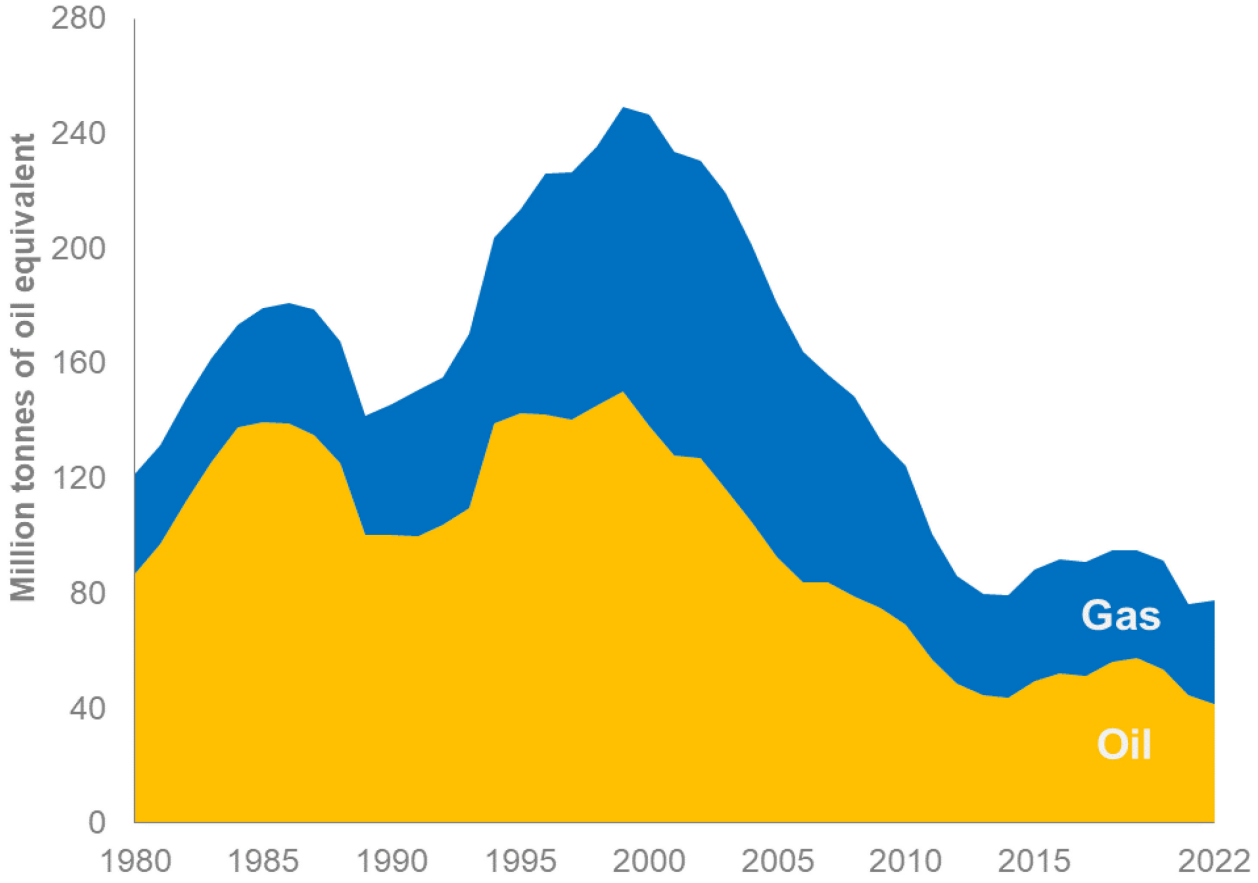
| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022* |
|---|---|---|---|---|---|---|
| Car & taxi | 980 | 4,110 | 8,590 | 8,118 | 9,710 | 9,652 |
| Light goods vehicles | 1,370 | 3,530 | 4,830 | 4,981 | 5,172 | 5,268 |
| Heavy goods vehicles | 6,370 | 6,150 | 5,940 | 5,921 | 5,984 | 6,116 |
| Buses & coaches | 1,640 | 1,530 | 1,380 | 674 | 861 | 842 |
| **Total** | **10,370** | **15,310** | **20,740** | **19,694** | **21,727** | **21,878** |

*Based on modelling by Ricardo Energy & Environment using data from the National Atmospheric Emissions Inventory.

**Demand for petrol** — **Thousand tonnes**

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Total | 24,300 | 21,400 | 14,600 | 9,144 | 10,159 | 10,887 |

## UK Continental Shelf production, 1980 to 2022




**Million tonnes of oil equivalent**

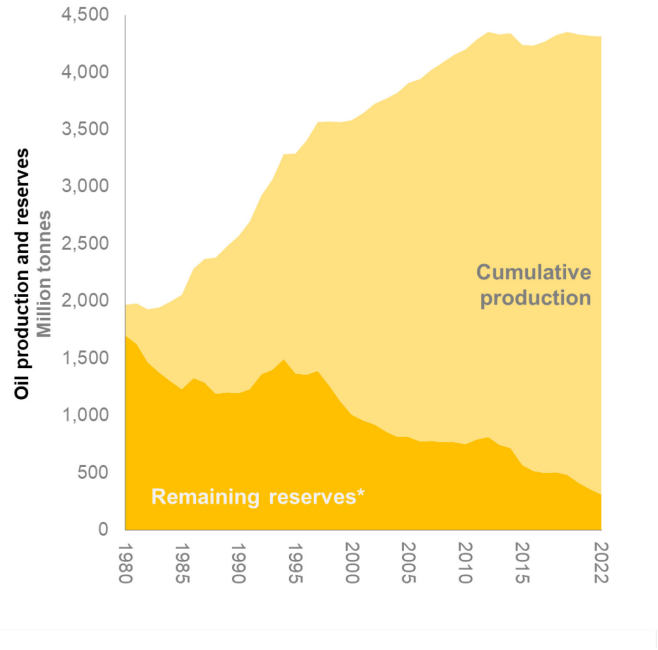
| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Oil | 100.1 | 138.3 | 69.0 | 53.6 | 44.7 | 41.3 |
| Gas | 45.5 | 108.4 | 55.3 | 37.8 | 31.3 | 36.4 |
| **Total** | **145.6** | **246.7** | **124.3** | **91.5** | **76.1** | **77.8** |

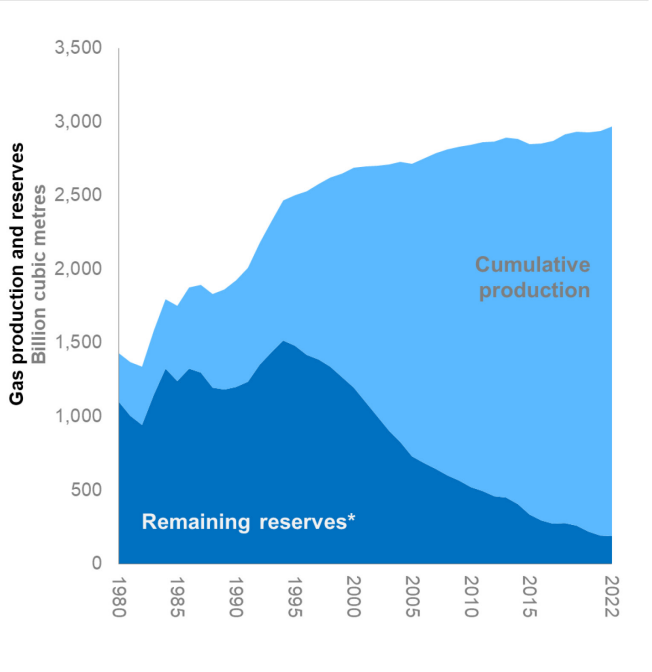
In 2022, total indigenous oil and gas production was stable on 2021. However, this was the result of a recovery in gas compared to a decline in oil production following extensive maintenance in 2021.

Gas production increased by 16 per cent in 2022 compared to 2021, which saw a record low because of extensive planned maintenance including the shutdown of the Forties Pipeline System (FPS). In 2022, gas production was 66 per cent lower than the 2000 peak. Since the peak, gas production generally declined until 2015 which was followed by a slight bump due to new fields opening. This fell off in 2021 due to maintenance but has now recovered and is just below levels since in 2019.

Oil production decreased by 7.6 per cent in 2022 compared to 2021, to reach a record low. In 2022, oil production was down 72 per cent compared to the 1999 peak. Following this production has been consistently down except from 2015-2019 which saw a slight bump due to new fields opening. Production then fell in 2020 and 2021 due to restrictions in place to curb the Covid-19 pandemic and an extensive planned maintenance schedule including the shutdown of the FPS.

## Oil and gas production and reserves, 1980 to 2022



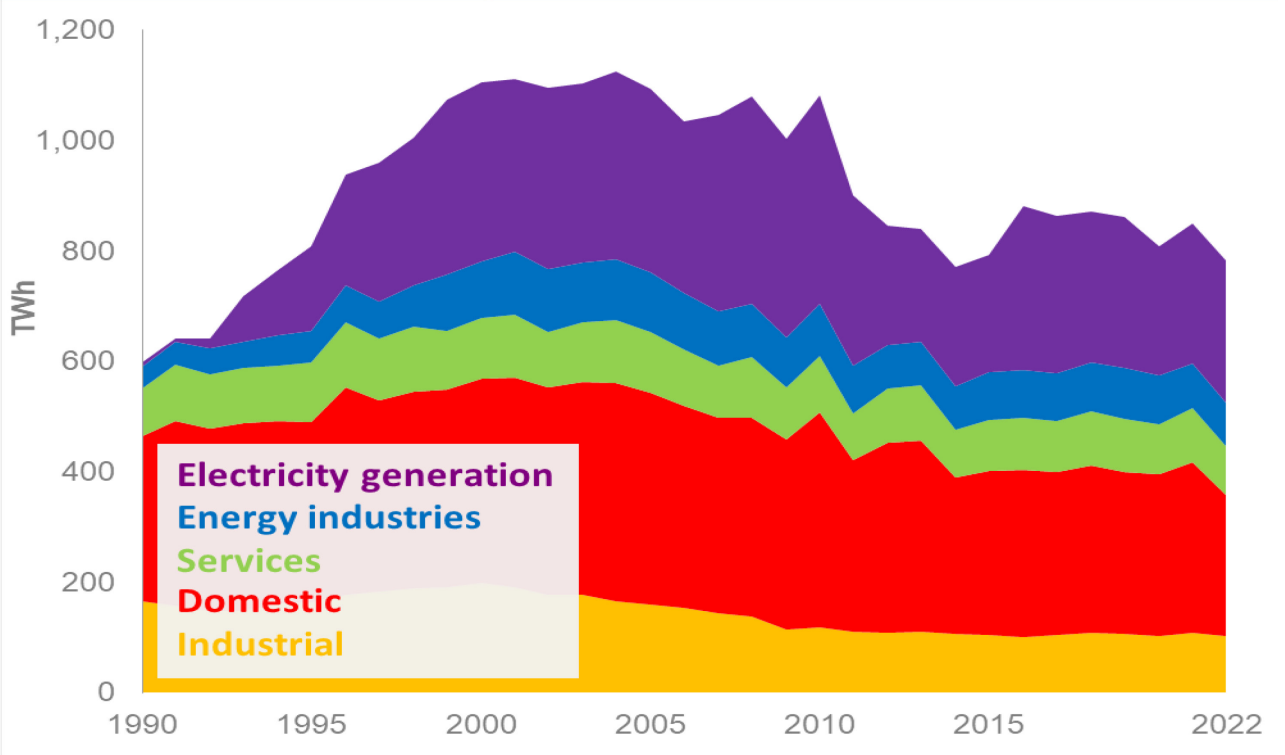




* From 2015, contingent resources have been re-categorised and removed from the probable and proven reserves category.

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **Oil** | | | | | | **Million tonnes** |
| Cumulative production | 1,375 | 2,571 | 3,446 | 3,919 | 3,960 | 3,998 |
| Proven plus probable reserves | 1,195 | 1,010 | 751 | 411 | 357 | 313 |
| **Total** | **2,570** | **3,581** | **4,197** | **4,330** | **4,317** | **4,311** |
| **Gas** | | | | | | **Billion cubic metres** |
| Cumulative production | 725 | 1,491 | 2,323 | 2,709 | 2,740 | 2,776 |
| Proven plus probable reserves | 1,200 | 1,195 | 520 | 221 | 195 | 189 |
| **Total** | **1,925** | **2,686** | **2,843** | **2,930** | **2,935** | **2,965** |

From 1980, total reserves grew substantially reflecting new discoveries of oil and gas and the development of new technologies which allowed the exploitation of resources that were previously regarded as non-commercial. In addition, known fields were included as they moved from *prospective* to *probable* status. In the last 10 years, estimated proven and probable reserves have declined as fewer discoveries were made whilst cumulative production continued to grow.

