Department for Business, Energy & Industrial Strategy

# Energy Consumption in the UK (ECUK) 1970 to 2020

## About this release

Information on energy consumption in the UK by sector and end use.

## In this release



## Data tables

Consumption

Energy intensity

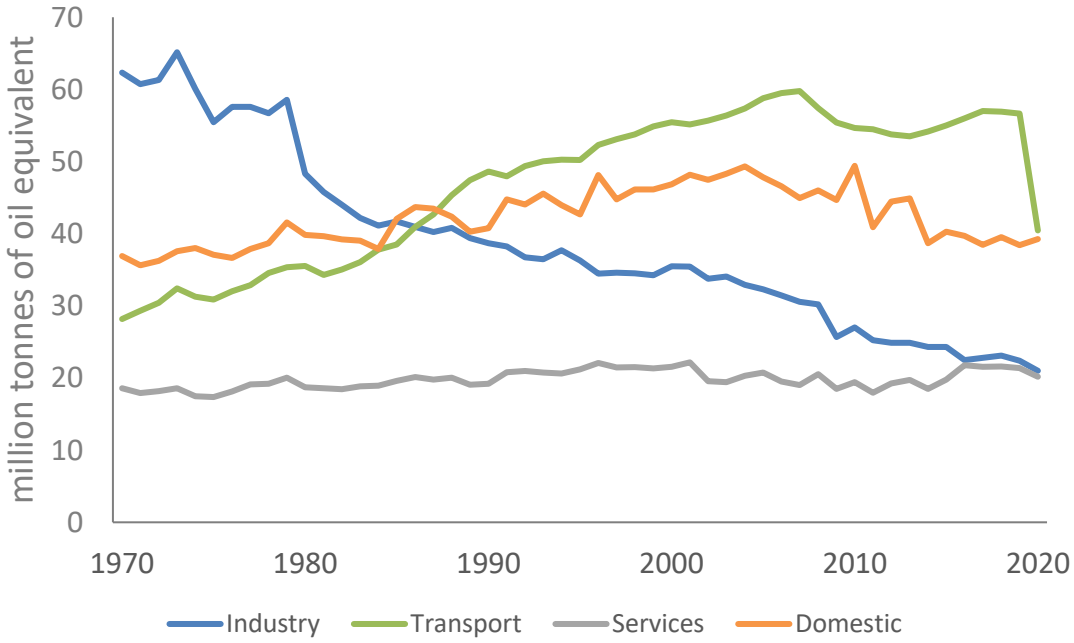
Primary energy consumption

End uses

Electrical products

- Consumption in 2020 was significantly affected by the Covid-19 pandemic and restrictions put in place in response; for further information on this please see DUKES and Energy Trends.
- Total energy consumption in the UK decreased by 17.9 million tonnes of oil equivalent (mtoe) (or 12.9 per cent) between 2019 and 2020 to 121.0 mtoe.
- Consumption fell in industry, services and transport but increased in the domestic sector. Transport contributed 16.2 mtoe to the overall decrease slightly offset by a 0.9 mtoe increase in domestic.
- With the exception of bioenergy and waste, all fuels saw a decrease particularly petroleum which fell by 15.9 mtoe (25 per cent).
- The energy ratio fell by 0.5 per cent (Table I1), meaning decreased Gross Domestic Product (GDP) was met with an almost commensurate reduction in the amount of energy demand.
- Figure 1 below shows the long-term trends in consumption by sector and fuel; peaks in consumption occurred in 2001 and in 2005 for electricity. By sector, the changes in 2020 are not large deviations from long-term trends except for transport.

**Change in energy consumption by sector**



# Chapter 1: Energy Consumption

### Final energy consumption

Final energy consumption is the direct consumption of fuels compared to primary consumption which relates to the fuel input.

For example a unit of electricity in final consumption would be allocated to the fuel input used to generate the unit of electricity (for example gas, or biomass).

Core final consumption data are sourced directly from that section of the energy balances as published in The Digest of UK Energy Statistics.

## Key headlines

Between 2019 and 2020, consumption (excluding non-energy use) decreased by 17.8 mtoe (13 per cent) to 121.1 mtoe, see consumption tables accompanying this publication, Table C1.

Chart 1.2 shows the magnitude of the change compared to changes seen in recent years.

Chart 1.1 below shows changes in consumption by sector highlighting which fuels are driving the changes; it can be a useful way of tracking changing fuel preferences. Between 2019 and 2020 the change is dominated by the reduction in petroleum consumption in transport of 16 mtoe. Reflecting reduced mobility due to Covid-19 related restrictions.

Fuel consumption also fell in industry and services, 1.4 and 1.1 mtoe respectively. Decreases were across all fuels except biofuels and waste.

Chart 1.2 shows the magnitude of the change compared to changes seen in recent years.

**Chart 1.1 Change in consumption by sector and fuel, 2019 to 2020**

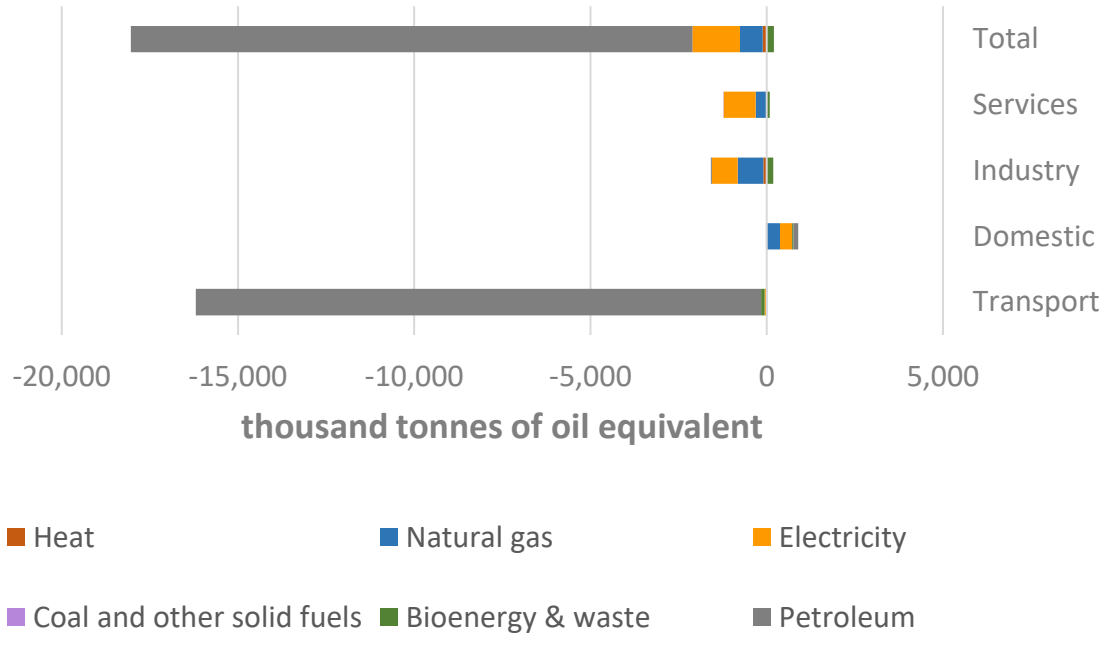
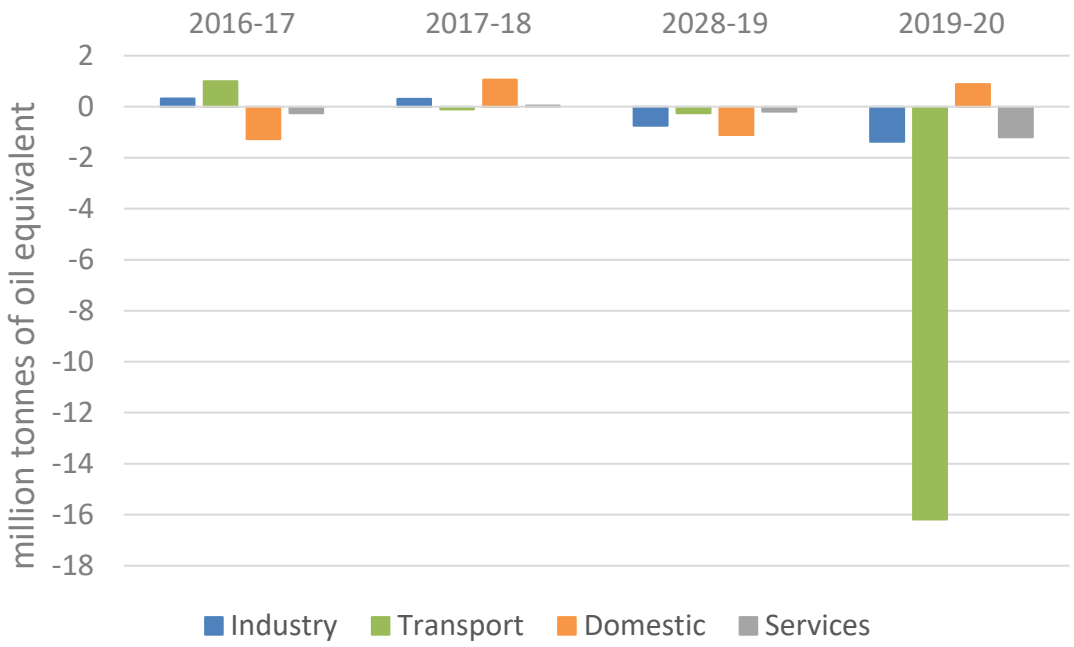


**Chart 1.2 Annual change in consumption by sector for the last 4 years**




## Domestic

Domestic consumption increased by 2.3 per cent or 0.8 mtoe with a 4 per cent increase in electricity and 2 per cent in gas. After we accounted for temperature, the increase is even larger after 15 consecutive years of decreases as Covid-19 restrictions meant more people stayed at home.

