

Pearson BTEC Levels 4 and 5 Higher Nationals in Engineering (RQF)

## **Unit 53: Utilisation of Electrical Power**

# **Unit Workbook 1**

in a series of 2 for this unit

## **Energy Consumption in the UK**



## Energy Consumption in the UK (ECUK) 1970 to 2019

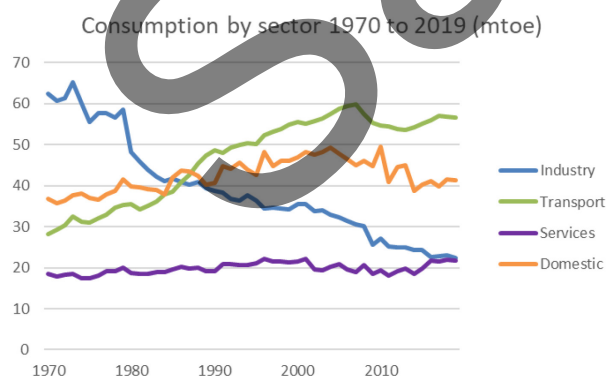
22 October 2020

National Statistics

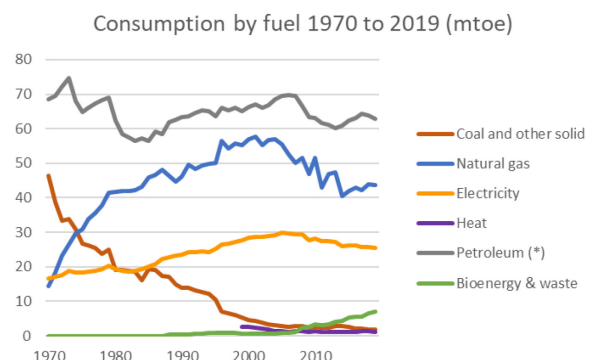
- Total energy consumption in the UK decreased by 1.4 million tonnes of oil equivalent (mtoe) (or 1.0 per cent) between 2018 and 2019 to 142.0 mtoe.
- All sectors saw a fall in consumption with almost half of the total decrease (45 per cent) being accounted for by the industrial sector with a further quarter by the domestic sector.
- With the exception of bioenergy and waste, all fuels saw a decrease particularly petroleum which fell by 0.9 mtoe (1.4 per cent).
- Bioenergy consumption increased by 0.5 mtoe (7.6 per cent) with three quarters of the increase being liquid biofuels consumed in transport offsetting to some extent the fall in petroleum in that sector. Overall, transport consumption fell by just 0.4 per cent.
- The energy ratio fell by 2.6 per cent (Table I1), meaning that increased efficiencies reduced the amount of energy needed to underpin each unit of Gross Domestic Product (GDP, £1 million).
- Figure 1 below shows the long-term trends in consumption by sector and fuel; by sector, the most notable element is the growth in transport consumption and fall in industrial. By fuel, coal has fallen considerably since 1970 (by 96 per cent) with gas consumption more than tripling (though has since fallen by a quarter since consumption peaked in 2001).

**Figure 1: Change in energy consumption by sector and fuel 1970 to 2019**

By sector.



By fuel.





## What you need to know about these statistics:

Energy Consumption in the UK (ECUK) is an annual publication that covers final energy consumption. It is of interest to a wide range of users including academics, energy industry experts, government policy users, and members of the public. These statistics provide additional insights and analysis of final energy consumption to complement the Digest of UK Energy Statistics (DUKES), which focuses on detailed energy balances.<sup>1</sup>

An [interactive tool](#) is published alongside this document which enables users to create and download charts and data tables on consumption according to interests and level of detail required. The tool will be updated for 2019 data on 29<sup>th</sup> October. Additionally, the Excel data tables also contain methodology notes and supporting information along with additional charts enabling users to see all relevant information in one place.