## Natural gas demand, 1990 to 2022



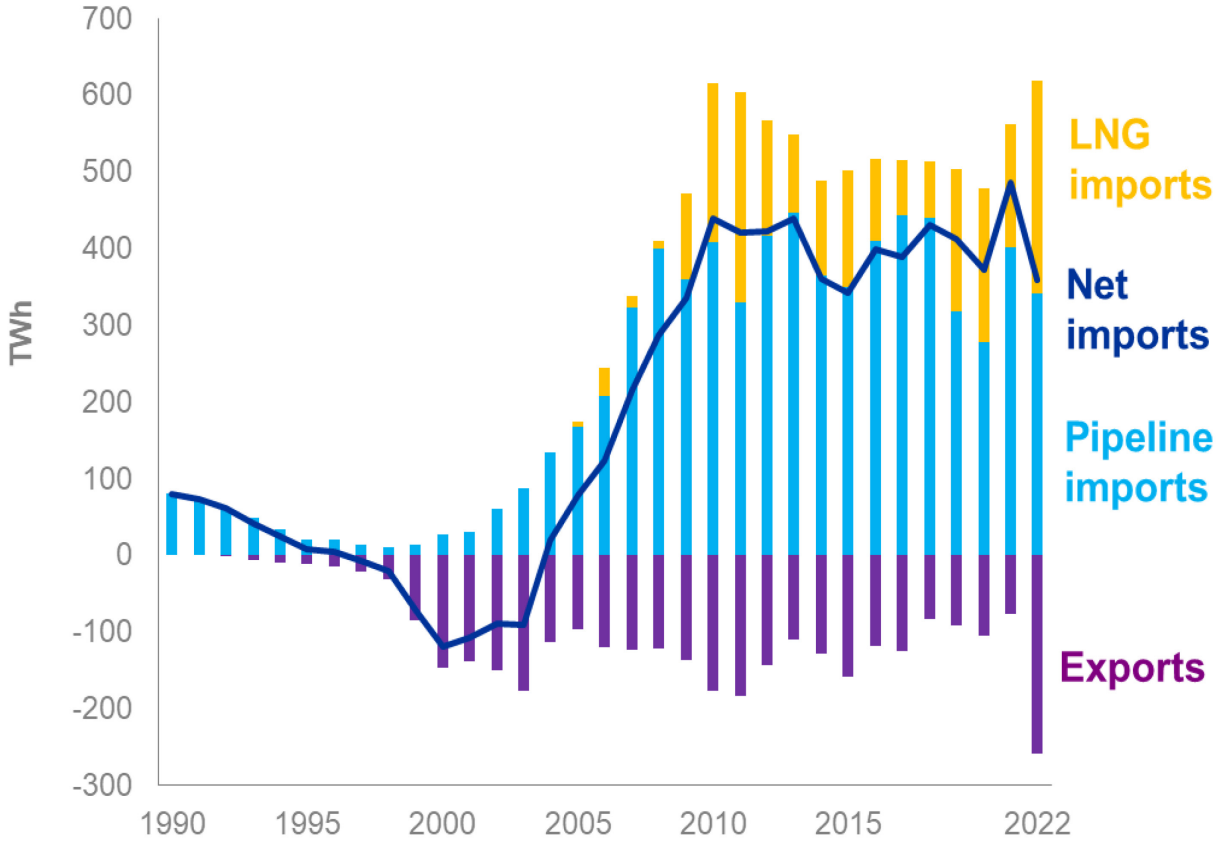

TWh

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Electricity generators | 6.5 | 324.6 | 377.1 | 232.6 | 254.4 | 258.1 |
| Energy Industries | 39.2 | 102.1 | 95.9 | 88.7 | 79.0 | 79.1 |
| Industry | 164.6 | 198.5 | 118.0 | 103.3 | 108.1 | 103.1 |
| Domestic | 300.4 | 369.9 | 389.6 | 291.8 | 310.2 | 254.4 |
| Services | 86.4 | 110.5 | 101.6 | 91.8 | 98.2 | 88.7 |
| Transport | .. | .. | .. | 0.9 | 1.0 | 1.0 |
| **Total** | **597.0** | **1,105.5** | **1,082.2** | **809.0** | **850.9** | **784.4** |

Following the expansion of UK natural gas production in the early 1970s, demand grew rapidly reaching a record high in 2004 of 1,125 TWh. Since then, demand has seen an overall decline, and in 2022 was nearly 30 per cent lower than the 2004 peak.

Gas demand in 2022 decreased by 7.9 per cent compared to 2021. Gas demand for electricity generation was stable with this decrease driven by final consumers, likely an outcome of record high temperatures and high energy prices. The largest fall was in the domestic sector which was down 18 per cent in the same period. Consumption by services and industrial sectors also fell, down 9.7 and 4.7 per cent respectively.

## UK trade in natural gas, 1990 to 2022



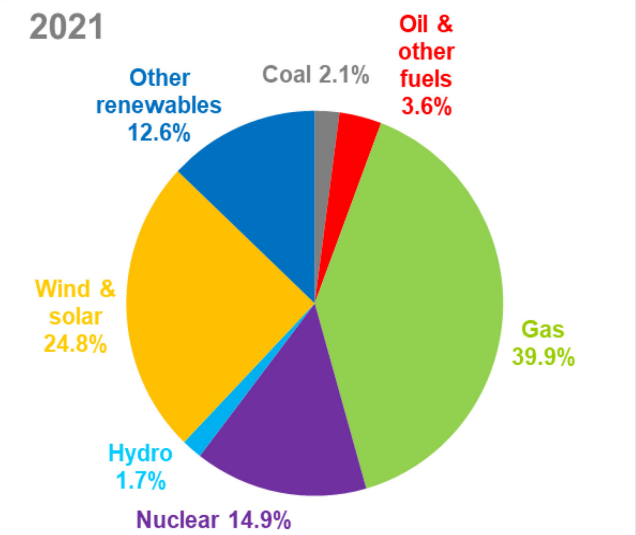

TWh

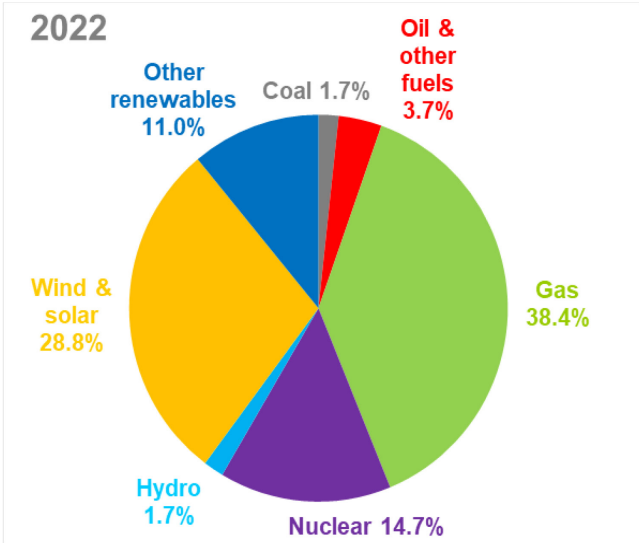
| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Natural gas production | 528.8 | 1,260.2 | 642.5 | 439.4 | 364.0 | 423.6 |
| Imports | 79.8 | 26.0 | 614.5 | 478.2 | 560.8 | 618.3 |
| *of which LNG* | - | | *206.8* | *200.1* | *159.9* | *277.8* |
| Exports | - | -146.3 | -176.4 | -106.0 | -76.1 | -259.9 |
| Net imports (+) or exports (- | +79.8 | -120.3 | +438.1 | +372.2 | +484.8 | +358.4 |

Following peak indigenous gas production in 2000 the has been UK increasingly reliant on imports to meet demand. Imports and exports reached record highs in 2022 reflecting shifting trade patterns in response to Russia's illegal invasion of Ukraine. Exports more than tripled as the UK's Liquefied Natural Gas (LNG) regasification infrastructure and pipelines to mainland Europe were utilised to support European efforts to move away from Russian gas.

LNG imports reached record highs, increasing by 74 per cent in 2022 compared to 2021. Pipeline imports fell as interconnectors with Belgium and the Netherlands were largely used to export. Pipeline imports from Norway were marginally down but remained the largest import source, accounting for 55 per cent of total imports in 2022.

## Electricity generated by fuel type, 2021 and 2022




TWh

| | 1990 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Coal | 229.9 | 120.0 | 107.6 | 5.5 | 6.5 | 5.6 |
| Oil & other fuels* | 20.7 | 13.6 | 10.5 | 12.0 | 11.2 | 12.0 |
| Gas | 0.4 | 148.1 | 175.7 | 112.7 | 123.1 | 125.0 |
| Nuclear | 63.2 | 85.1 | 62.1 | 50.3 | 45.9 | 47.7 |
| Hydro | 5.6 | 5.1 | 3.6 | 6.9 | 5.4 | 5.6 |
| Wind & Solar | - | 0.9 | 10.3 | 87.9 | 76.7 | 93.6 |
| Other renewables | - | 4.3 | 12.3 | 39.5 | 40.0 | 35.8 |
| **Total electricity generated** | **319.7** | **377.1** | **382.0** | **314.6** | **308.9** | **325.3** |

*Includes generation from pumped storage.

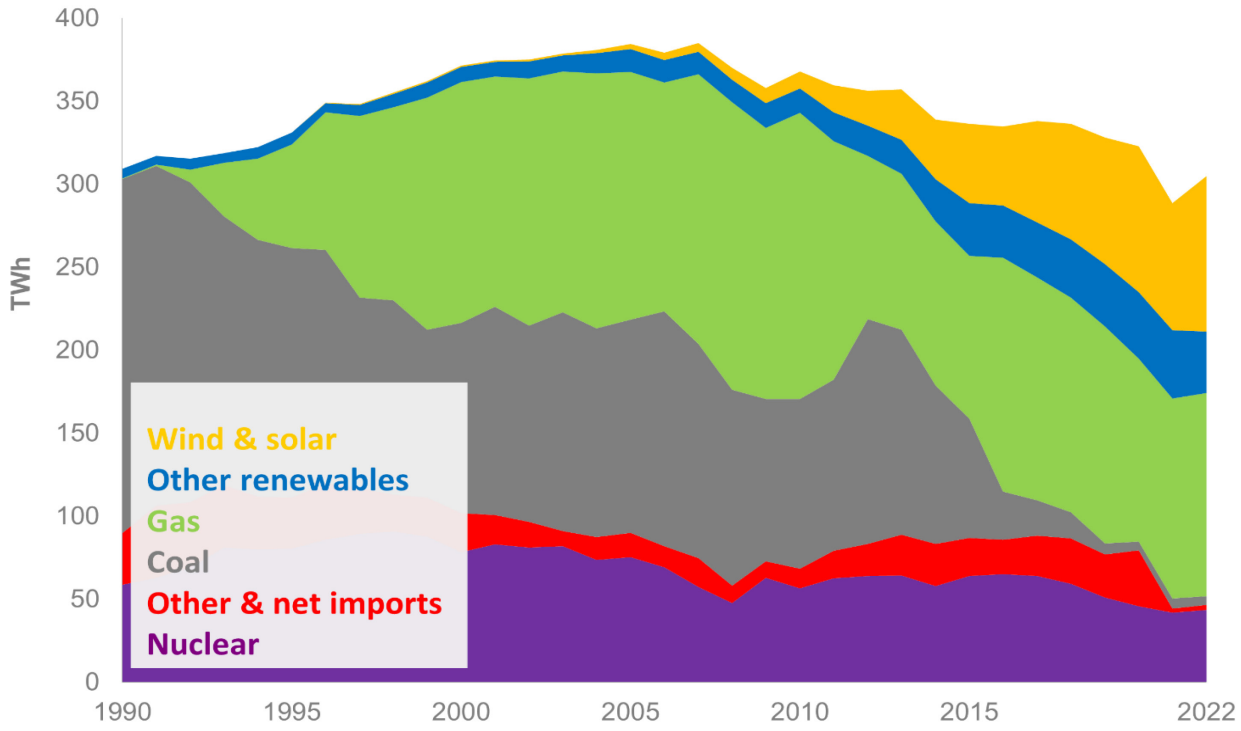
Total electricity generated rose by 5.3 per cent between 2021 and 2022, in contrast to a 3.8 per cent drop in demand to a record low 320.7 TWh. Record exports accounted for the difference, due to French nuclear outages, increasing the need for UK-based generation.

The share of generation from renewables increased from 39.6 per cent in 2021 to 41.5 per cent in 2022. This was record renewable output and the second highest share of renewable generation recorded, driven by an increase in offshore wind capacity, with record wind and solar generation. Generation from nuclear dipped slightly from 14.9 per cent in 2021 to 14.7 per cent in 2022.

Fossil fuel generation shares fell in 2022 in response to strong renewable generation. Gas-fired generation remained the largest single fuel but fell from 39.9 per cent to 38.4 per cent. The share of electricity generated from coal in 2022 fell 0.4 percentage points from 2021 to a record low 1.7 per cent.

Further details on renewable electricity generation can be found on page 32.

## Electricity supplied by fuel type, 1990 to 2022




The mix of fuels used to generate electricity continues to evolve. Since 1990, the decline of coal, the rise of gas, and in more recent years renewables, have been the most marked features, but none of these fuels have followed a smooth path.

Coal recorded its highest level for ten years in 2006 as nuclear station availability was reduced and as a substitute for high priced gas. Coal use trended downwards until 2010 when higher winter electricity demand resulted in an increase from coal, then rose in 2012 due to high gas prices. Subsequently, supply from coal has fallen to a record low of 5.1 TWh in 2022.

Between 1990 and 2008, supply from gas rose significantly from 0.4 TWh to a peak of 173 TWh in 2008. Subsequently, supply has fluctuated with a large increase in 2016, but decreases in 2017 and 2018. Gas supply fell to 109.3 TWh in 2020 as the Covid-19 pandemic reduced electricity demand but recovered to 122.4 TWh in 2022.

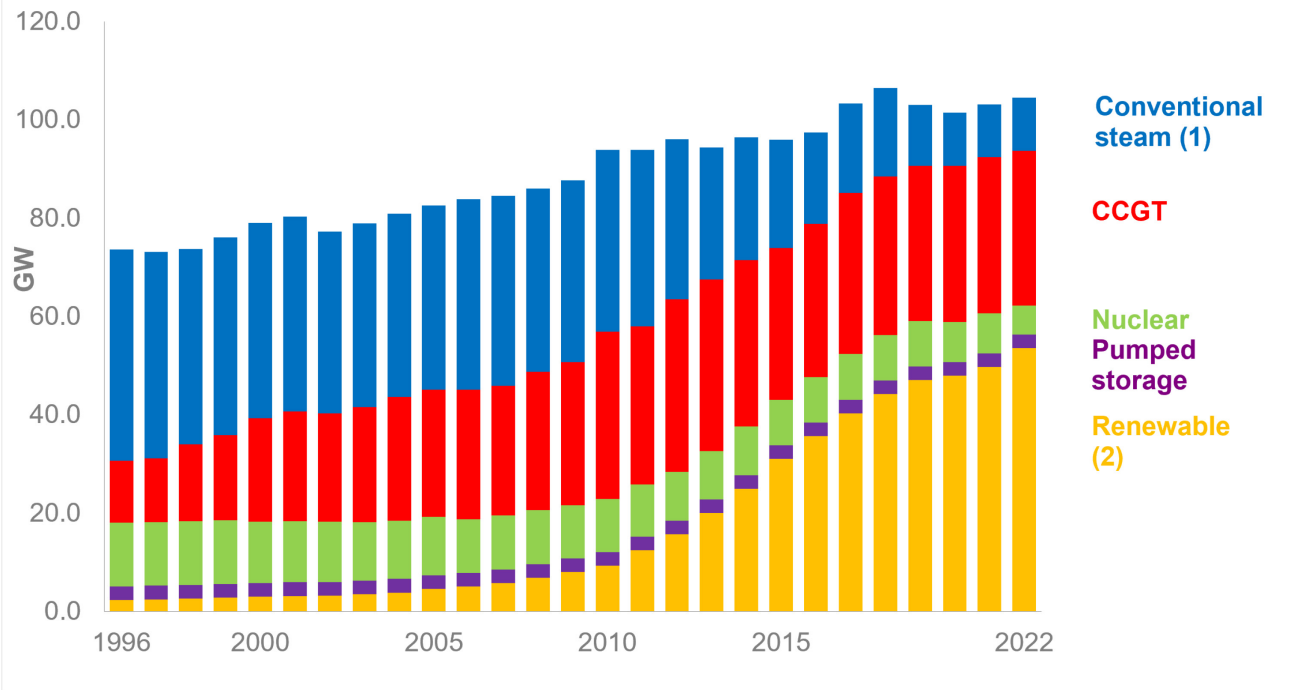
Supply from nuclear peaked in 1998 before falling back, particularly during 2006 to 2008, as station closures and maintenance outages reduced supply. Nuclear supply has generally declined each year since 2016 due to outages and reduced capacity, falling to 43.3 TWh in 2022.