**Chart 1.3 Domestic consumption, temperature-corrected consumption and average annual temperatures**

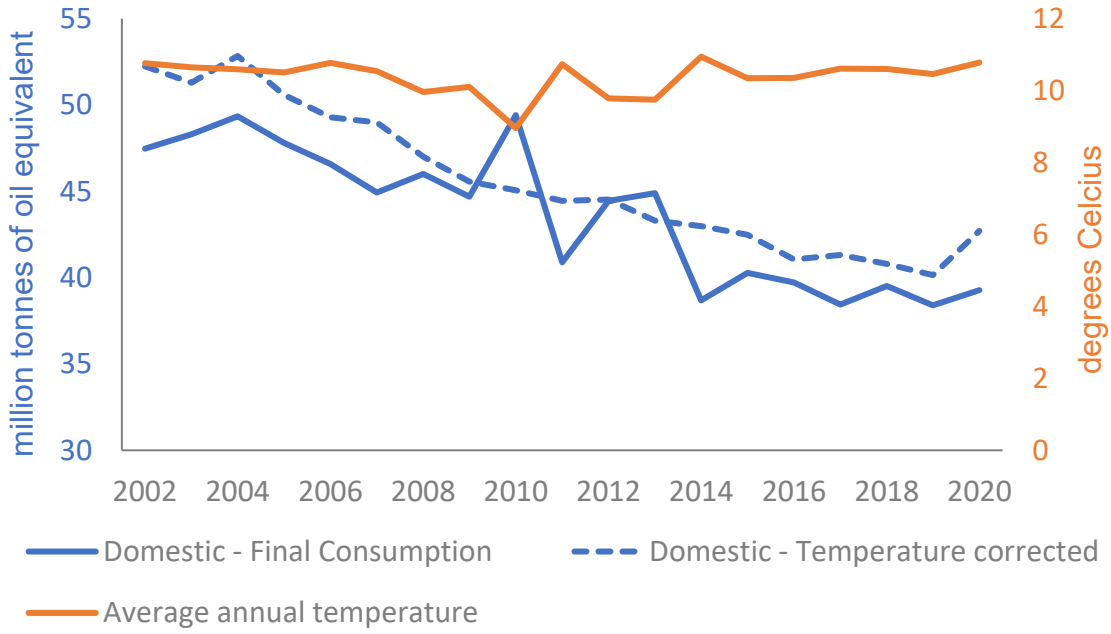
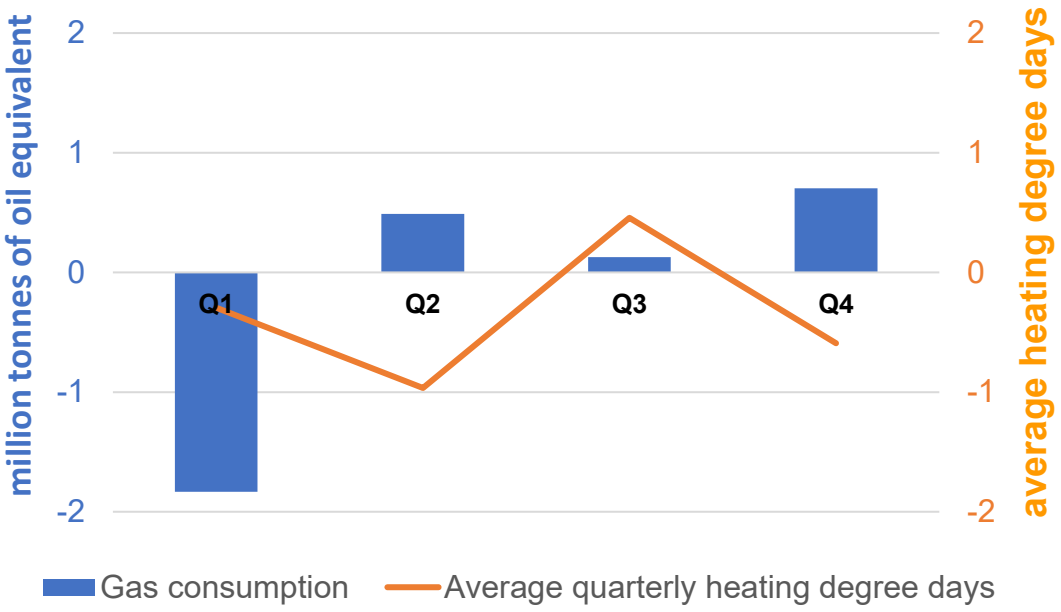



Chart 1.4 below shows the difference in quarterly data for 2019 to 2020 compared with the difference in heating degree days. In the second and fourth quarters, coinciding with the strictest periods of lockdown, gas consumption was higher than in 2019 despite the number of heating degree days being lower.

**Chart 1.4 Change in quarterly domestic demand and heating degree days, between 2019 and 2020**




Source: Quarterly Gas Consumption - Energy Trends Table 4.1, Heating Degree Days - Energy Trends Table 7.1

**Additional BEIS Statistics on Consumption in the Domestic Sector.**

National Energy Efficiency Data Framework (NEED)

Published 24 June 2021;

Mean and median consumption of domestic energy in 2019 by property characteristics.
Estimates of the impact on average consumption of energy efficiency measures.

Household Energy Efficiency Statistics

Last updated 26 August 2021;

Statistics relating to the Energy Company Obligation (ECO) and Green Deal.
The detailed report presents annual updates (last updated 18th March 2021) on in-depth ECO statistics and insulation levels.

Fuel Poverty Statistics

Published 29th April 2021 covering the year 2019

**Sub-national consumption statistics** (published 22nd December 2020);

Sub-national electricity consumption data

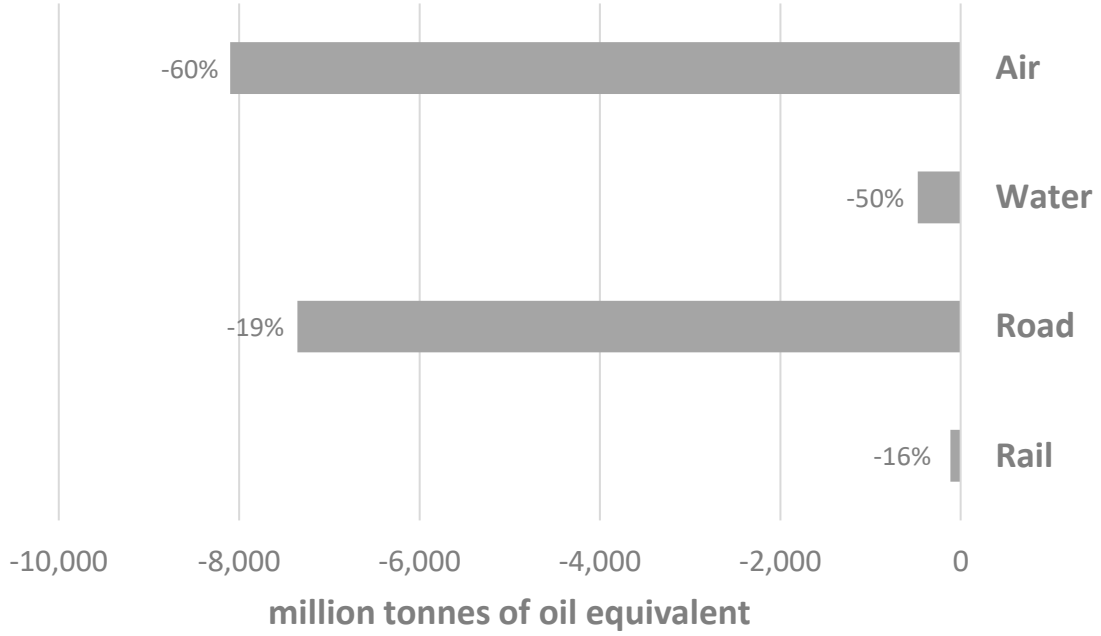
Sub-national gas consumption data

## Transport

Chart 1.5 shows an unprecedented decrease in petroleum consumption in the transport sector in 2020. In aviation, powered entirely by petroleum, consumption in 2020 was just 40 per cent of 2019 levels. Petroleum consumption in road transport was 81 per cent of 2019 levels. More detailed data on the energy consumption split between passengers and freight is not yet available for 2020 but data from the Department for Transport

indicates there was a much bigger decline in the use of buses, coaches and cars than for HGVs and LGVs[1] . The share of road transport energy demand met by biofuels increased slightly from 4.2 to 4.8 per cent in energy terms.

**Chart 1.5 Change in petroleum consumption in transport by travel mode, 2019 to 2020**

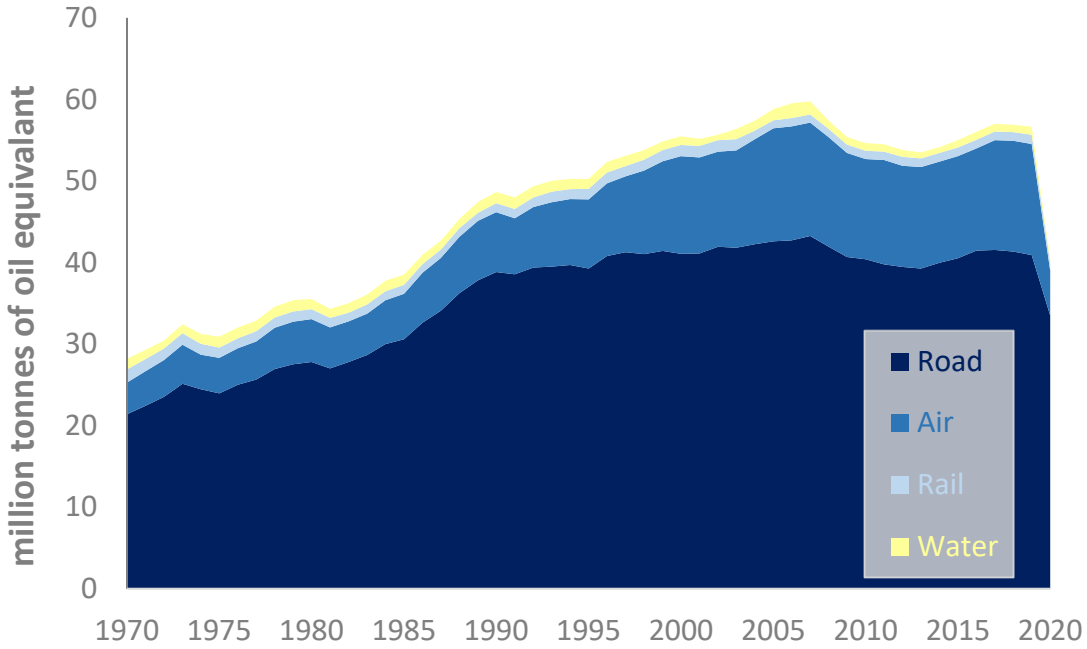



Despite the drop in mobility, out of services, industry, domestic and transport, transport remains the biggest component of energy consumption in the UK.

Over the last decade the shares of energy consumption by mode have been stable. Efficiency improvements have partly offset increased demand in both road and air travel. 2020 was an obvious exception reflecting Covid-19 restrictions. Energy consumption in aviation was 8.1 mtoe lower in 2020 than in 2019, a decrease of 60 per cent. In road transport the fall was 7.4 mtoe, a decrease of 18 per cent as from a much higher 2019 value of 40.9 mtoe. These year-on-year changes are far bigger than in any other year at least as far back as 1970, from when our time series are reported. The long-term trends and the anomalous consumption in 2020 can be seen together in Chart 1.6.

[1] Regional traffic by vehicle type

**Chart 1.6 Trends in transport consumption from 1970 by mode**

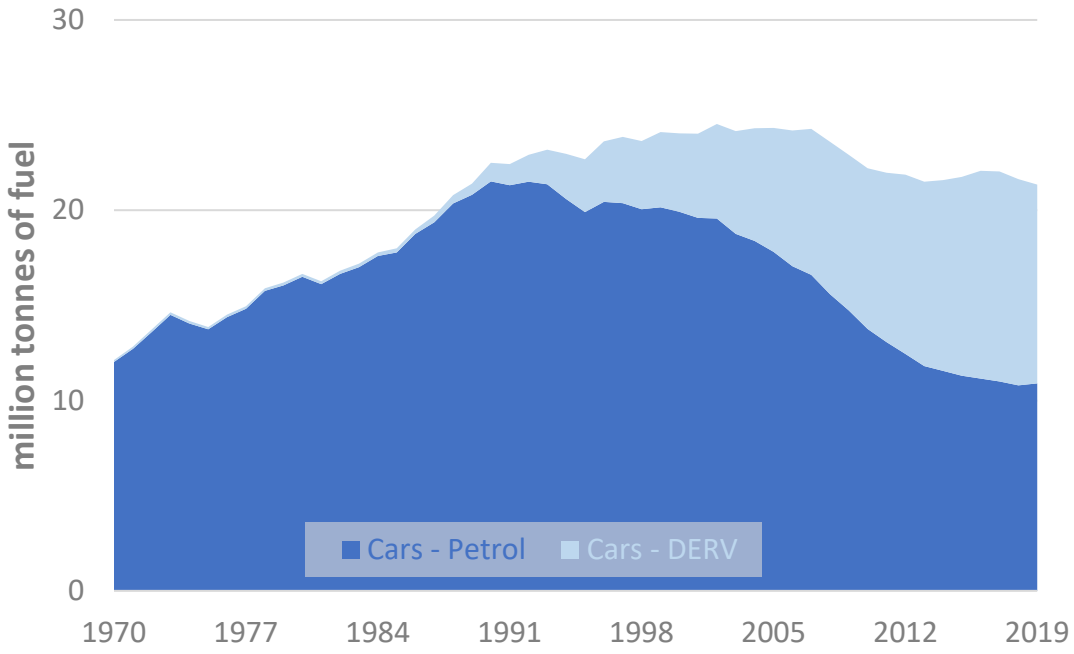



Electricity consumption in road transport has been modelled using information from the DVLA on electric vehicle registrations. For 2020 this estimate was reduced to account for the lower numbers of journeys compared to a more typical year. Despite this reduction electricity demand in road transport is estimated to have increased by 50 per cent between 2019 and 2020 from 32 to 48 thousand tonnes of oil equivalent (ktoe). 108 000 battery electric vehicles were registered for the first time in 2020 compared to 38 000 in 2019[2].

Chart 1.7 highlights diesel's increasing share in cars, notably from the early 1990s onwards until 2017 when diesel[3] narrowly overtook petrol demand. This trend has reversed since then as biodiesel displaced more diesel and petrol demand increased. Data on types of vehicles on the road is modelled up to 2019.