Supply from wind and solar increased from 2000 to 2022 as generation capacity increased each year, reaching a record 80.3 TWh from wind and 13.3 TWh from solar in 2022, despite wind speeds below the ten-year average.

In 2022 the UK temporarily became a net exporter of electricity for the first time since the 1970s as French nuclear outages drove demand via France-UK interconnectors. However, interconnectors with Belgium, Netherlands and Norway saw net imports to the UK.

Total electricity supplied rose continuously from 1997 to reach a peak in 2005. It has subsequently followed a downwards trend, reflecting lower demand due to improved energy efficiency as well as economic factors. High electricity prices further reduced demand, with supply in 2022 18% lower than that in 2005.

## Electricity capacity, 1996 to 2022




GW

| | 1996 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Conventional Steam (1) | 43.0 | 36.8 | 36.3 | 10.8 | 10.7 | 10.8 |
| CCGT | 12.7 | 22.9 | 34.1 | 31.8 | 31.8 | 31.5 |
| Nuclear | 12.9 | 12.5 | 10.9 | 8.1 | 8.1 | 5.9 |
| Pumped Storage | 2.8 | 2.8 | 2.7 | 2.7 | 2.7 | 2.7 |
| Renewable (2) | 2.3 | 3.0 | 9.3 | 47.9 | 49.7 | 53.5 |
| **Total** | **73.6** | **77.9** | **93.2** | **101.4** | **103.1** | **104.6** |

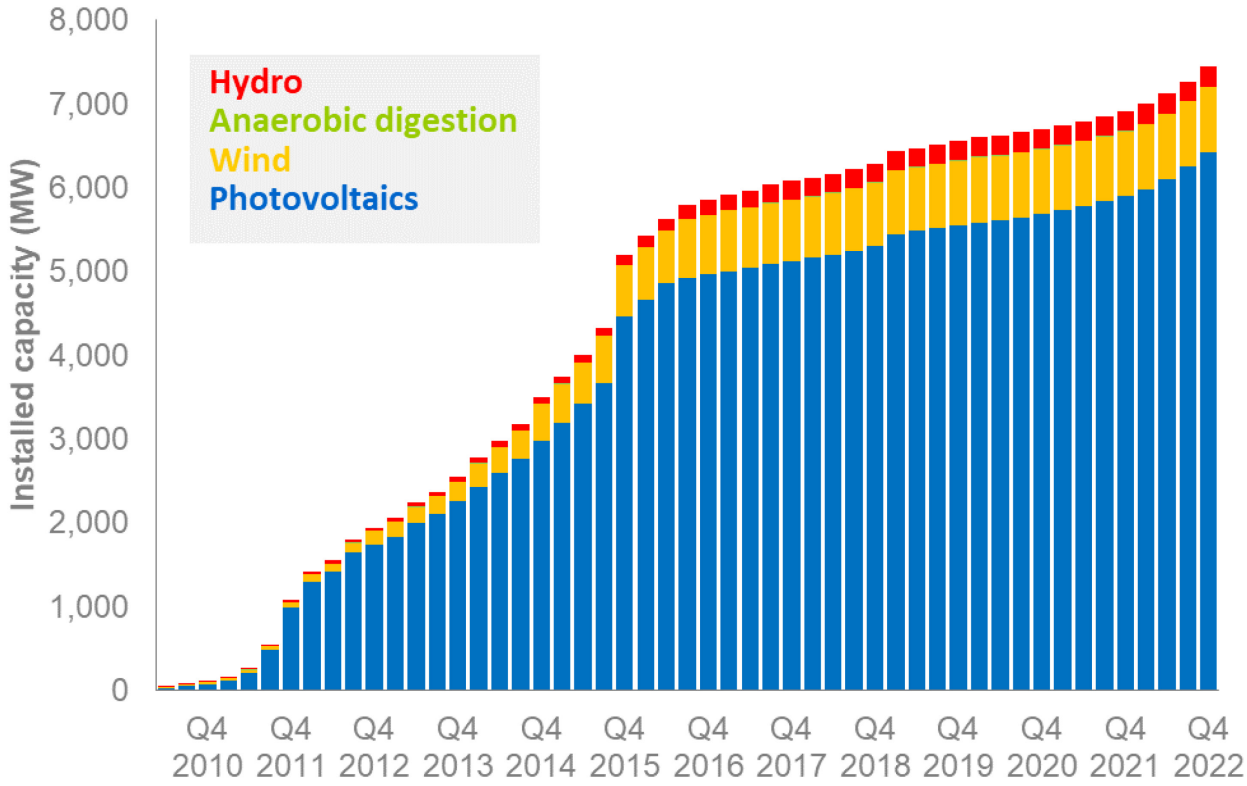
(1) Includes coal, non-CCGT gas, oil and mixed/dual fired. Does not include thermal renewables.
(2) Renewable capacity is on an Installed Capacity basis. Data for other fuels/technologies relates to Declared Net Capacity from 1996 to 2005, data for 2006 onwards is transmission entry capacity (TEC)

Installed capacity for electricity generation in the UK increased gradually between 1996 and 2018, from 73.6 GW to 106.4 GW before falling back as coal-fired and nuclear plants closed. Overall, there has been a decline in conventional steam, outweighed initially by an increase in combined cycle gas turbines (CCGT) and more recently by an increase in renewables. From 2019, the mix of plants shifted towards renewable technologies with the closure of large coal-fired and nuclear power plants. 2022 saw total capacity increase to 104.6 GW, with increased renewable capacity, in particular a 24 per cent increase in offshore wind to 13.9 GW.

CCGT capacity increased almost threefold over the period from 1996 to 2012, from 12.7 GW to 35.1 GW. This figure fell over the following years before increasing between 2016 and 2017. Since 2018, CCGT capacity has fallen slightly, to 31.5 GW in 2022. Conventional steam capacity has fallen since 2010 with the closure of coal-fired power plants, to 10.8 GW in 2022.

Nuclear capacity declined in 2022 to 5.9 GW as Hunterston B and Hinkley Point B closed. Renewables capacity continued to rise, with an installed capacity in 2022 of 53.5 GW. This is more than 20 times the capacity in 1996. Offshore wind and solar saw the largest increase from 2021 to 2022.

## Small scale renewable capacity (GB), 2010 to 2022



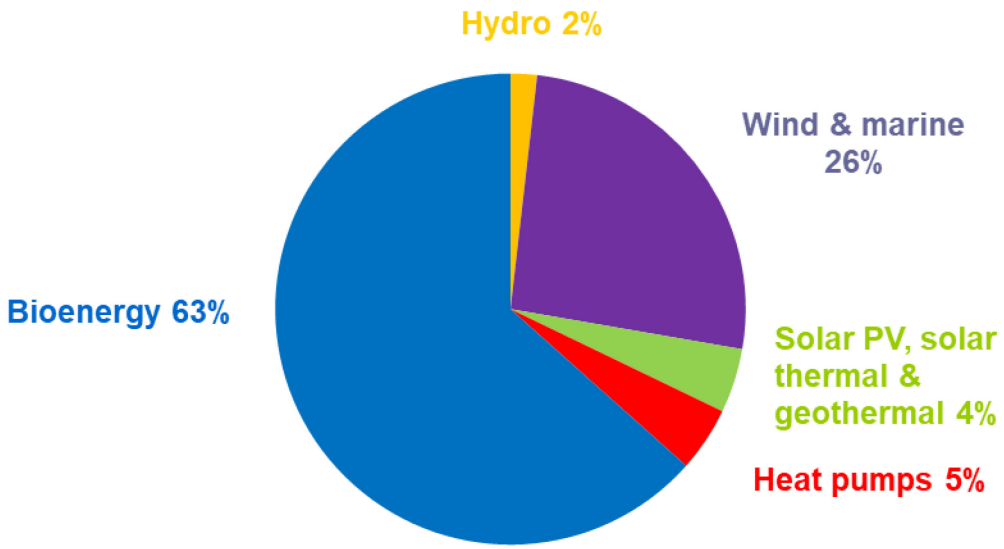

| Cumulative Installed Capacity (FITs and MCS) – GB only | | | | | | | MW |
|---|---|---|---|---|---|---|---|
| | 2010 | 2012 | 2014 | 2016 | 2020 | 2021 | 2022 |
| Micro CHP | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Anaerobic Digestion | 1 | 2 | 2 | 3 | 6 | 6 | 6 |
| Hydro | 12 | 40 | 77 | 183 | 236 | 236 | 236 |
| Wind | 21 | 166 | 447 | 701 | 776 | 776 | 776 |
| Photovoltaics | 77 | 1,734 | 2,975 | 4,972 | 5,684 | 5,897 | 6,424 |
| **Total** | **111** | **1,943** | **3,502** | **5,859** | **6,703** | **6,916** | **7,443** |

Source: Microgeneration Certification Scheme (MCS) and Central FITs register (CFR).

At the end of 2022 7,443 MW of capacity (around 1,232,000 installations) was installed, around 7.6% more confirmed capacity (and 12.6% more installations) than at the end of 2020. Nearly all of the installations and new capacity was Solar PV. Small scale capacity increased rapidly between 2010 and 2016 but slowed between 2017 and 2020. The number of small-scale solar PV installations recovered in 2021 and then increased sharply in 2022, seeing the most installations in a calendar year since 2015.

These figures are based on MCS data for installations with a capacity lower than 50 kW and the Central FITs register for installations between 50 kW and 5 MW. Registering with MCS was a pre-requisite for the Feed in Tariff (FiT) scheme. The FiT scheme was introduced on 1st April 2010 and is a financial support scheme for eligible low-carbon electricity technologies. The FiT scheme closed to new entrants at the end of March 2019.

## Renewable energy sources, 2022




**Total renewables used = 26,648 thousand tonnes of oil equivalent (ktoe)**

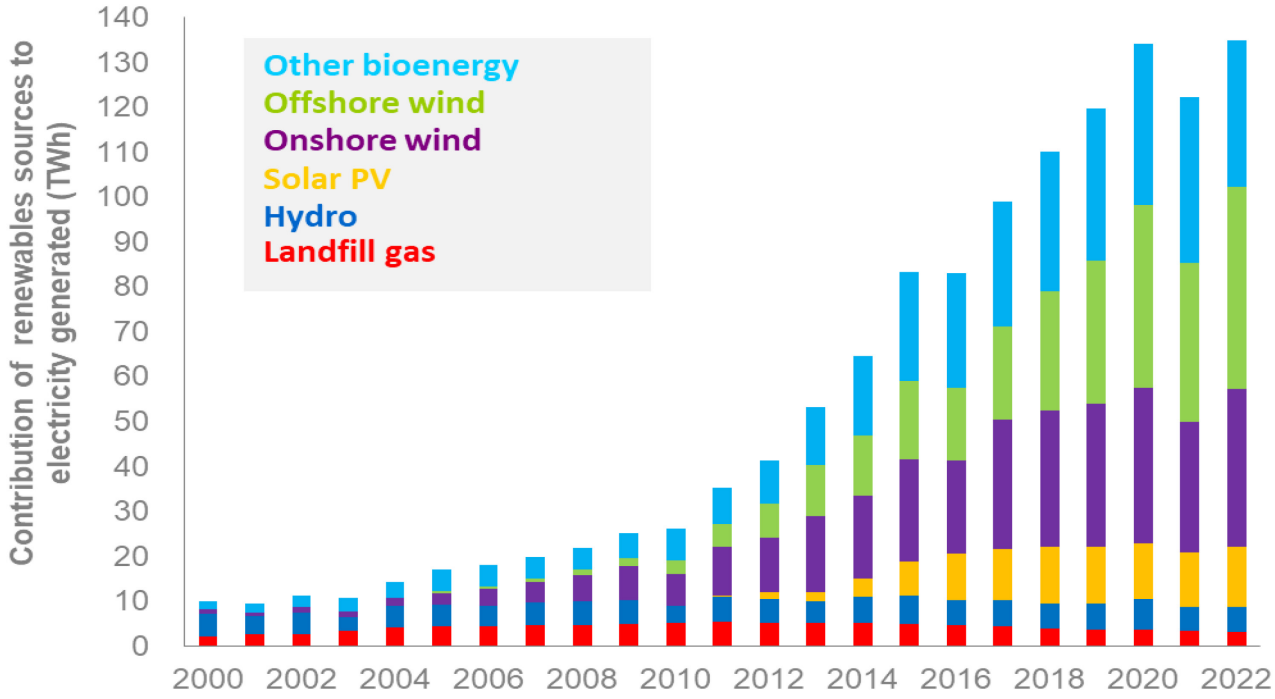
| | Thousand tonnes of oil equivalent | | | | | |
|---|---|---|---|---|---|---|
| | **1990** | **2000** | **2010** | **2020** | **2021** | **2022** |
| Solar PV, active solar and geothermal | 7 | 12 | 31 | 1,112 | 1,075 | 1,179 |
| Wind and marine | 1 | 81 | 885 | 6,483 | 5,561 | 6,902 |
| Hydro (small and large scale) | 448 | 437 | 309 | 591 | 464 | 485 |
| Landfill Gas | 80 | 731 | 1,725 | 849 | 805 | 754 |
| Sewage gas | 138 | 169 | 295 | 327 | 326 | 316 |
| Wood (domestic and industrial) | 174 | 458 | 667 | 1,097 | 1,215 | 1,207 |
| Municipal Waste Combustion | 183 | 704 | 1,165 | 3,527 | 3,729 | 3,686 |
| Heat pumps | 0 | 0 | 778 | 1,077 | 1,121 | 1,182 |
| Transport biofuels | 0 | 0 | 1,218 | 1,822 | 1,794 | 2,406 |
| Cofiring | 0 | 0 | 625 | 0 | 0 | 0 |
| Other bioenergy* | 72 | 265 | 1,054 | 8,935 | 9,360 | 8,531 |
| **Total** | **1,103** | **2,859** | **8,751** | **25,817** | **25,449** | **26,648** |

**Includes plant and animal biomass, anaerobic digestion, bioliquids and biogas injected into the gas grid*

In 2022, bioenergy accounted for about 63% of renewable energy sources used, with most of the remainder coming from wind (26%), heat pumps and solar (4.4% each).