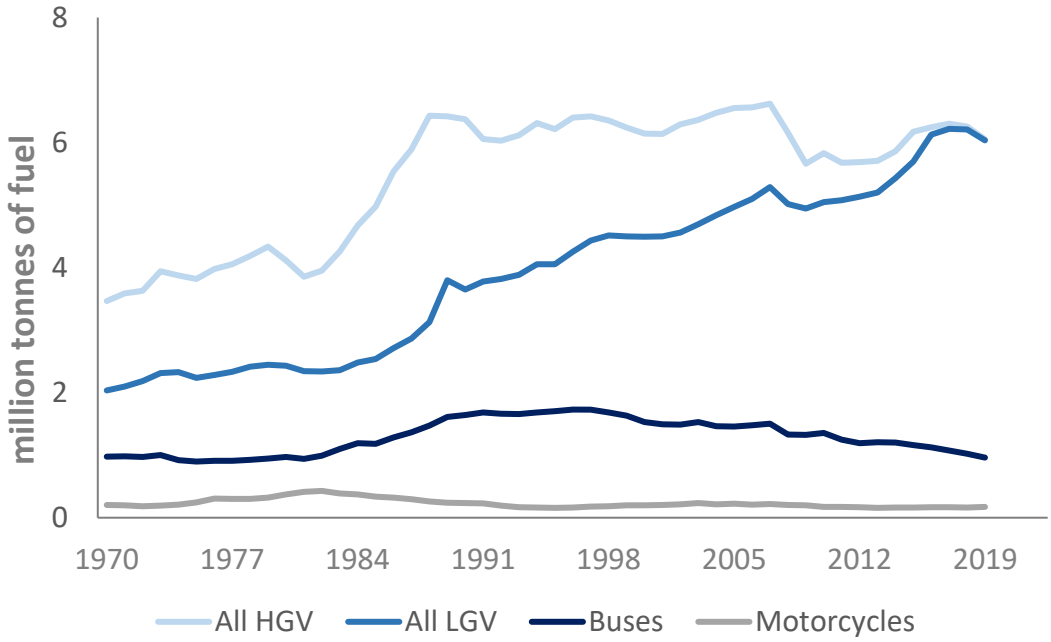
[2] See Cars registered for the first time by propulsion and fuel type: Great Britain and United Kingdom
[3] See Energy Trends article for a detailed analysis;

**Chart 1.7 Petrol and Diesel (DERV) consumption for cars 1970 to 2019**




Cars represent the largest consumers in road transport consumption. Other road transport vehicles' consumption is shown in Chart 1.8.

**Chart 1.8 Consumption by other types of vehicles (excluding electricity) 1970 to 2019**

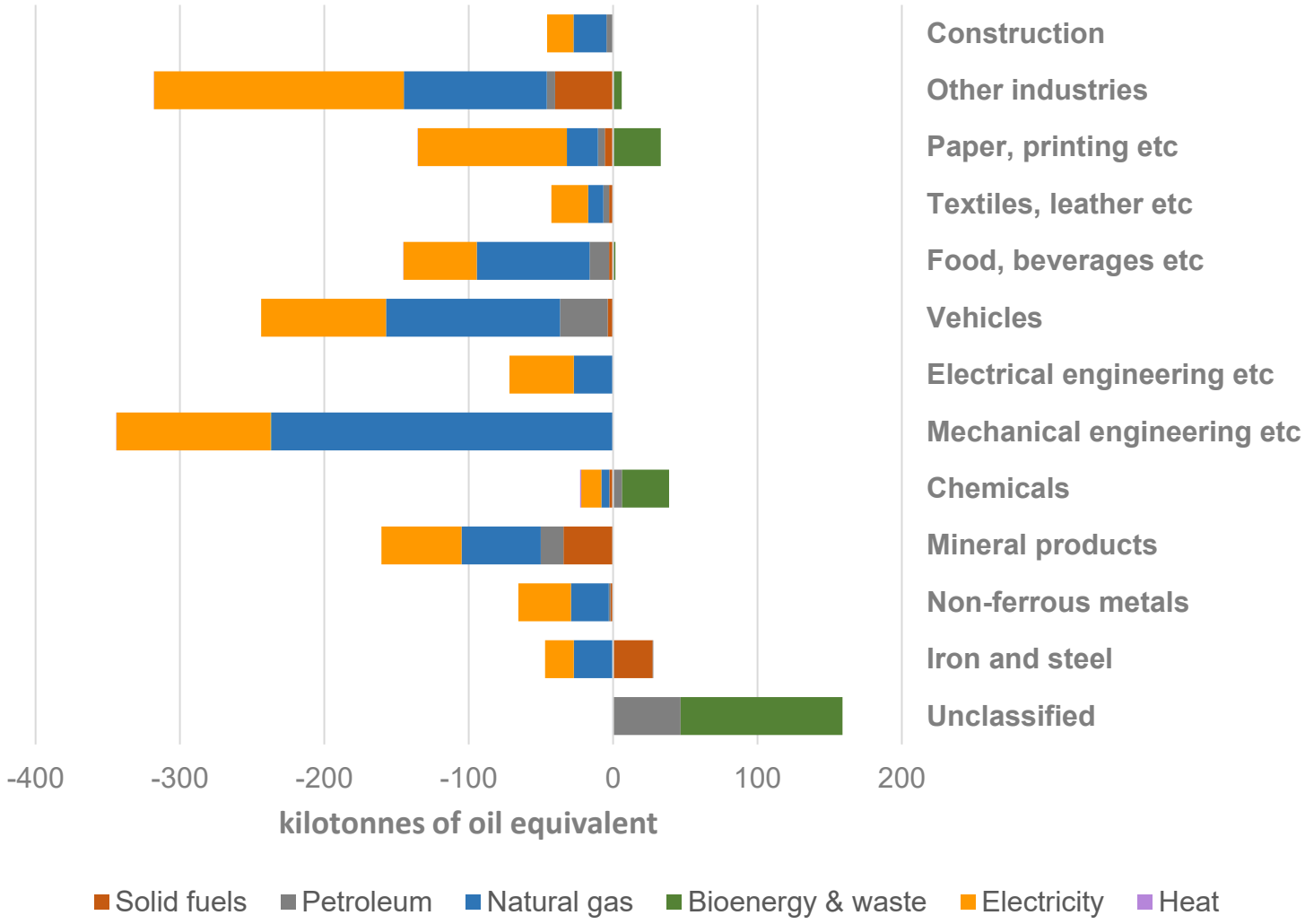



Consumption in both LGVs and HGVs fell slightly from 2018 to 2019 though the long-term trend has been an upward trajectory temporarily interrupted by the Global Financial Crisis.

## Industry

There was a large drop in energy consumption across industrial sectors in 2020. Gas and electricity consumption fell sharply and the only fuel to see increased use was bioenergy and waste. Consumption of bioenergy and waste increased partly due to increased use in chemicals and the paper and printing sectors though more data is needed to identify the sub-sectors consuming the remainder of the increase.

**Chart 1.9 Change in Industrial consumption sub-sectors from 2019 to 2020 by fuel**

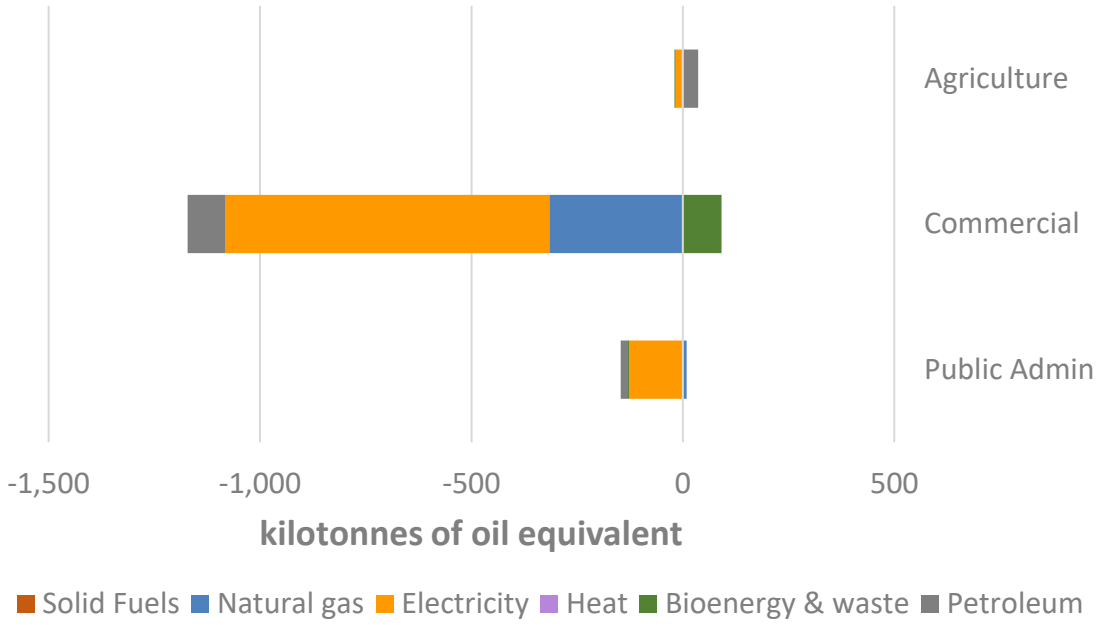



## Services

Table C4 shows that consumption in the services sector decreased by 1.2 mtoe (6 per cent) between 2019 and 2020.

Chart 1.10 shows that both the public administration and commercial sectors saw a decrease in total consumption between 2019 and 2020, seen in gas consumption for the former and electricity consumption for the latter.

**Chart 1.10 Change in Services Consumption, 2019 to 2020**




Consumption dropped by over 1 mtoe or 6 per cent in the commercial sector. Electricity consumption dropped 766 ktoe and gas 316 ktoe. Electricity consumption in public administration dropped by 127 ktoe but gas consumption slightly increased.

**Sub-national consumption statistics (last update published 22nd December 2020)**;

Sub-national electricity consumption data

Sub-national gas consumption data

# Chapter 2: Energy Intensity

**What is Energy Intensity?**

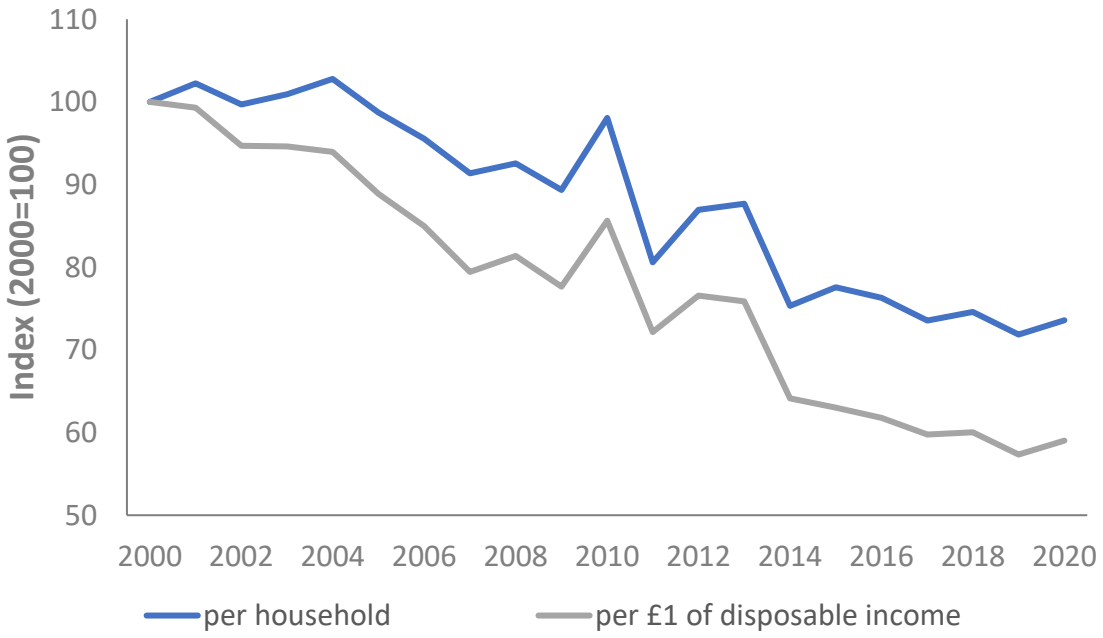
Energy Intensity is the amount of energy per unit of output. It includes (but is not limited to) energy efficiency changes. Units of output vary depending on the sector and sub-sector and relate to such economic activity as number of passengers and distance travelled for the transport sector, whilst changes in the ONS' Index of Production data are used to estimate trends in the output for the industrial sector.

The 'Methodology and Quality' sheet in the data tables include a comprehensive list of output factors used for each sub-sector.

## Domestic

Energy consumption per person fell from 0.8 ktoe in 2000 to 0.6 ktoe in 2020 with consumption per household following a very similar trajectory. Disposable income has increased more quickly than population and so the consumption per unit of disposable income has decreased even more rapidly. The improvements to energy intensity in this sector are likely related to higher energy efficiency of homes resulting from improvements to insulation measures, boiler, and other appliance efficiencies[4].

**Chart 2.1 Indexed change in energy intensity per household and on disposable income basis, 2000 to 2020**




## Transport

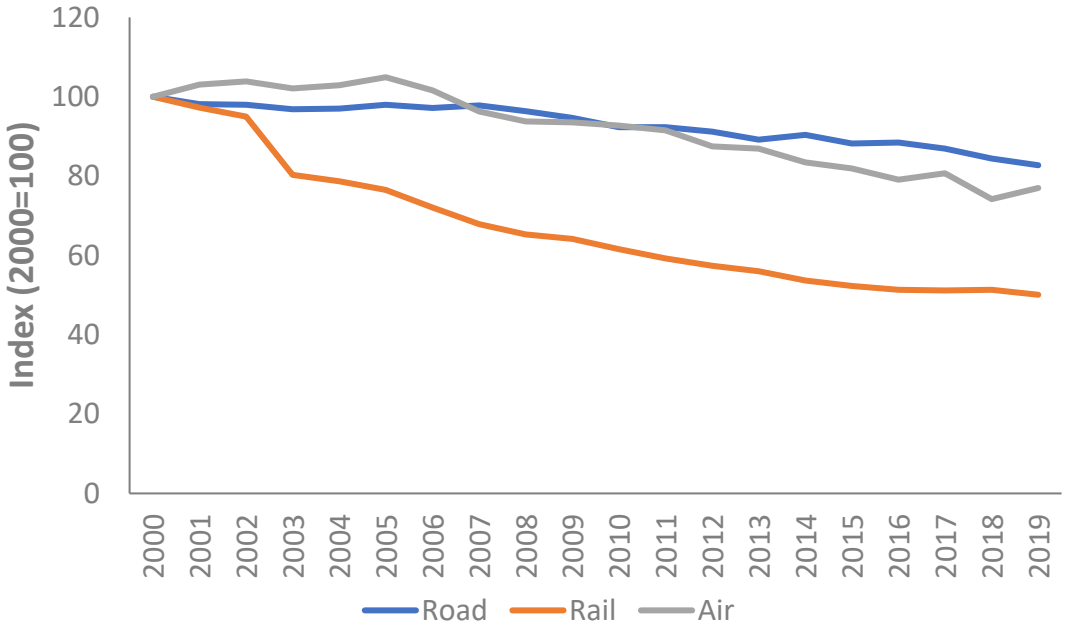
Energy intensity for passenger transport, measured as consumption per passenger kilometre, has been modelled up to 2019 when the most recent transport factors available. Energy intensity has fallen for the key

[4] National Energy Efficiency Data-Framework (NEED) report

modes of transport; road, rail and air with the largest decrease in rail passenger transport (see Figure 12) which has fallen by more than a third (36 per cent). The timeframe considered is from 2004 to 2019; 2004 has been selected as the start of the series in this instance as there was a step change in consumption by rail transport when energy consumption for providing building services was reallocated from transport to the commercial sector.

Energy intensity in air transport increased by 3.8 per cent in 2019 reflecting a 3.3 per cent drop in passenger kilometres but only a 0.4 per cent drop in consumption. Intensity in 2019 was still 25 per cent lower than 2004.

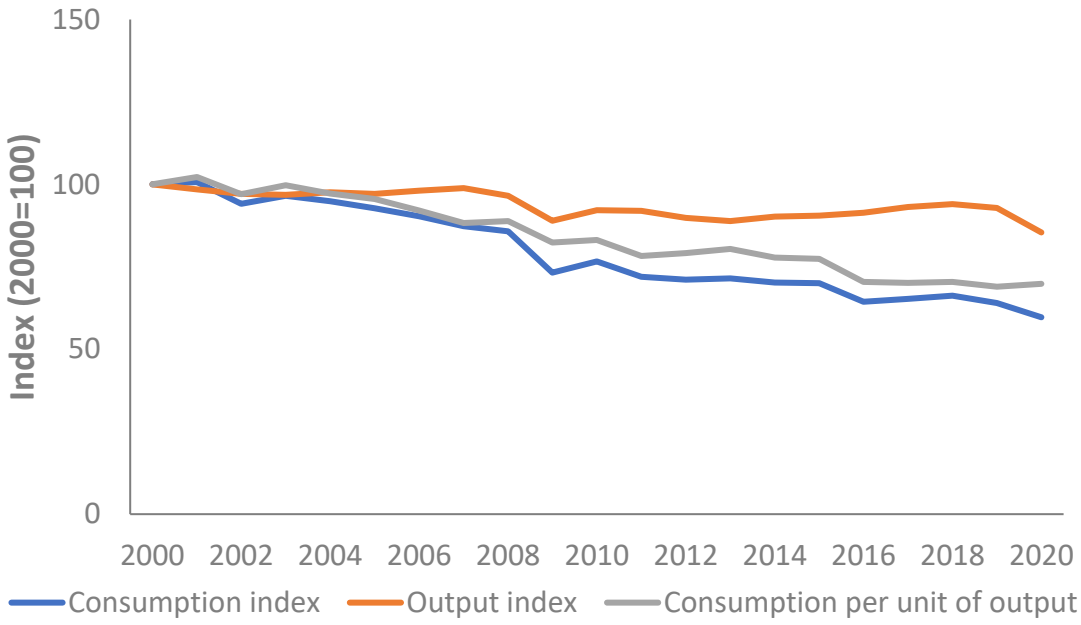
**Chart 2.2 Change in energy intensity for passenger transport, 2000 to 2019**




## Industry

The industrial sector has shown decreases in the energy used to produce a unit of output since 2000 by a third. The improvements were driven particularly by improvements to intensity in the vehicle manufacturing, chemicals, and iron & steel sectors. In 2020 output and consumption fell by similar rates so intensity was very similar to 2019 levels.