Of the 26.6 million tonnes of oil equivalent of primary energy use accounted for by renewables, 19.1 million tonnes were used to generate electricity, 4.6 million tonnes were used to generate heat, and 2.4 million tonnes were used for transport. Renewable energy use grew by 4.7% between 2021 and 2022 and has increased more than nine-fold on the 2000 total.

## Electricity generation from renewable sources since 2000




TWh

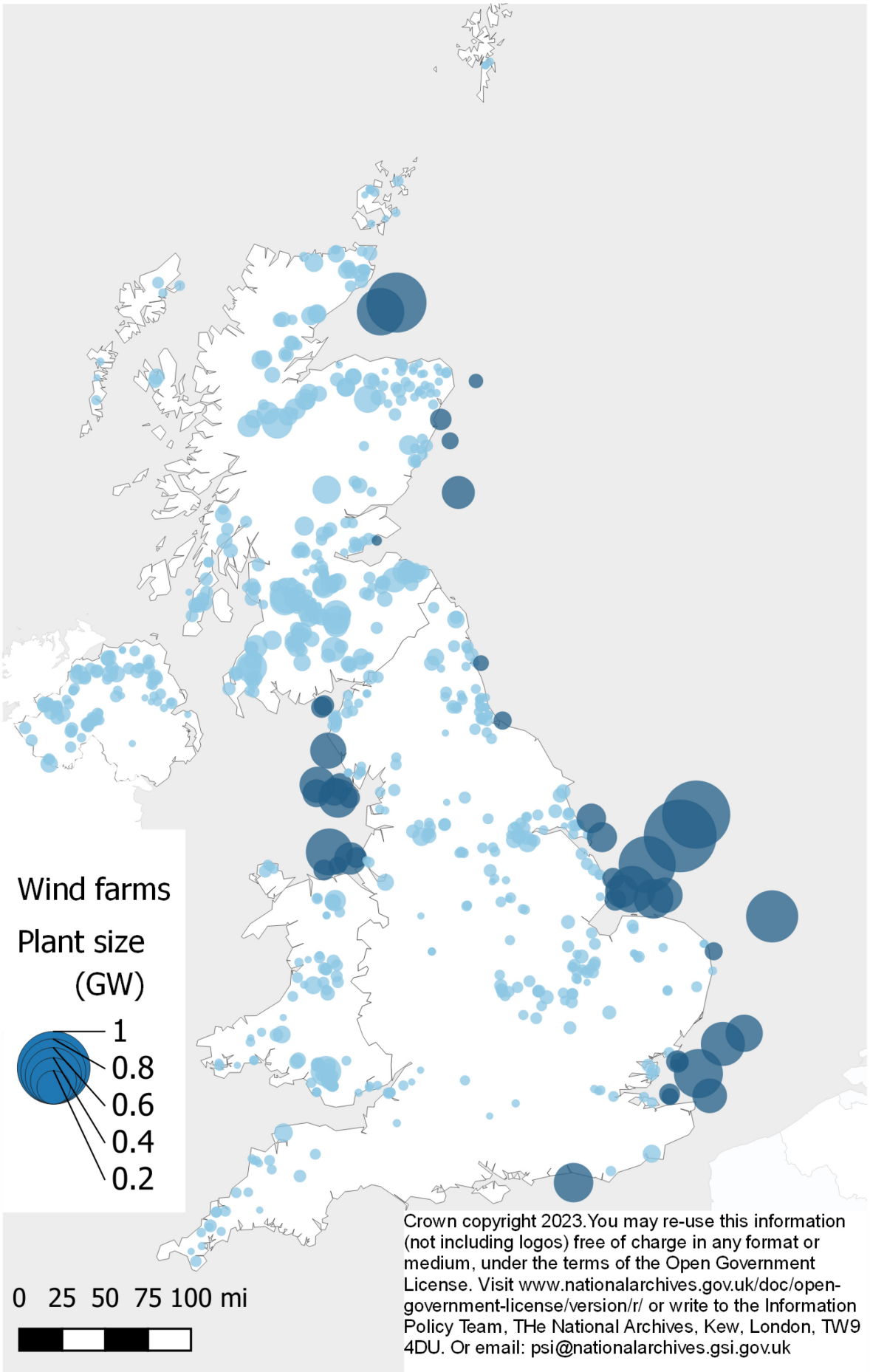
| | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| Onshore wind | 0.9 | 7.2 | 34.7 | 29.2 | 35.2 |
| Offshore wind | - | 3.1 | 40.7 | 35.5 | 45.0 |
| Solar PV | - | 0.0 | 12.5 | 12.1 | 13.3 |
| Hydro | 5.1 | 3.6 | 6.9 | 5.4 | 5.7 |
| Landfill Gas | 2.2 | 5.2 | 3.5 | 3.3 | 3.1 |
| Other Bioenergy | 1.7 | 7.0 | 36.0 | 36.7 | 32.7 |
| **Total Renewables** | **9.9** | **26.2** | **134.3** | **122.2** | **135.0** |

Electricity generated from renewable sources increased by 10.5% between 2021 and 2022 to 135.0 TWh, a new record figure. The increase on last year is due to more favourable weather conditions and new offshore wind capacity. Generation was marginally ahead of 2020, the previous record. Capacity grew by 7.7%, the highest growth rate since 2018 (new capacity was hampered by the Covid pandemic in 2020 and 2021).

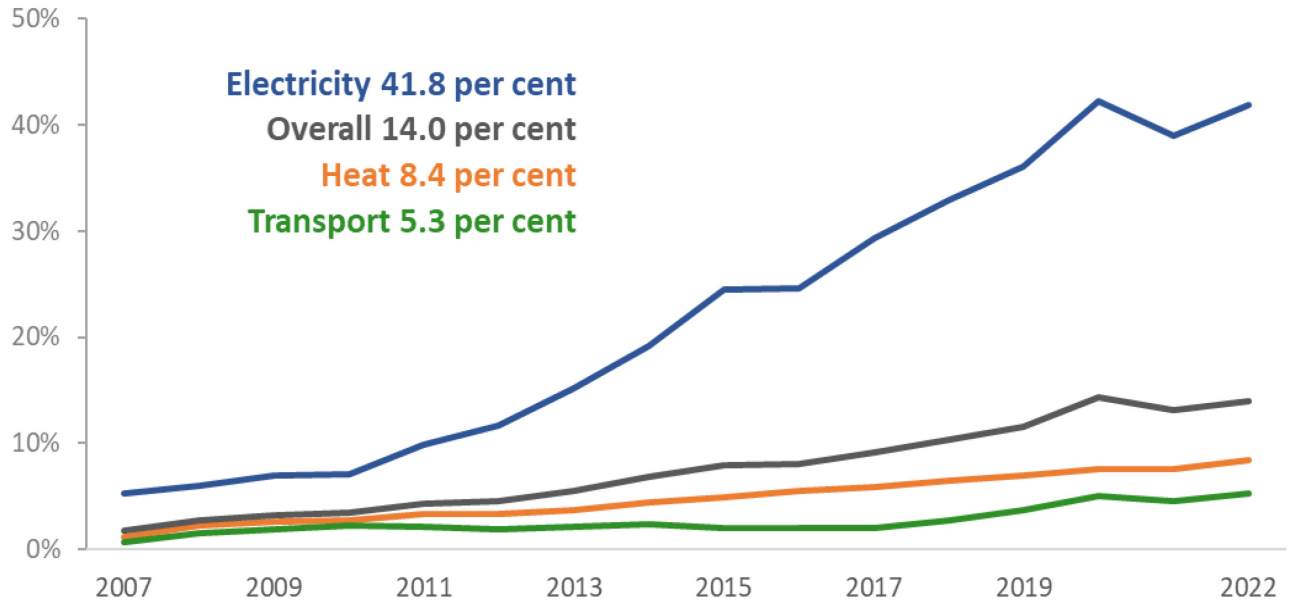
Total wind generation increased by nearly 24% to 80.3 TWh, this included new records for onshore and offshore generation. Generation had been hampered in 2021 by relatively low wind speeds. In addition, offshore wind capacity increased by nearly 24%, include three major new plants. Hydro generation increased by 4.5% in 2022. Generation from solar PV increased by 10%, this was driven by longer average sunlight hours and a 5.3 % increase in capacity. Generation from bioenergy decreased by 11%. Within this, generation from plant biomass fell by around 16%, mainly due to several outages at major plants.

Renewable electricity accounted for a record 41.5% of electricity generated in the UK during 2022, 2.0 percentage points higher than in 2021 and the second highest on record after 2020 (42.7%). The map on page 33 shows the capacity of wind farms across the UK with a capacity of 0.5 GW or more. The locations are representative and not exact.

## UK Onshore and Offshore Wind Capacity



## Renewable proportion of Gross Final Consumption

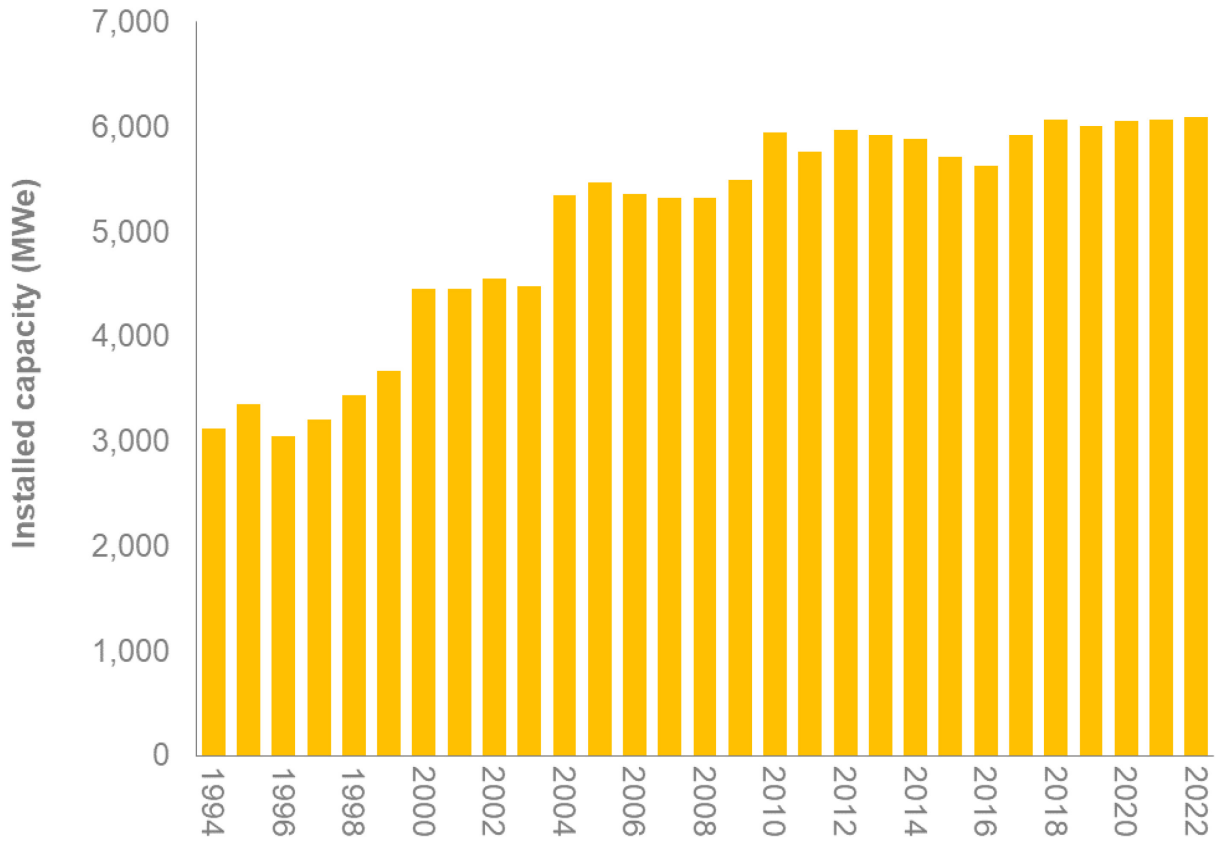



The Gross Final Consumption proportions in the chart reflect the proportion of renewable electricity and heat consumption before losses; the transport measure is on an actual consumption basis. The electricity measure excludes the use of electricity in transport which is allocated to that sector's measure. Heat represents final consumption for fuels other than electricity but includes heat sold.

The proportion of electricity generation from renewables increased in 2022 to 41.8 per cent, in line with the actual generation measure, reflecting the more favourable weather conditions and increased capacity when compared to 2020. The proportion of heat from renewable sources has steadily increased from 1.8 per cent in 2007 to 8.4 per cent in 2022. This has increased from 7.6% in 2021, largely due to a fall in gas consumption rather than an increase in renewable heat.

Given the dominance of renewable electricity in the overall renewable measure, the impact of higher renewable electricity supply in 2020 has pushed up the overall measure from 13.2 per cent in 2021 to 14.0 per cent in 2022.

## Combined heat and power, 1994 to 2022

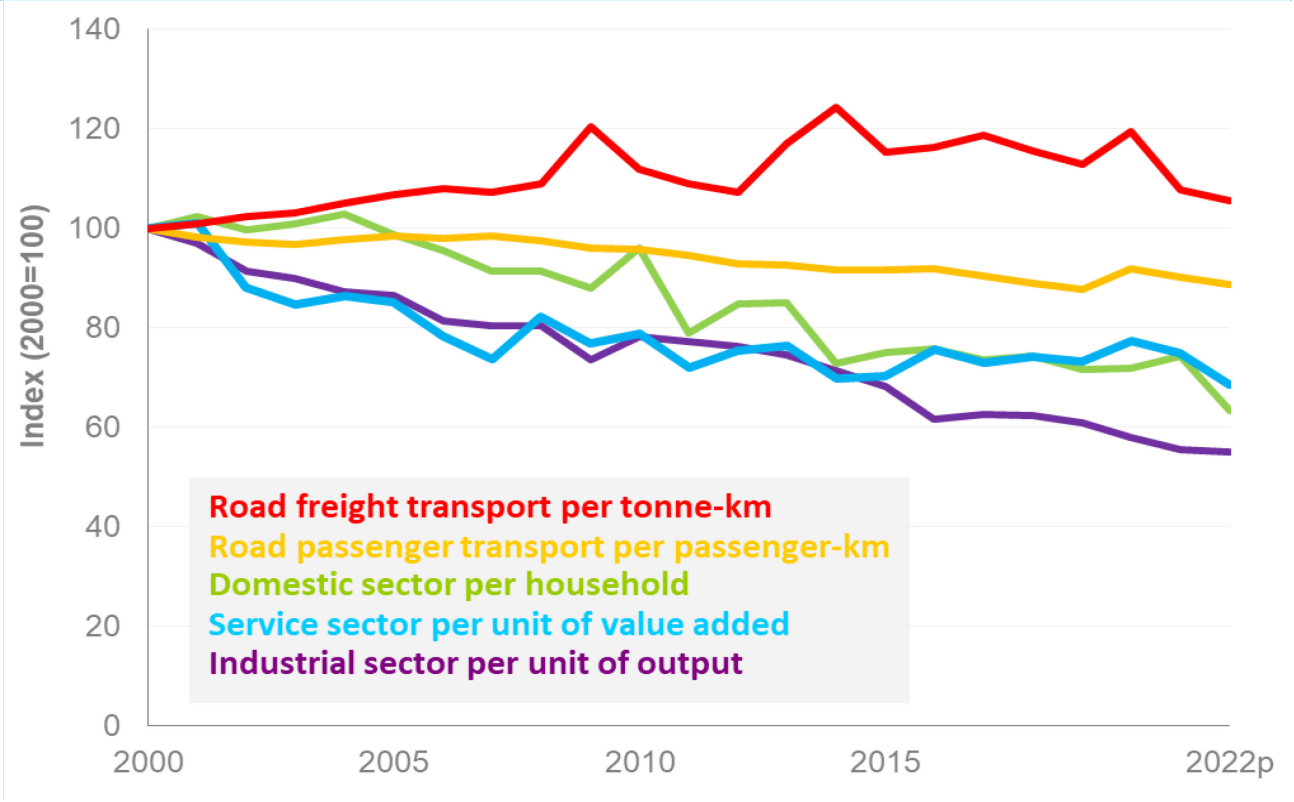



| | 1995 | 2000 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| CHP electrical capacity (MWe) | 3,354 | 4,451 | 6,049 | 6,067 | 6,088 |
| CHP electrical generation (GWh) | 14,777 | 25,245 | 22,100 | 21,962 | 22,686 |
| CHP heat generation (GWh) | 56,830 | 54,877 | 40,735 | 40,418 | 39,967 |
| Number of CHP sites | | | | | |
| <= 100 kWe | 620 | 560 | 454 | 353 | 356 |
| > 100 kWe to 1 MWe | 397 | 533 | 1,253 | 1,144 | 1,173 |
| >1 MWe to 2 MWe | 26 | 41 | 215 | 223 | 227 |
| > 2 MWe to 10 MWe | 113 | 141 | 260 | 267 | 271 |
| > 10 MWe + | 63 | 64 | 70 | 69 | 68 |
| **Total** | **1,219** | **1,339** | **2,252** | **2,056** | **2,095** |

In 2022 CHP electrical capacity increased marginally by 0.2% compared to 2021 with the number of schemes increasing by 39 (2%).

Electricity generation increased by 4.2% in 2022, while heat generation decreased by 1.1% when compared to 2021. Schemes larger than 10 MWe represent 69% of the total electrical capacity of CHP schemes whereas schemes less than 1MWe constitute the majority (73%) of the number of schemes. In 2022 CHP schemes accounted for 7.0% of the total electricity generated in the UK and 7.7% of UK gas demand.

## Energy intensity, 2000 to 2022



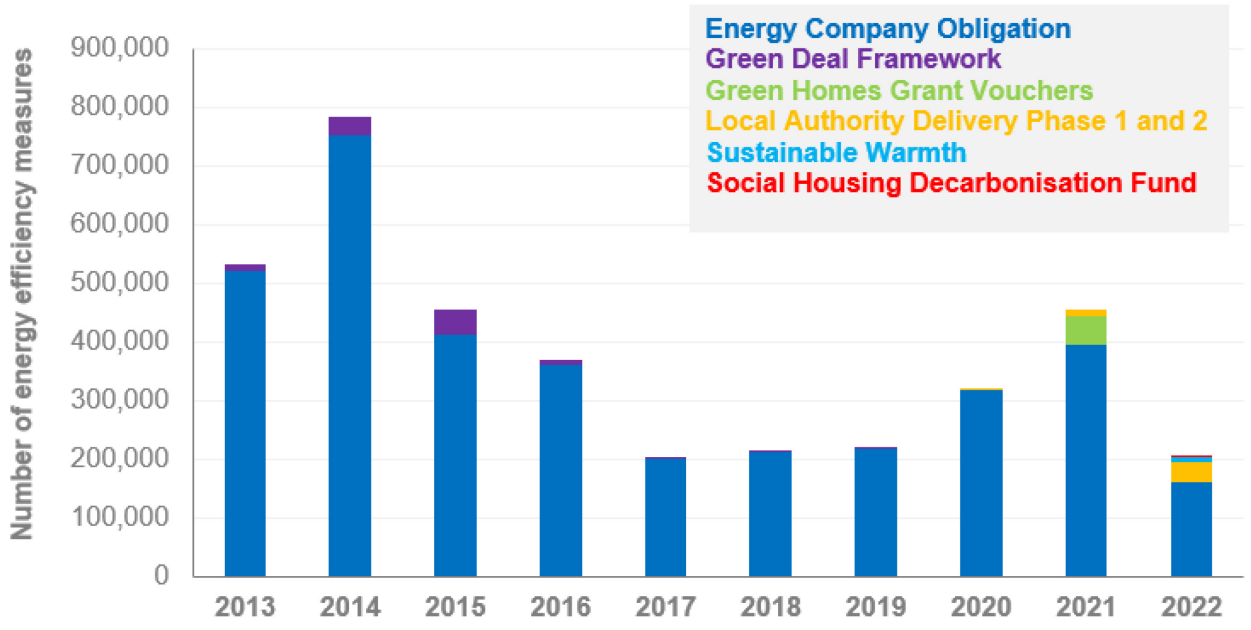

Tonnes of oil equivalent

| | 2000 | 2010 | 2020 | 2021 | 2022p |
|---|---|---|---|---|---|
| Industrial energy consumption per million units of GVA | 140.0 | 109.6 | 81.0 | 77.8 | 77.0 |
| Domestic energy consumption per household | 1.9 | 1.8 | 1.4 | 1.4 | 1.2 |
| Service sector energy consumption per million units of GVA | 19.8 | 15.6 | 15.3 | 14.8 | 13.6 |
| Road passenger energy consumption per million passenger-kilometres* | 41.5 | 39.7 | 38.2 | 37.5 | 36.8 |
| Road freight energy consumption per million freight-kilometres* | 81.4 | 91.0 | 97.1 | 87.6 | 85.9 |

* DESNZ estimates for 2022.

Energy consumption per unit of output, known as energy intensity, gives a broad indication of how efficiently energy is being used over time. Changes in energy intensity occur for several reasons: process change, technological change and structural change (in the case of industry and the service sector) as well as efficiency change. The largest falls in energy intensity in the 21st century have occurred in the industrial sector, mainly due to structural change in the period before 2000, and in the service sector due to general energy efficiency improvements. In the domestic sector there has been a general downward trend in domestic consumption due to improvements in energy efficiency measures, and more recently due to the impact of higher energy prices. The changes in the road passenger and freight categories since 2020 are a direct result of the Covid-19 pandemic and the subsequent easing of travel restrictions.

## Energy efficiency measures delivered through Government schemes, 2013 to 2022



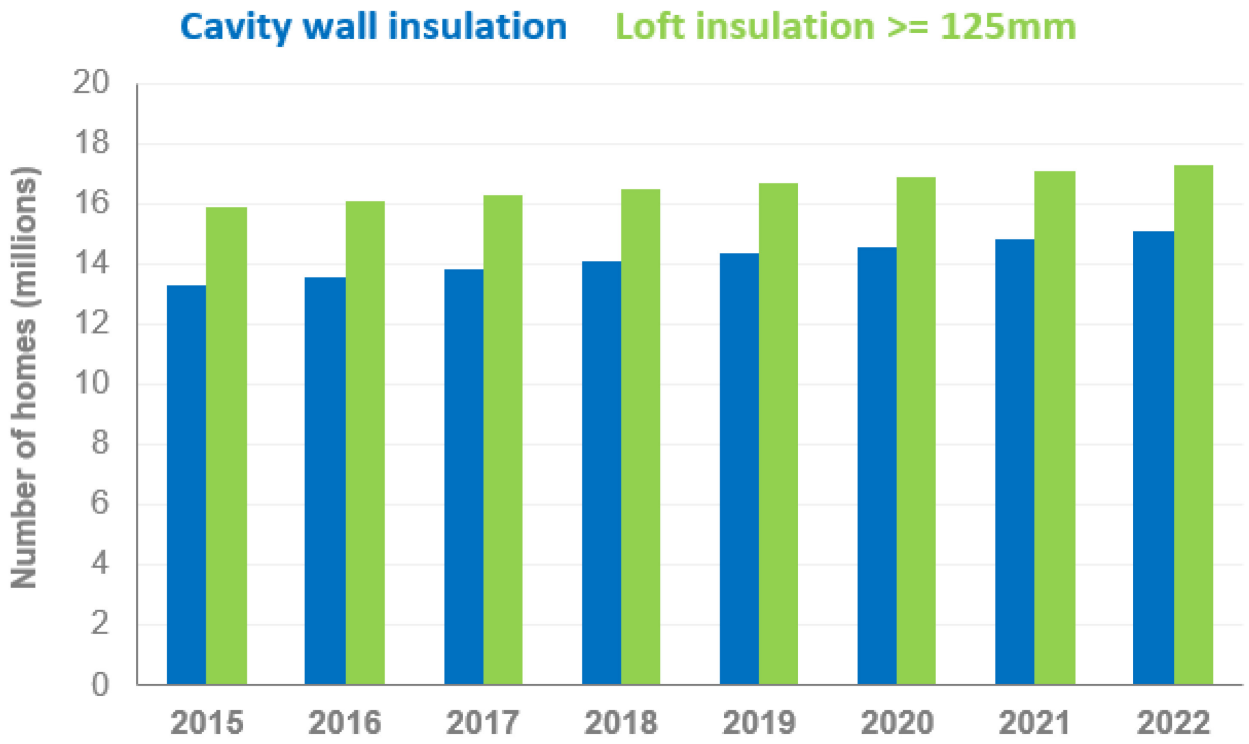

*Source: DESNZ, Household Energy Efficiency (HEE) National Statistics, detailed report 2022*

The Government has introduced a number of schemes since 2013 to improve the energy efficiency of households. The biggest of these schemes is the Energy Company Obligation (ECO) which was introduced in January 2013 to reduce energy consumption and support people at greater risk of living in fuel poverty. The larger energy companies are set obligations to install insulation and heating measures to achieve reductions in energy usage and heating costs. ECO is now in its fourth iteration since it began. ECO4 is set to run from April 2022 to March 2026.

Other government schemes introduced since 2013 include the Green Homes Grant Voucher (GHGV) scheme which ran from the end of September 2020 to March 2021. Measure delivery funded through Green Deal (GD) finance plans began in 2013. The Green Homes Grant Local Authority (LAD) scheme launched in 2020. Phase 1 and 2 of the scheme ran from October 2020 to December 2022. The Sustainable Warmth scheme launched in early 2022 and consists of LAD Phase 3 and the Homes Upgrade Grant (HUG) Phase 1. The Social Housing Decarbonisation Fund (SHDF) began delivery in March 2022.

In 2022, 159,700 measures were installed under ECO. Measure delivery increased under LAD1 and LAD2, with 35,100 measures being installed, up from 13,800 measures in 2021. The GHGV scheme closed on 31 March 2021, so the majority measures were installed in 2021 (48,400 measures), with only 160 measures being installed in 2022. Sustainable Warmth (LAD3 and HUG1) and the Social Housing Decarbonisation Fund (SHDF) schemes both launched in 2022. To the end of December 2022, 6,900 measures were delivered through Sustainable Warmth and 2,300 measures through SHDF. The main measures delivered in 2022 were insulation (wall, loft etc), heating controls and boilers.