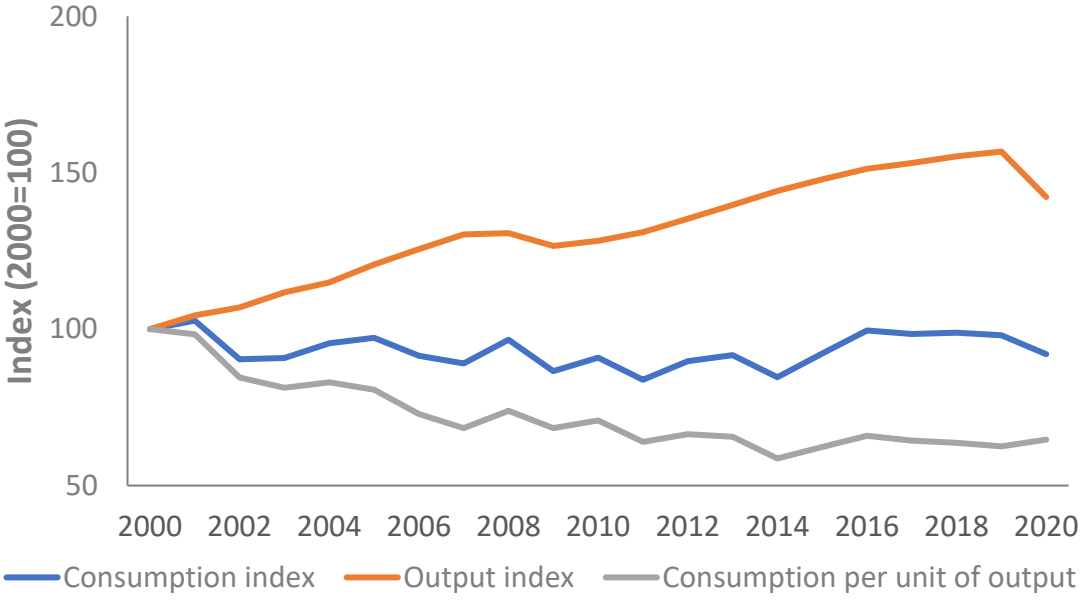
**Chart 2.3 Indexed change in industrial consumption, output and intensity, 2000 to 2020**




## Services

ONS statistics on output in the services sector show there was a contraction in activity in 2020. Energy consumption dropped but not at a rate as large as economic activity leading to an increase in intensity. The longer-term trend has been towards less energy consumption per unit of economic activity and even with the recent increase consumption per unit of output was 35 per cent lower in 2020 than in 2000.

**Chart 2.4 Indexed change in services consumption (excluding agriculture), output and intensity, 2000 to 2020**



## Output and Intensity Factors

Table I6 in the data tables shows a comparison of the effects on consumption due to output and intensity changes between 2000 and 2020 (2019 for transport). The output effect is the change in consumption which would have occurred had all other factors remained constant, specifically intensity changes. The remaining difference is then the intensity effect.

Chart 2.5 shows the contributions of changes in output and changes in intensity to changes in energy consumption since 2000. In services the decrease in intensity is almost entirely offset by the increase in economic output. Economic contraction of industry since the year 2000 has driven down energy consumption by 3.5 mtoe but the remainder, 9.3 mtoe, has come from reductions in energy intensity. Road passenger transport and air travel pushed up consumption to 3.4 mtoe above 2000 levels in 2019. The drop in consumption in 2020 is not typical, as energy consumption in transport has otherwise been steady since 2000.

**Chart 2.5 Output and Intensity Effects by sector 2000 to 2020**

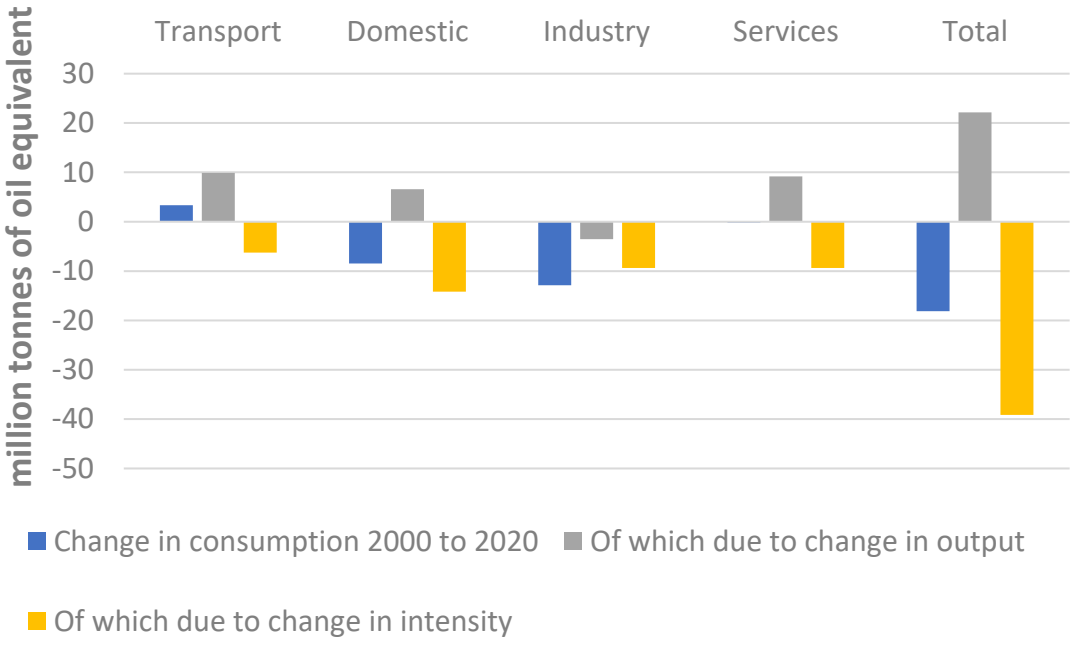
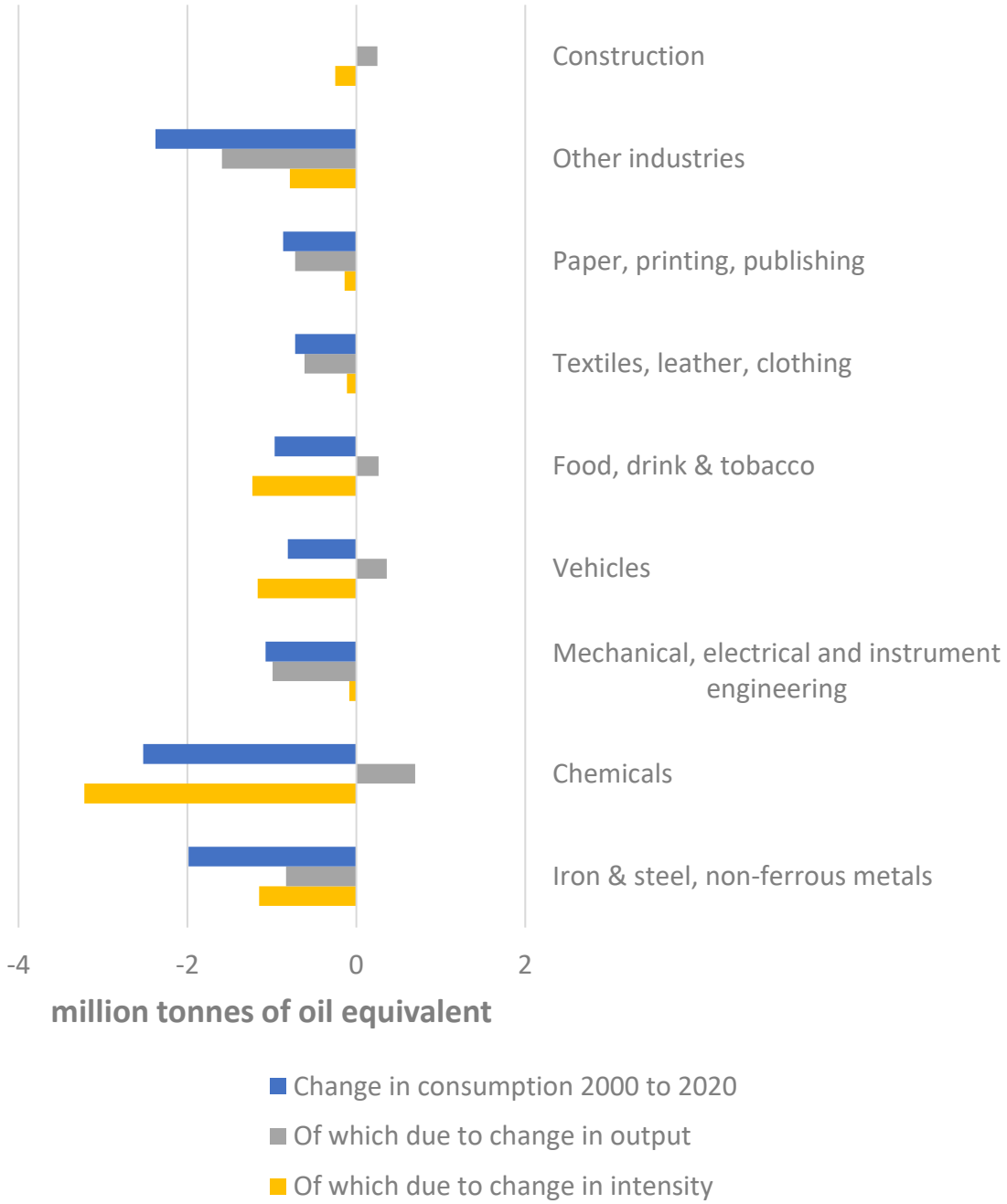