## Number of homes with energy efficiency measures, December 2015 to December 2022




**UK Insulated homes (Thousands)**

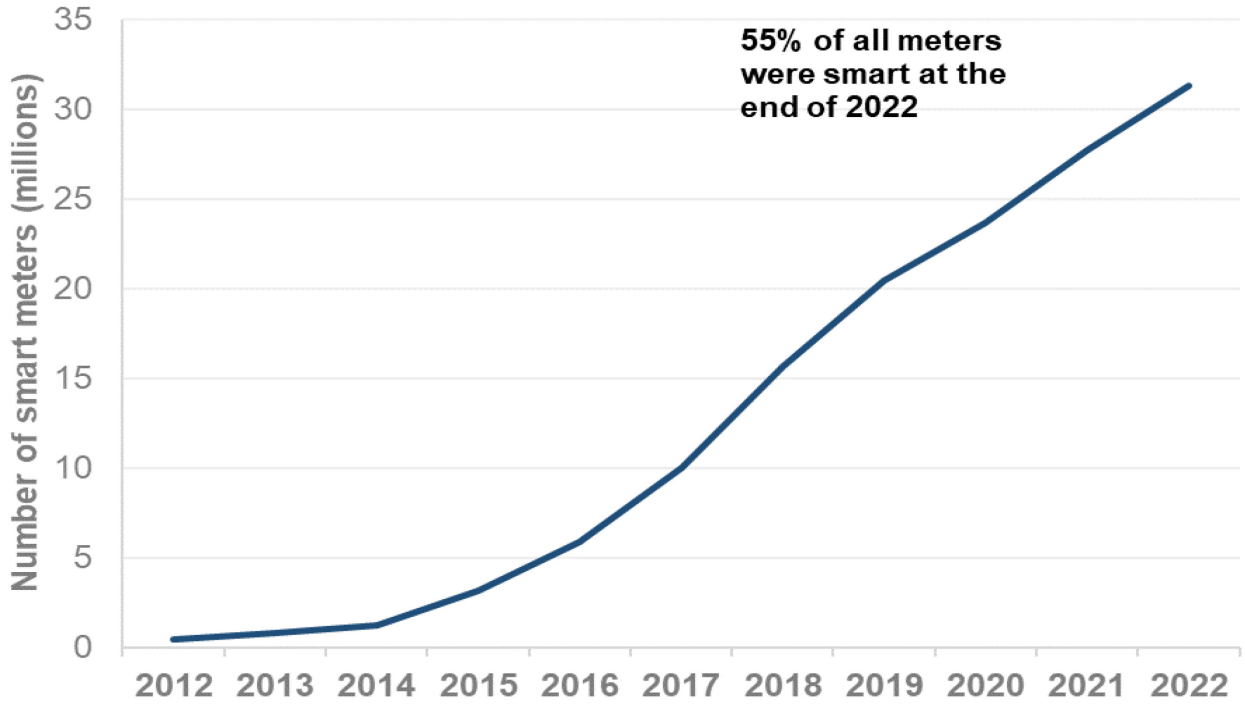
| End of year | 2015 | 2017 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Cavity wall insulation | 13,320 | 13,810 | 14,340 | 14,550 | 14,820 | 15,060 |
| Loft insulation >= 125mm | 15,890 | 16,250 | 16,670 | 16,850 | 17,090 | 17,290 |

*Source: DESNZ, Household Energy Efficiency (HEE) National Statistics, detailed report 2022 – GB level data are scaled up to UK level. Full details on how these estimates are constructed, based on the new methodology, can be found in the HEE statistics methodology note. Figures are rounded to the nearest ten thousand.*

Cost effective methods of improving energy efficiency in homes are to install cavity wall and loft insulation where these measures are practical. Building Regulations require new homes to reach thermal efficiency standards which would typically be met by installing these measures. In addition, existing homes have had these measures retrofitted through Government schemes or through a DIY loft insulation. These data show the change in the number of insulated homes as a result of new build and retro fitting insulation via Government schemes.

The number of homes with cavity wall insulation has increased by 13% between the end of December 2015 and December 2022 such that 15.1 million of the 21.3 million homes with cavities, are insulated. The number of homes with loft insulation, of a depth of at least 125mm, has increased by 9% between the end of December 2015 and December 2022 meaning that 17.3 million of the 25.9 million homes with lofts are insulated to this level.

## Smart meters in Great Britain, December 2012 to December 2022




**Total meters (Thousands)**

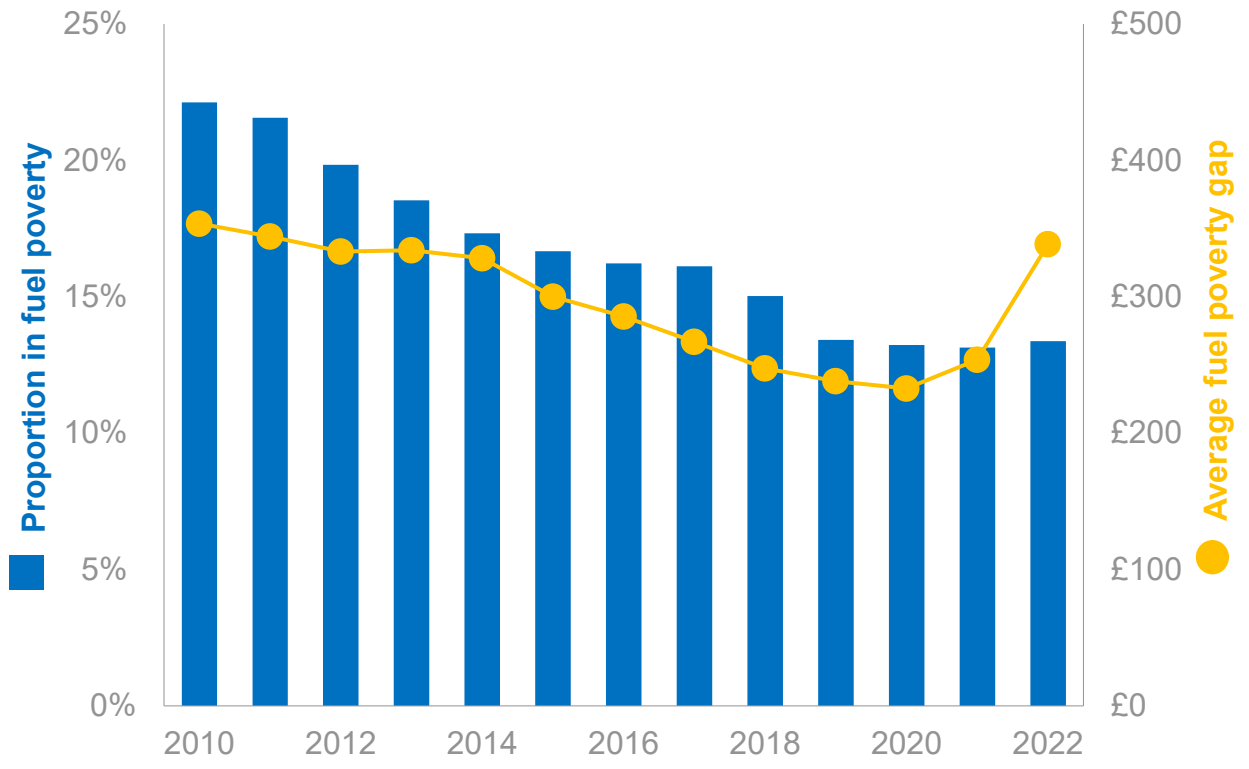
| *End of year*[1] | 2012 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Domestic | | | | | | |
| Smart | 3 | 14,514 | 19,164 | 22,170 | 26,135 | 29,572 |
| Non-smart | 47,726 | 36,522 | 32,681 | 30,267 | 26,588 | 23,771 |
| Non-domestic[2] | | | | | | |
| Smart | 454 | 1,135 | 1,313 | 1,476 | 1,634 | 1,746 |
| Non-smart | 2,424 | 2,092 | 1,887 | 1,807 | 1,696 | 1,586 |
| Total | | | | | | |
| Smart | 457 | 15,648 | 20,477 | 23,646 | 27,769 | 31,318 |
| Non-smart | 50,150 | 38,614 | 34,568 | 32,073 | 28,285 | 25,357 |

*Source: DESNZ, Smart Meter Statistics in Great Britain, Quarterly update December 2022.*
*1. Data for 2013-2016 are not included in this table. All annual data can be found in the UK Energy in Brief 2022 dataset.*
*2. Non-domestic sites include small and microbusinesses; Smart in non-domestic sites includes both Smart and Advanced meters.*

Smart meters are replacing traditional gas and electricity meters as part of an essential infrastructure upgrade for Great Britain. Smart meters provide information which helps customers manage their energy use, save money and reduce emissions. They communicate automatically with energy suppliers, which avoids manual meter reads and provides customers with accurate bills. These data show the growth in the number of smart meters operating in Great Britain between 2012 and 2022.

At the end of December 2022 there were 31.3 million smart meters operating in Great Britain. Of these, 28.1 million were smart meters operating in smart mode or advanced meters. At the end of 2022, 55% of all meters in domestic households were smart, compared to 52% in smaller non-domestic sites. Overall, 55% of all meters in domestic or smaller non-domestic sites were smart, an increase of six percentage points from the end of 2021.

## Households in fuel poverty, 2010 to 2022




Fuel poverty in England is measured using the Low Income Low Energy Efficiency (LILEE).

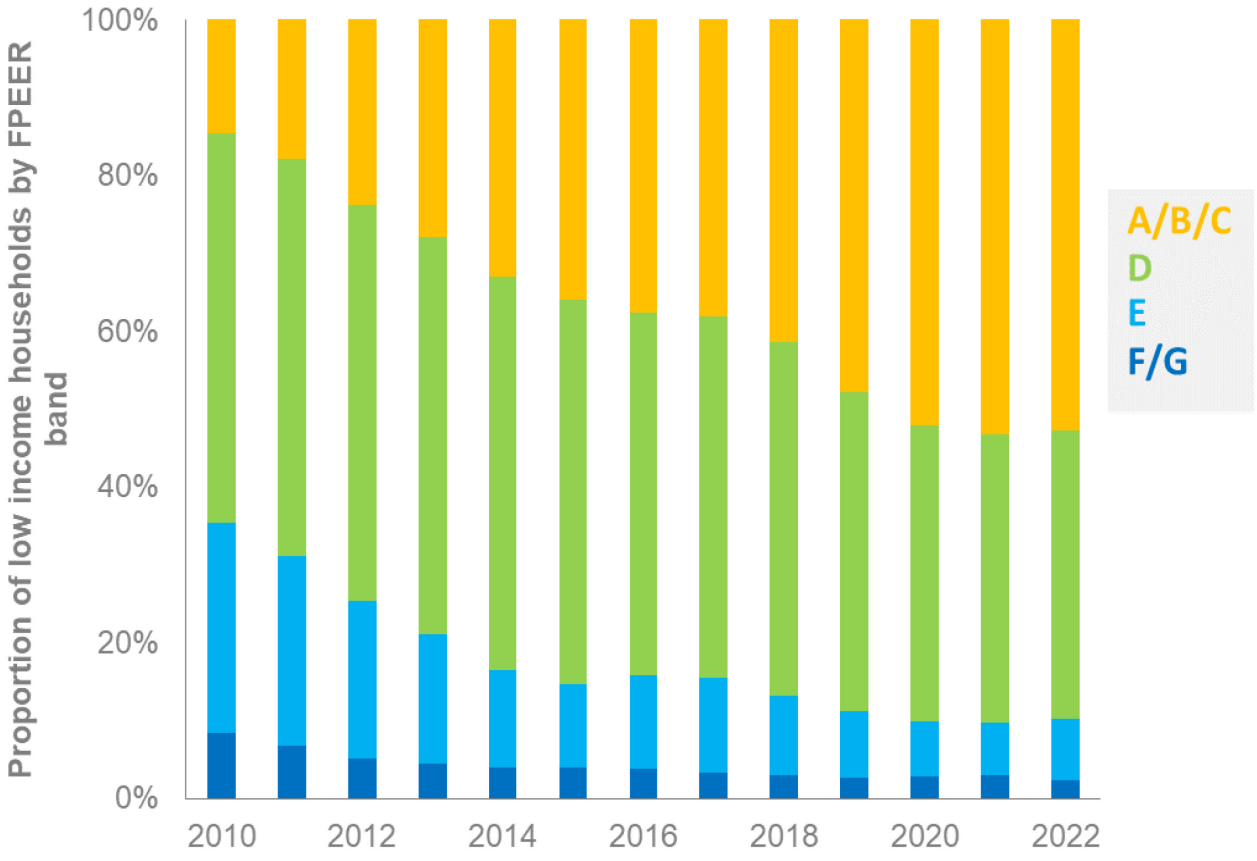
Under LILEE, a household is considered to be fuel poor if: they are living in a property with a fuel poverty energy efficiency rating of band D or below; and were they to spend the required amount to heat their home, they would be left with a residual income below the official poverty line.

- The proportion of households in England in fuel poverty was estimated to have increased by 0.3 percentage points from 2021 to 13.4% in 2022 (approximately 3.26 million households).
- In 2022, the average fuel poverty gap (the reduction in fuel bill that the average fuel poor household needs in order to not be classed as fuel poor) in England was estimated at £338, up by 33 per cent from £254 in 2021 in real terms following a steady downward trend since 2014.
- The higher number of households in fuel poverty and increase in the average gap also caused the aggregate fuel poverty gap for England to continue to increase in 2022 (by 37% in real terms) to £1,103 million.

**Key drivers of fuel poverty, 2021-2022**

- Between 2021 and 2022 gas & electricity prices rose by 45 per cent in real terms but the impact of this has been partially abated through Government support.
- The income distribution began to recover in 2022 following the impact of the pandemic while progress continued to be made with energy efficiency.

## Low income households by FPEER[2] band, 2010 to 2022



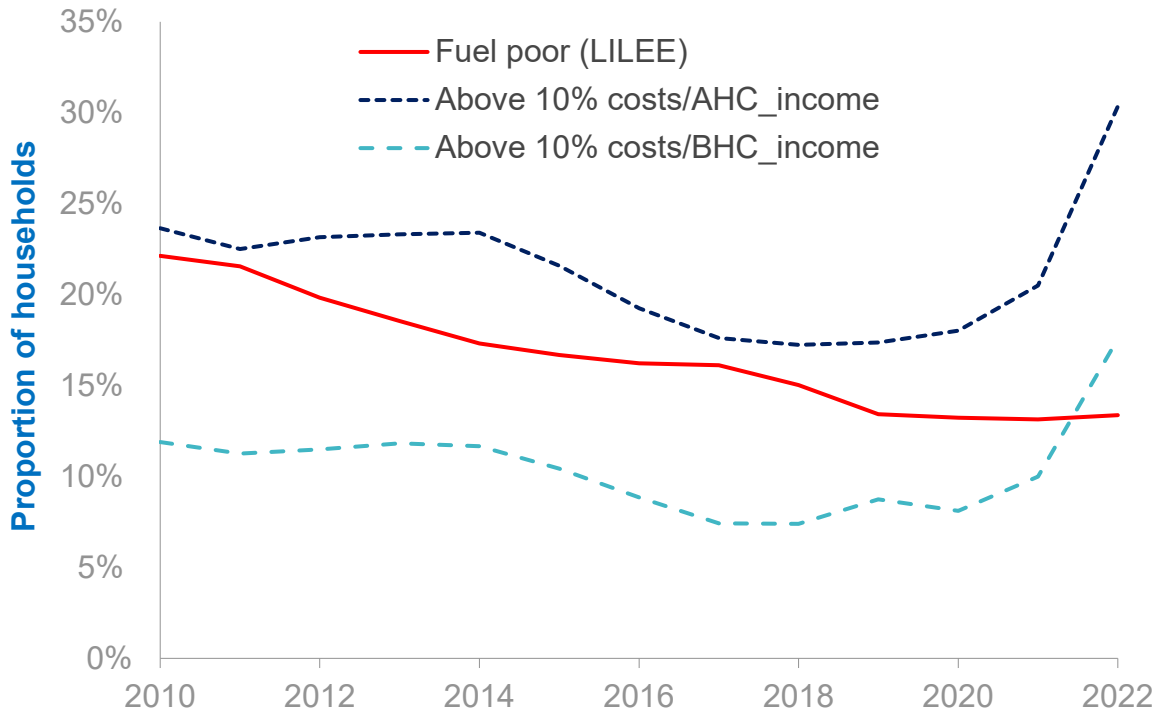

In December 2014 the Government introduced a new statutory fuel poverty target for England. The target is to ensure that as many fuel poor homes as reasonably practicable achieve a minimum energy efficiency rating of Band C by 2030 (with interim milestones to lift as many fuel poor homes in England as is reasonably practicable to Band E by 2020; and Band D by 2025). Under the LILEE metric a household that achieves a fuel poverty energy efficiency rating of band C or above would not be fuel poor, and therefore fuel poverty would be eradicated if all low income households achieved an energy efficiency band C rating. Progress towards the fuel poverty target is now measured as the share of all low income households who achieve an energy efficiency band C in 2030 and the interim milestones.