**Chart 2.6 Output and Intensity Effects for Industrial Sub-sectors 2000 to 2020**




All industry sub-sectors except construction saw reductions in energy consumption between 2000 and 2020 and energy intensity decreased in all sub-sectors. Increased economic activity in chemicals offset 0.7 mtoe of the 2.5 mtoe decrease driven by reduced energy intensity. Similar patterns are seen in vehicle manufacture and the food and drinks industry where decreasing intensity have led to an overall reduction in consumption despite growth in the sectors.

# Chapter 3: Primary Energy Consumption

### What is Primary Energy Consumption?

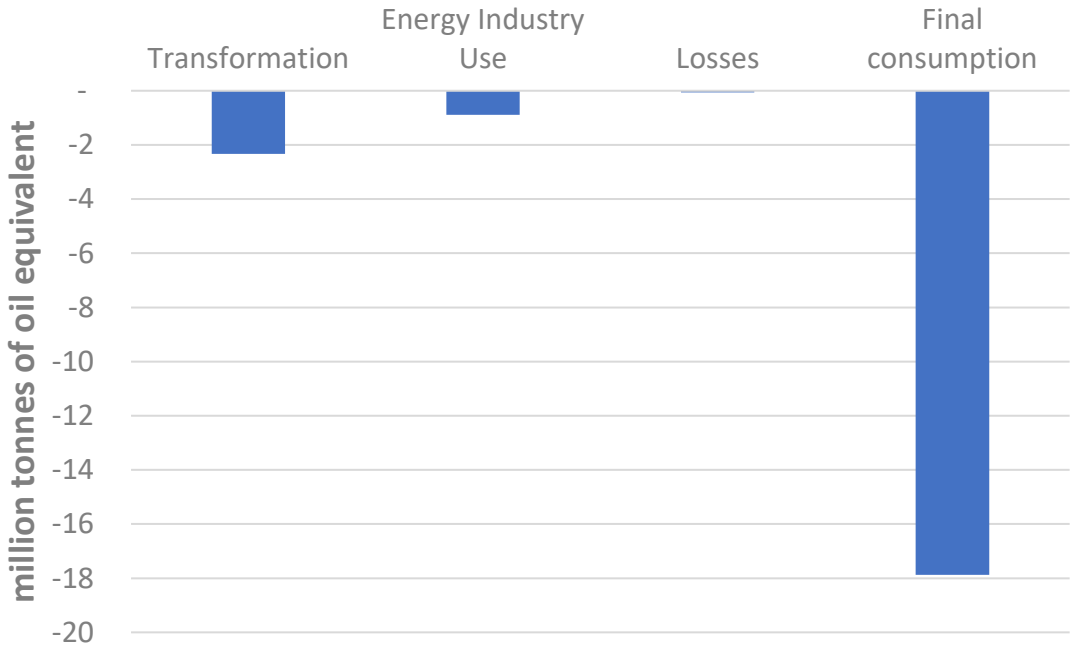
Primary Energy Consumption is the amount of fuel used prior to any loss of energy through conversion or transformation. The primary energy equivalent includes the losses incurred during the transformation process.

Primary consumption data are calculated by taking the final consumption fuel mix and apportioning to the fuel input required to produce the final unit of consumption. Most of the conversion losses are in generating electricity from combustible fuels so those sectors with a high proportion of electricity consumption have a relatively large absolute primary equivalent value.

## All sectors 2019 to 2020

Primary energy consumption fell 20.6 mtoe from 2019 to 2020 largely driven by the substantial fall in final energy consumption. Transformation losses reduced by 2.3 mtoe as wind and solar made bigger contributions to total electricity supply. These forms of renewable generation are considered primary electricity and have no conversion losses. Energy consumed within the energy industry fell by 0.9 mtoe mostly driven by a fall in demand in oil refineries.

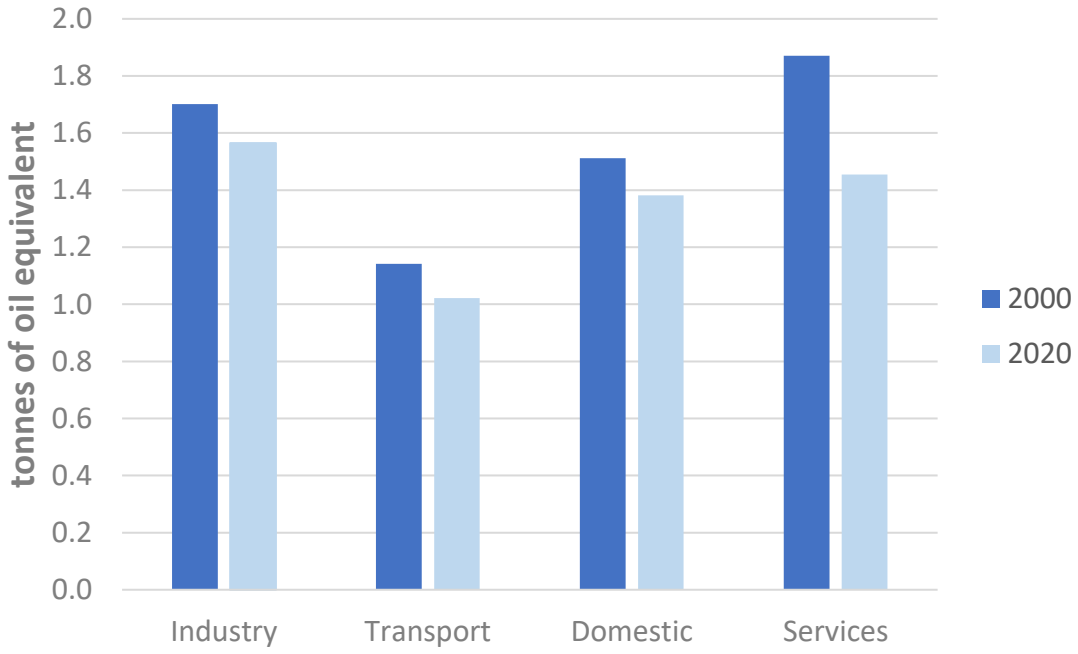
**Chart 3.1 Impact on Primary Energy Consumption 2019-2020**



## All sectors 2000 to 2020

Conversion factors are a measure of the efficiency of transformation calculated as the ratio of primary energy and final energy consumption. These factors are presented in Table P3 in the data tables and represent how many tonnes of oil equivalent are required to produce one tonne of oil equivalent final consumption. A comparison of factors across the sectors between 2000 and 2020 is shown in Chart 3.2 below.