In 2022, no further progress was made towards the 2030 fuel poverty target, with 52.8 per cent of all low income households living in a property with a fuel poverty energy efficiency rating of band C or better. This is due to the impact of higher energy prices.

| Target year | Fuel poverty target | 2010 (%) | 2022 (%) | Percentage point change |
|---|---|---|---|---|
| 2025 | Band D or above | 64.6 | 89.8 | 25.2 |
| 2030 | Band C or above | 14.6 | 52.8 | 38.2 |

[2] Fuel poverty energy efficiency rating (FPEER)

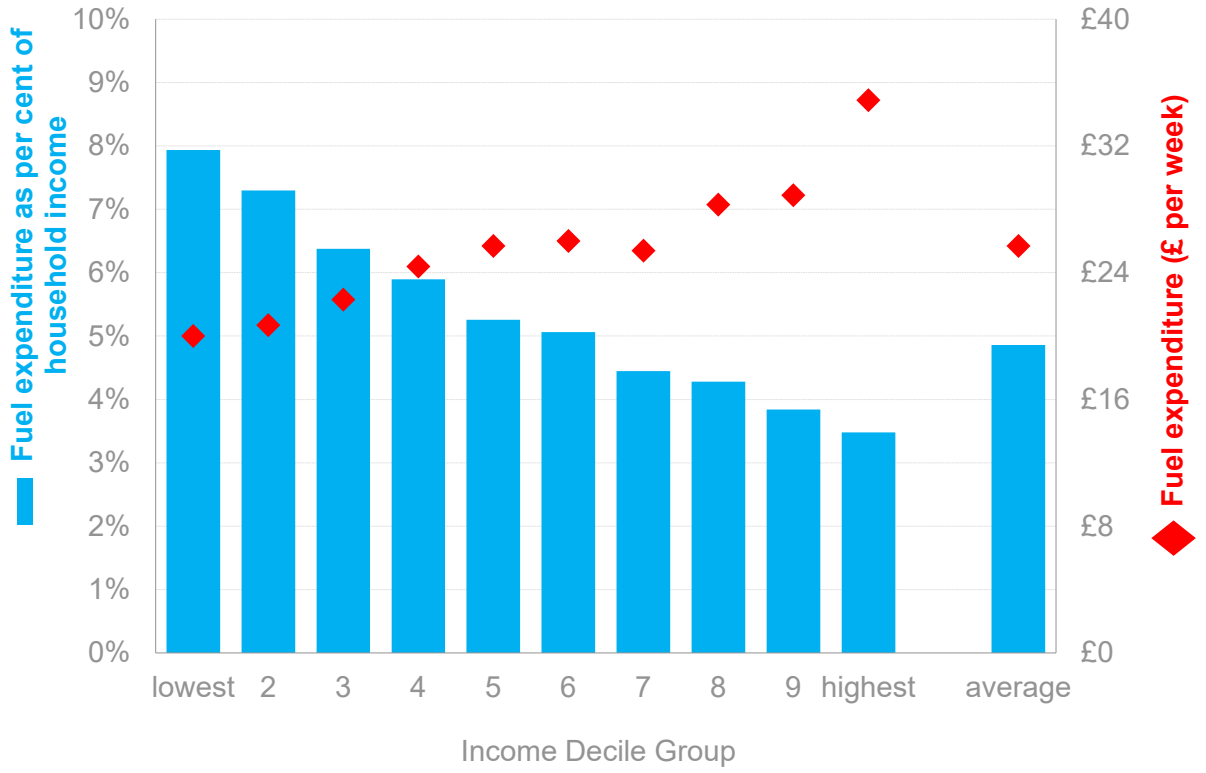
## Energy affordability metrics, 2010 to 2022




The Low Income Low Energy Efficiency (LILEE) measure of fuel poverty generally reflects the trend in improving energy efficiency. This decreased steadily between 2010 and 2019. Since 2019, this measure has showed little change as the continued progress on energy efficiency has been offset by income changes during the pandemic and more recently by rising energy prices.

Energy prices have risen sharply since 2020, so even those not in fuel poverty as measured by the main Government metric for England may struggle with their energy bills. Two different measures are presented looking at shares of money spent on energy both after housing costs have been accounted for (AHC), and before housing costs (BHC). These 10% affordability measures are much more sensitive to energy prices and between 2021 and 2022 the share of households exceeding these affordability thresholds are estimated to have increased to 30 per cent for AHC in 2022 up from 21 per cent in 2021. The BHC measure will always be lower than AHC and up to 2021 was lower than the LILEE metric. This is estimated to have increased to 18 per cent in 2022 from 10 per cent in 2021.

## Fuel expenditure of households[1], 2021/22




### Fuel expenditure as a percentage of total household expenditure, 1990 to 2021/22

| Fuel type | 1990 | 2000/01 | 2010 | 2020/21[2] | 2021/22 |
|---|---|---|---|---|---|
| Gas | 1.7% | 1.2% | 2.0% | 2.0% | 2.0% |
| Electricity | 2.3% | 1.6% | 2.1% | 2.6% | 2.6% |
| Coal and Coke | 0.3% | 0.3% | 0.4% | 0.2% | 0.3% |
| Heating oil | 0.2% | | | | |
| **Total** | **4.5%** | **3.1%** | **4.5%** | **4.8%** | **4.9%** |

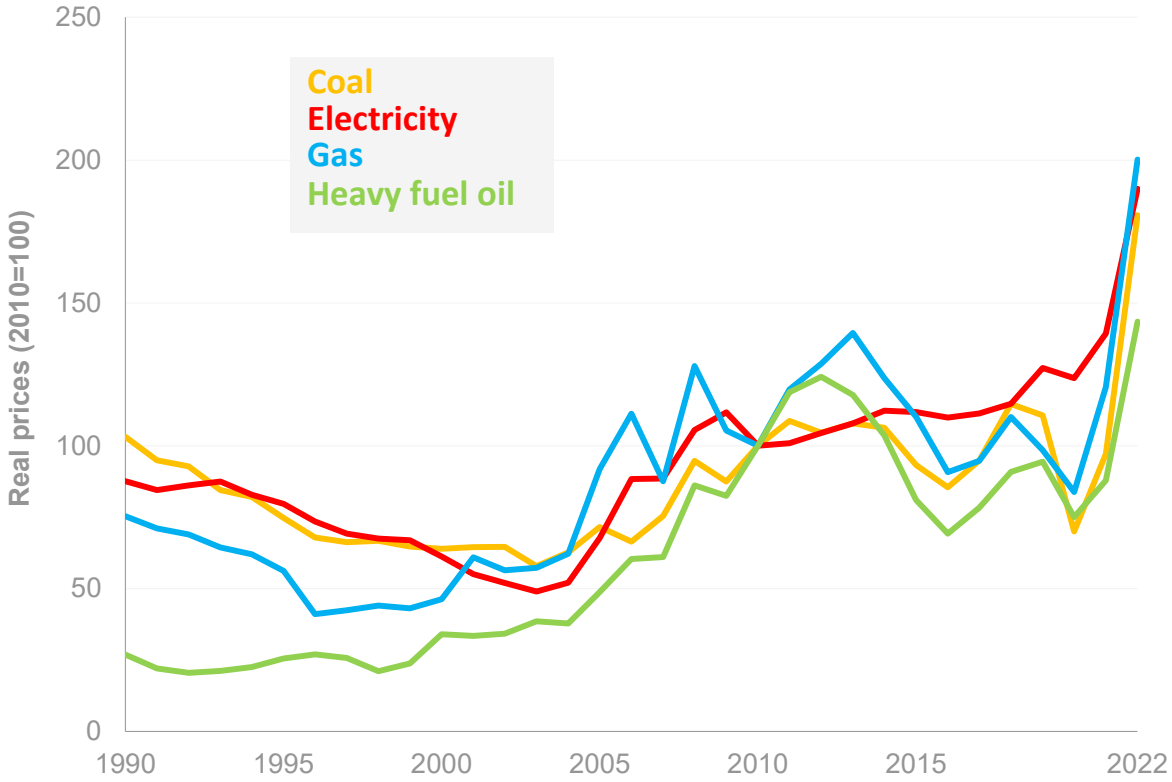
Source: Living Costs and Food Survey 2021/22, Office for National Statistics

(1) Includes non-consuming households
(2) From 2015 onwards, ONS moved from calendar to fiscal year reporting for the Living Costs and Food survey data

Households in the United Kingdom spent, on average, 4.9% of their total expenditure on fuel for their homes in 2021/22, 0.1% more than in 2020/21.

Households whose income falls in the lowest 10% in the United Kingdom spend, on average, 7.9% of their weekly spend on fuel for their homes. The top 10% of households in terms of income, spend only 3.5% per week of their weekly spend on domestic fuel.

## Fuel price indices for the industrial sector, 1990 to 2022




| | Real prices, 2010 = 100 | | | | | |
|---|---|---|---|---|---|---|
| | **1990** | **2000** | **2010** | **2020** | **2021** | **2022** |
| Coal | 103.1 | 64.0 | 100.0 | 70.0 | 97.1 | 180.7 |
| Electricity | 87.5 | 61.2 | 100.0 | 123.7 | 139.3 | 189.9 |
| Gas | 75.3 | 46.3 | 100.0 | 83.8 | 120.6 | 200.2 |
| Heavy fuel oil | 26.9 | 34.0 | 100.0 | 75.1 | 87.8 | 143.4 |
| **Industrial prices** | **77.4** | **53.0** | **100.0** | **111.7** | **130.0** | **187.6** |

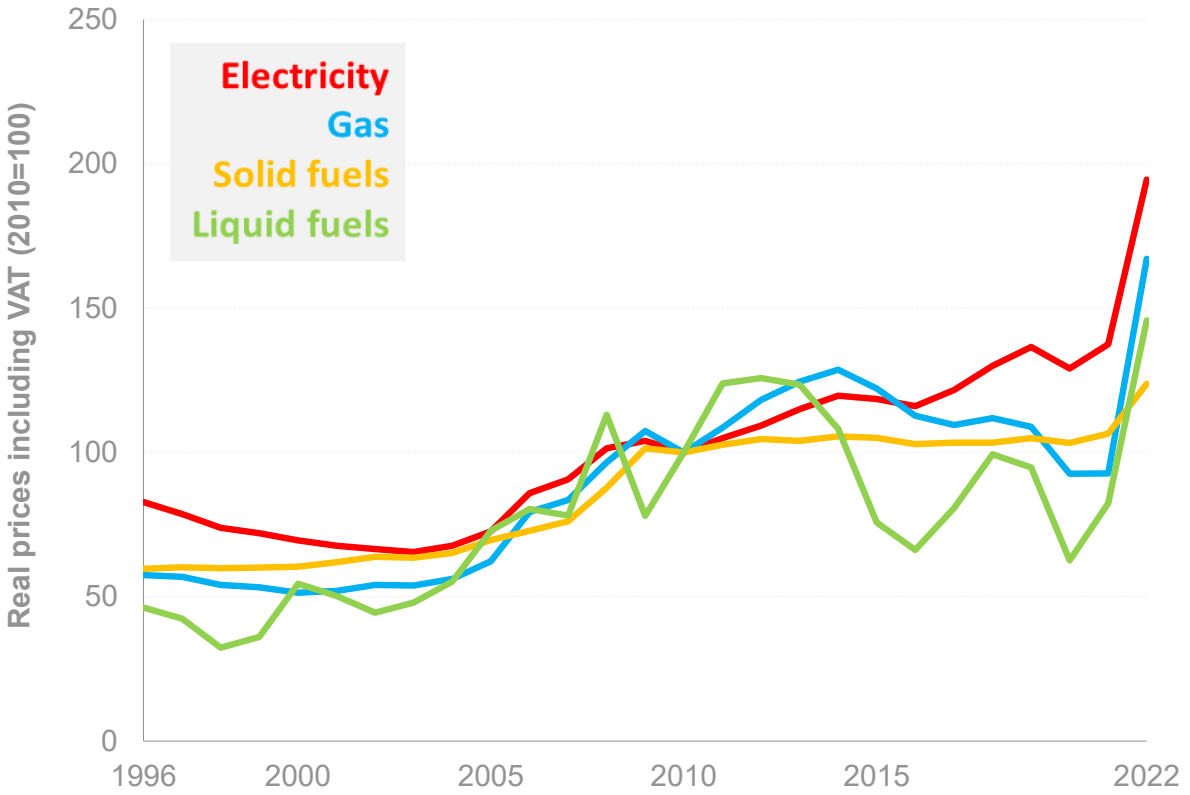
Includes the Climate Change Levy that came into effect in April 2001

Industrial prices, in real terms, steadily fell from the mid-1980s until 2003 where they were at their lowest. Industrial prices then rose again reaching a peak in 2013 before steadily falling and rising again to a new peak in 2019. Industrial prices fell in 2020, however, in 2021 coal, electricity, gas and heavy fuel oil prices all increased and 2022 saw further increases.

Compared to the previous year, in 2022 industrial electricity prices, in real terms, were up by 36% and were the highest on record. Gas prices were up by 66%. Coal prices paid for by industry were up by 86%. Industrial heavy fuel oil prices in real terms were up by 63%.

Over the last five years industrial gas prices, in real terms, have increased by 121% and electricity prices have increased by 73%.

## Fuel price indices for the domestic sector, 1996 to 2022




**Real prices including VAT, 2010 = 100**

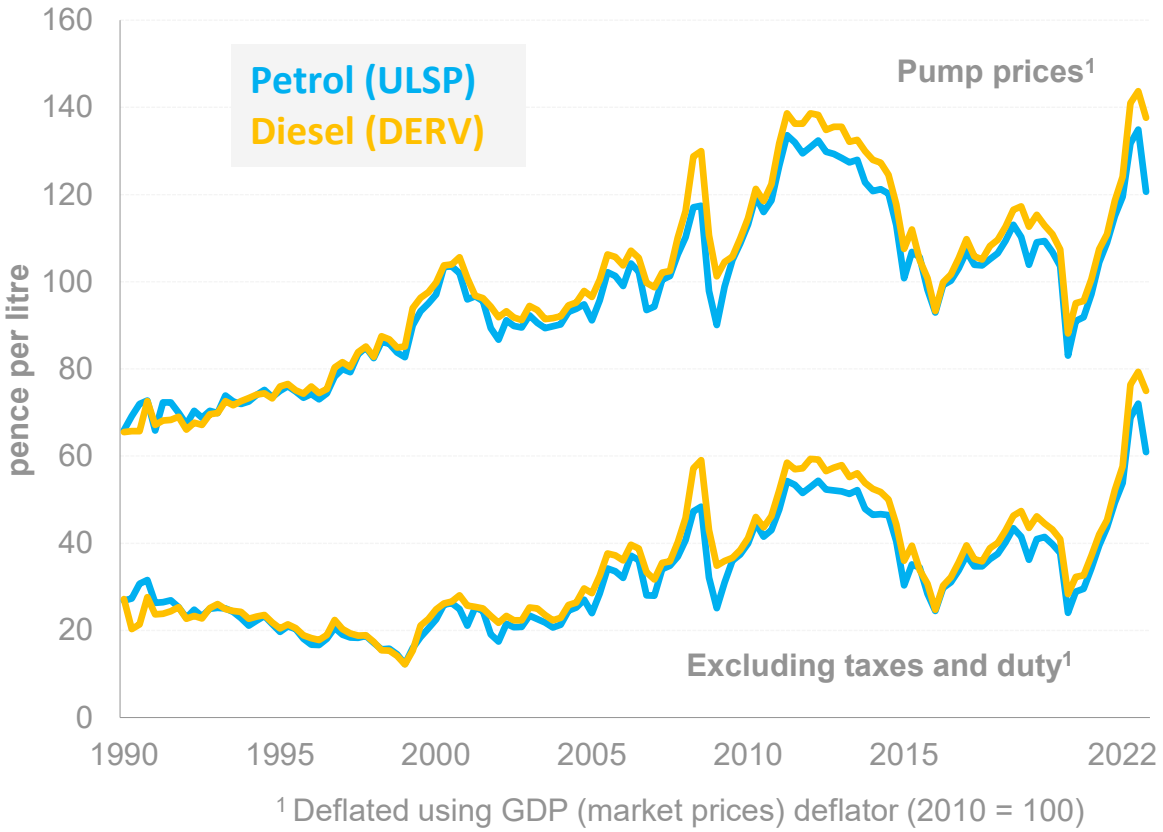
| | 1996 | 2000 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Solid fuels | 59.7 | 60.3 | 100.0 | 103.3 | 106.5 | 123.8 |
| Electricity | 82.8 | 69.5 | 100.0 | 129.1 | 137.5 | 194.5 |
| Gas | 57.5 | 51.4 | 100.0 | 92.6 | 92.7 | 167.1 |
| Liquid fuels | 46.2 | 54.5 | 100.0 | 62.5 | 82.4 | 145.7 |
| **Domestic fuels** | **68.5** | **60.9** | **100.0** | **110.9** | **116.0** | **181.2** |

*Source: Consumer Price Index, Office for National Statistics*

Compared to 2021, total domestic energy prices in total for 2022 increased in real terms by 56%. Over the same period, liquid fuels increased by 77%, gas prices increased by 80%, electricity prices increased by 42% and solid fuels increased by 16%.

Comparing prices in 2022 with prices 10 years prior, real prices for domestic fuels overall increased by 58%. The real price of electricity increased by 78%, solid fuels increased by 18%, gas increased by 41% and liquid fuel prices increased by 16%.

## Petrol and diesel prices, 1990 to 2022

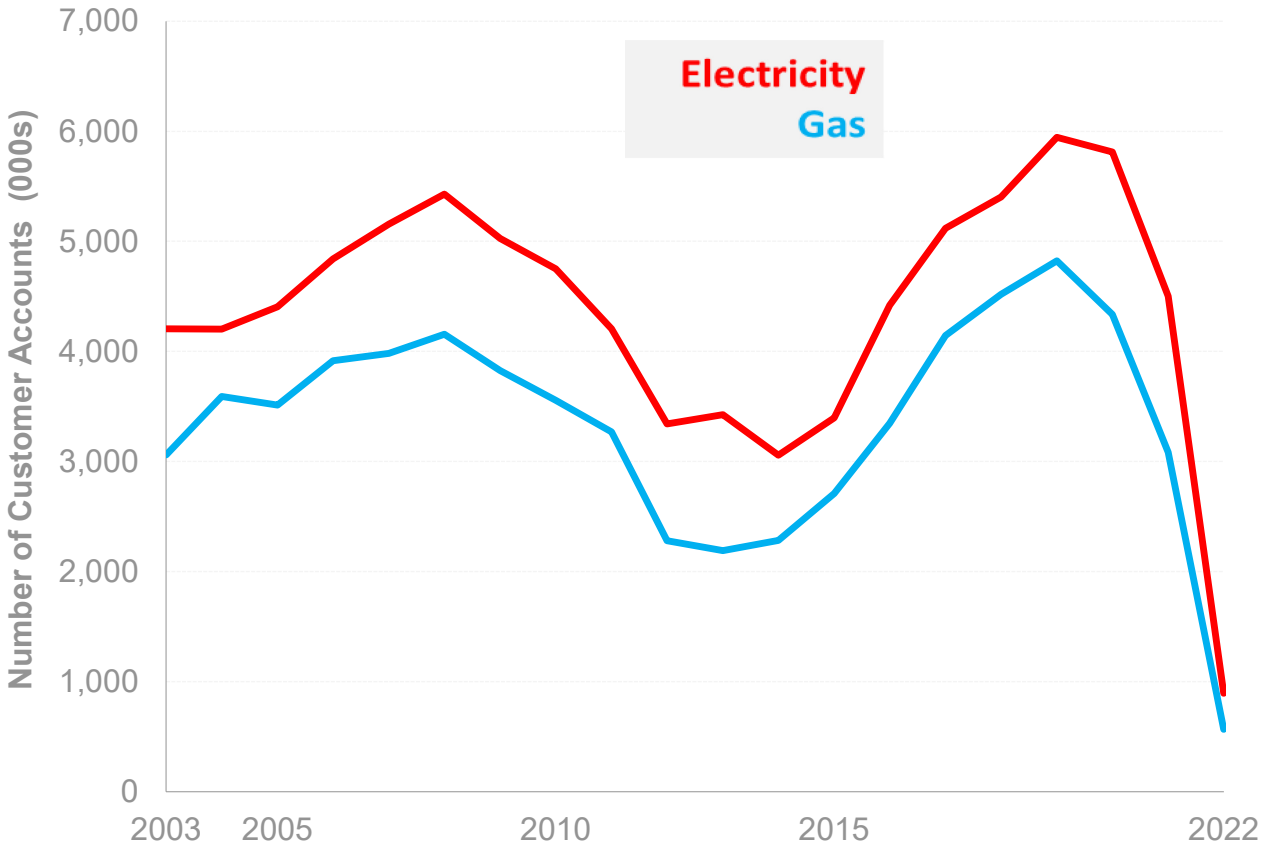



| Current retail prices | Pence/litre | |
|---|---|---|
| | Petrol (ULSP) | Diesel |
| 1990 | 42.0 | 40.5 |
| 2000 | 79.9 | 81.3 |
| 2005 | 86.8 | 90.9 |
| 2010 | 116.9 | 119.3 |
| 2015 | 111.1 | 114.9 |
| 2020 | 113.9 | 119.1 |
| 2021 | 131.3 | 134.9 |
| 2022 | 164.7 | 177.7 |

In cash terms the price of Ultra Low Sulphur Petrol (ULSP) cost 33 pence per litre more and diesel cost 43 pence per litre more in 2022 than in 2021.

In real terms the price of petrol was 19% higher and diesel was 25% higher in 2022 compared to 2021. In 2022 taxes and duty accounted for 50% of the retail price of unleaded and 47% of the price of diesel.

## Domestic supplier transfers, 2003 to 2022




**Number of households switching domestic energy supplier, 2003 to 2021, in 000s**

| (000s) | 2003 | 2005 | 2010 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Electricity | 4,204 | 4,405 | 4,750 | 5,811 | 4,502 | 893 |
| Gas | 3,059 | 3,511 | 3,556 | 4,336 | 3,082 | 566 |

Please note: the number of customers switching supplier shown in the graph is based on the number of meter points a supplier gains from another following a customer choice to change their supplier. This number does not include either internal switches among white labels or brands associated with the same supplier or customer transfers resulting from corporate changes, company mergers and Supply of Last Resort events.

Source: Transfer Statistics, Ofgem

The number of households that switched energy suppliers in Great Britain decreased by 82% for gas and decreased by 80% for electricity between 2021 and 2022.

The drop in transfers in 2022 were affected by the Ofgem Default Tariff cap (the price cap[3]), subsequent implementation of bills support schemes and guarantees to protect against rises in wholesale gas prices. Both electricity and gas tariffs offered by companies were less competitive. The variable tariffs being offered were increasingly charged at the guaranteed price level.

[3] https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/default-tariff-cap

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To convert from the units on the left-hand side to the units across the top multiply by the value in the table.

| | | | | | |
|---|---|---|---|---|---|
| | *to:* | **Thousand toe** | **TJ** | **GWh** | **Million therms** |
| *from:* | **Thousand toe** | 1 | 41.868 | 11.63 | 0.39683 |
| | **TJ** | 0.023885 | 1 | 0.27778 | 0.0094778 |
| | **GWh** | 0.085985 | 3.6 | 1 | 0.034121 |
| | **Million therms** | 2.52 | 105.51 | 29.307 | 1 |

Data relating to the energy content of fuels are on a gross calorific value basis.

Prices are presented in real terms i.e., the effect of inflation has been removed by adjusting each series using the GDP deflator.

The symbol '-' is used in the tables where the figure is nil or not separately available, and '..' is used to indicate 'not available'.

The Department for Energy Security and Net Zero is the source of all data except where stated.

All data within this publication are classified as National Statistics, except those on page 39 which are classified as Official Statistics.

All figures are for the United Kingdom, except for pages 37, 38, 39, 40, 41, 42 and 47.

The Department for Energy Security and Net Zero (DESNZ) also produces the following energy and climate change statistics publications:

The **Digest of United Kingdom Energy Statistics** is the annual energy statistics publication of DESNZ. With extensive tables, charts and commentary covering all the major aspects of energy, it provides a detailed and comprehensive picture of the last three years and a detailed picture for the last three years. It includes detailed information on the production and consumption of individual fuels and of energy as a whole. The 2023 edition, published on 27 July 2023, is available at:
https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

The **Energy Flow Chart** is an annual publication illustrating the flow of primary fuels from home production and imports to their eventual final uses. They are shown in their original state and after being converted into different kinds of energy by the secondary fuel producers. The 2023 edition of the chart, published on 27 July 2023, shows the flows for 2022 and is available at: https://www.gov.uk/government/collections/energy-flow-charts

**Energy Trends** is a quarterly publication of statistics on energy in the United Kingdom. It includes tables, charts and commentary covering all major aspects of energy. It provides a comprehensive picture of energy production and use, to allow readers to monitor trends during the year. https://www.gov.uk/government/collections/energy-trends
Monthly updates to tables in Energy Trends split by fuel source are also available.

**Energy Consumption in the United Kingdom** brings together statistics from a variety of sources to produce a comprehensive review of energy consumption and changes in intensity and output since the 1970s, with a particular focus on trends since 2000. The information is presented in five key themes covering overall energy consumption, energy intensity by sector, primary energy consumption, end uses and electrical products consumption and stock.
https://www.gov.uk/government/collections/energy-consumption-in-the-uk

**UK Greenhouse Gas Emissions statistics** are produced by DESNZ to show progress against the UK's goals, both international and domestic, for reducing greenhouse gas emissions.
https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics

**Household Energy Efficiency statistics** are published by DESNZ on the Energy Company Obligation (ECO) and Green Deal (GD). The headline release presents monthly updates of ECO measures and quarterly updates of in-depth ECO statistics, carbon savings and the Green Deal schemes. The detailed report presents annual updates on in-depth Green Deal statistics and insulation levels.
https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics

**Smart Meters statistics** are produced by DESNZ on the roll-out of smart meters in Great Britain, and covers both operating and installed meters.
https://www.gov.uk/government/collections/smart-meters-statistics

**Fuel Poverty statistics** are produced by DESNZ to support the Fuel Poverty Strategy for England.
https://www.gov.uk/government/collections/fuel-poverty-statistics

**Energy Prices** is a quarterly publication that contains tables, charts and commentary covering energy prices, to domestic and industrial consumers, for all the major fuels. It also presents comparisons of fuel prices in the European Union and G7 countries.
https://www.gov.uk/government/collections/quarterly-energy-prices

**Sub-National Energy Consumption statistics** are produced by DESNZ to emphasise the importance of local and regional decision making for energy policy in delivering a number of national energy policy objectives.
https://www.gov.uk/government/organisations/department-for-energy-security-and-net-zero/about/statistics

DESNZ has constructed a **National Energy Efficiency Data-framework (NEED)** to enable detailed statistical analysis of energy efficiency. The data framework matches the gas and electricity consumption data collected for DESNZ sub-national energy consumption statistics and records of energy efficiency measures in the Homes Energy Efficiency Database (HEED) run by the Energy Saving Trust (EST), as well as typographic data about dwellings and households.
https://www.gov.uk/government/collections/national-energy-efficiency-data-need-framework

Any enquiries regarding this publication should be sent to us at: energy.stats@energysecurity.gov.uk

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

If you need a version of this document in a more accessible format, please email us. Please tell us what format you need. It will help us if you say what assistive technology you use.