**Chart 3.2 Changes in conversion factors from 2000 to 2020**

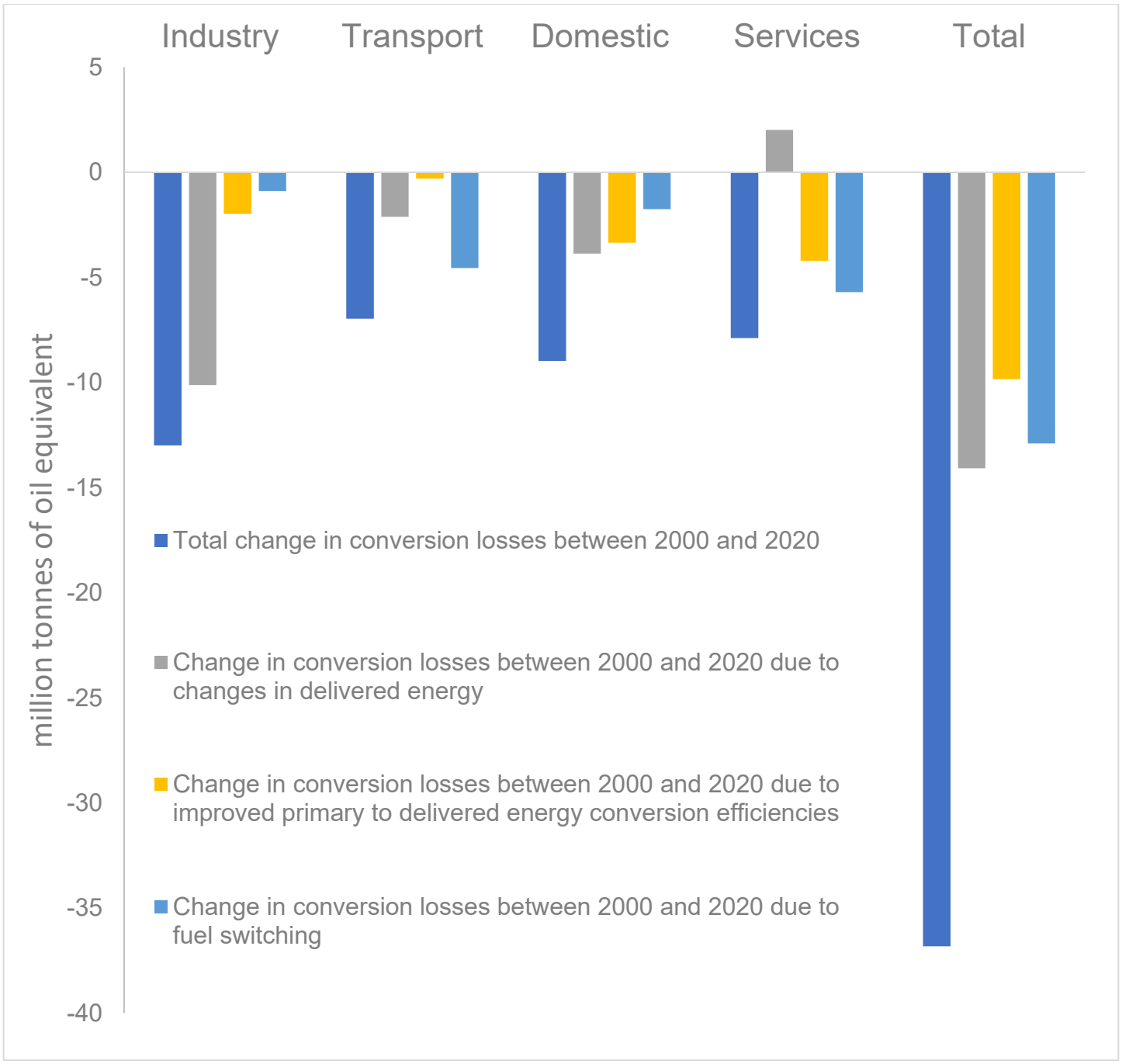



All sectors show a reduction in conversion factors over the period indicating improvements in efficiency in the transformation sector but also includes the effects of fuel switching whereby consumers shift from fuels requiring transformation to direct consumption which also includes the effect of the increasing proportion of primary electricity generation particularly renewables such as wind, and solar.

Table P5 in the data tables quantifies actual changes in conversion losses due to changes in final consumption (conversion losses will fall if less fuel is being converted), efficiency improvements and fuel switching. All sectors show a reduction in final consumption (see Chart 3.3 below). Reductions in final consumption, reductions in conversion losses and fuel switching have reduced primary energy consumption attributed to all sector except for services where increased final demand partly offset reductions in primary consumption delivered by reduced conversion losses and fuel switching.

The data tables include more detailed information on the services and domestic sectors whereby the methodology to estimate final consumption to primary energy equivalents has been applied to produce end use by primary equivalent.

**Chart 3.3 Changes in conversion losses 2000 to 2020**



# Chapter 4: Additional Tables

## End Use

The end use tables show how energy is being used, for example for space or water heating. Final consumption data are sourced from table C1 and proportions are applied to estimate end uses. For the domestic sector (Table U3) the proportions are updated each year using data collected for the English Housing Survey and modelled. For the industry sector, end use splits are based on estimates last updated in 2014. The splits for the services sector are sourced from the Building Energy Efficiency Survey (BEES) which was undertaken by BEIS in 2015. The transport sector is only included in table U1 for completeness' sake. For further information, see methodology note in the End Use data tables workbook.

Understanding what energy is eventually used for is useful in assessing consumer behaviours which in turn contributes to developing policies and establishing future strategies.

Estimating end uses is difficult and some sectors are more challenging than others, due to data availability. Most estimates are modelled and use assumptions.

## Electrical Products

The electrical products tables show the stock of certain domestic and non-domestic appliances, including electricity consumption and efficiency bands. The data are derived from modelling individual products and are therefore not representative of total electricity consumption in the domestic and non-domestic sectors. See product information sheet for a list of products included and the commentary for more background.

Data in the electrical products tables are the results of modelling against a prescribed but quite wide-ranging set of electrical products used in the home and workplace. The model provides estimates of the total stock (Table A2) of these products and their per unit consumption (Table A3) consumption. For the majority of products, total consumption (Table A1) is calculated by multiplying the stock of appliances by the average per product consumption. The resulting outputs are a sub-set of energy consumption in the home and workplace which can be used to assess trends in consumption.

Table A6 has not been updated with the new labelling scheme. Details of the changes made to the labelling of electrical products and links to further information on relevant legislation can be found on the Label 2020 website.

The tables are presented with the first row showing the last update of the model. The modelling has not been updated with data for 2020 so will not capture impacts resulting from the Covid-19 pandemic.

# Chapter 5: Technical information

## Definitions

| | |
|---|---|
| **DUKES glossary** | This covers definitions commonly used in energy statistics reporting. The majority of terms used in this publication are covered in the DUKES glossary; |
| **Energy Intensity** | The amount of energy required to produce one unit of output. A reduction in energy intensity could imply an improvement in energy efficiency. |
| **Energy Ratio** | Temperature corrected total inland consumption of primary energy per 1 million Gross Domestic Product (GDP) at market prices; it is a measure of how much energy is consumed per unit of economic activity (in this case 1m GDP). |
| **Final Consumption** | Energy consumed by final users after transformation. |
| **Tonne Kilometres** | The measure of how much freight has been moved using weight and distance. |
| **Passenger Kilometres** | This measure is based on how far each passenger travels; i.e. it is dependent not only on how many passengers, but also how far each one has travelled. |
| **Primary Energy Equivalents** | Final consumed plus energy in the transformation sector and losses incurred during conversion and transformation. |
| **Temperature Corrected Consumption** | Energy consumption adjusted for changes due to fluctuations in the weather, to allow underlying trends to be identified. BEIS and the ONS have published methodology notes on temperature adjustments. |
| **Tonne of oil equivalent (toe)** | A common unit of energy measurement which enables different fuels to be directly compared and aggregated. One tonne of oil equivalent is set equal to 41.868 Giga Joules (GJ) or 11,630 kilo Watt hours (kWh). Quantities in this report are generally quoted in thousand tonnes of oil equivalent (ktoe) apart from the electrical products tables where comparison with other tables is not relevant and the more usual GWh are provided. |

# Chapter 6: Further information

## National statistics

This is a National Statistics publication. National Statistics status means that our statistics meet the highest standards of trustworthiness, quality, and public value, and it is our responsibility to maintain compliance with these standards.

The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the UK Statistics Authority: Code of Practice for Statistics.

The continued designation of these statistics as National Statistics was confirmed in September 2018 following a compliance check by the Office for Statistics Regulation. The statistics last underwent a full assessment against the Code of Practice in June 2014.

Designation can be broadly interpreted to mean that the statistics:

- 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.

## 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 BEIS statement of compliance with the Pre-Release Access to Official Statistics Order 2008.

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https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

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