Consumption data are mostly sourced from DUKES and are of good quality. However, some of the modelled tables are based on research undertaken only periodically and have not been updated for some time. This is particularly relevant for end uses in the industrial sector but in the interest of providing a comprehensive picture of detailed consumption patterns, proportions obtained from historical modelling have been applied to updated consumption totals from DUKES. The proportions applied have now been included in the Excel tables marked as reference tables.

Secondly, although this publication covers the UK some of the modelling uses variables that do not have UK-wide coverage. For example, the English Housing Survey underpins some of the analysis in ECUK, but this survey is only for England. Where geographic coverage of variables used for modelling is not complete it has been assumed that characteristics apply to the whole of the UK.

The publication has been split into five themes: Energy Consumption; Energy Intensity; End Use; Primary Energy Equivalents; and Electrical Products.

Data are provided for the period 1970 to 2019 where possible though for some tables, updates are not yet available for 2019 and other series start more recently (e.g. industrial sub sector splits are only available from 1998).

The data are provisional and subject to revision. This year energy consumption data have been revised back to 2016 and the revisions are outlined in section IX of [Chapter 1 in DUKES](#). Table C1 is based on [DUKES Table 1.1.5](#) and revised values have been annotated with an “r” in that table. [Tables 1.1 to 1.3](#) show which values have been revised at a more disaggregated level.

For data sourced from other government departments which are all classified as National Statistics, the reader should refer to the respective publications’ revisions policy.

<sup>1</sup> <https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

# Contents

Introduction	4
Energy Consumption	5
Domestic	6
Transport	8
Road Transport Consumption	9
Industry	11
Services	12
Energy Intensity	14
Transport	14
Domestic	15
Industry	16
Services	16
Output and Intensity Factors	17
Primary Energy Consumption	19
All sectors 2018 to 2019	19
All sectors 2000 to 2019	20
Energy End Uses	22
Electrical Products	24
Introduction	24
Wet Appliances	25
Televisions	27
Consumer Electronics	28
Cold Appliances	29
Technical information	30
Definitions	30
Further information	31
Related statistics	31
Uses of these statistics	31
User engagement	32
National Statistics designation	32
Pre-release access to statistics	32
Contact	32

# Introduction

Energy Consumption in the UK (ECUK) is a publication that complements the Digest of UK Energy Statistics (DUKES), also published by the Department for Business, Energy and the Industrial Strategy. Whilst DUKES provides detailed information on balances, including the supply side of energy to the UK, ECUK includes supplementary analysis of consumption data to provide additional insights into the use of energy by sector in the UK.

Data are presented under five key themes:

## **Energy Consumption**

Taking headline consumption data from the Digest of UK Energy Statistics (DUKES), this section examines energy use by fuel and sector (e.g. use of electricity, biofuels and petroleum products in transport).

## **Energy Intensity**

This section examines the relationship between energy used and output over time, for example the amount of fuel used in transport compared to the number of passenger numbers and miles travelled. Lower ratios can indicate improved energy efficiencies (among other effects) to achieve the same output using less energy.

## **End Use**

To further explore the use of energy in the UK, this section models consumption reported in DUKES by estimating the proportions of end uses for each fuel. An example would be the amount of gas used in the domestic sector for space heating, water heating and cooking.

## **Primary Energy Equivalents**

The above sections on consumption, end use and intensity examine final consumption of energy, which does not include use by the energy industry and losses. Primary demand includes these elements of demand and is therefore higher than final consumption. This section apportions energy on a primary demand basis to each sector. This is helpful to understand the total energy requirements to not only supply energy for final consumption, but also to generate the energy supplied to each sector.

## **Electrical Products**

Using modelled data, this section shows how much electricity was used by electrical appliances. Only certain electrical products have been modelled, meaning that total use here does not match electricity demand elsewhere in ECUK or in DUKES. These tables are shown in Gigawatt Hours (GWh) only because they are not comparable to these other statistics.

For comparison purposes across fuel types energy is quoted in thousand tonnes of oil equivalent (ktoe), unless stated; the electrical products tables are however, presented in Giga Watt hours (GWh) as these tables are not comparable with others in the publication. This is standard practice when considering electricity in isolation.

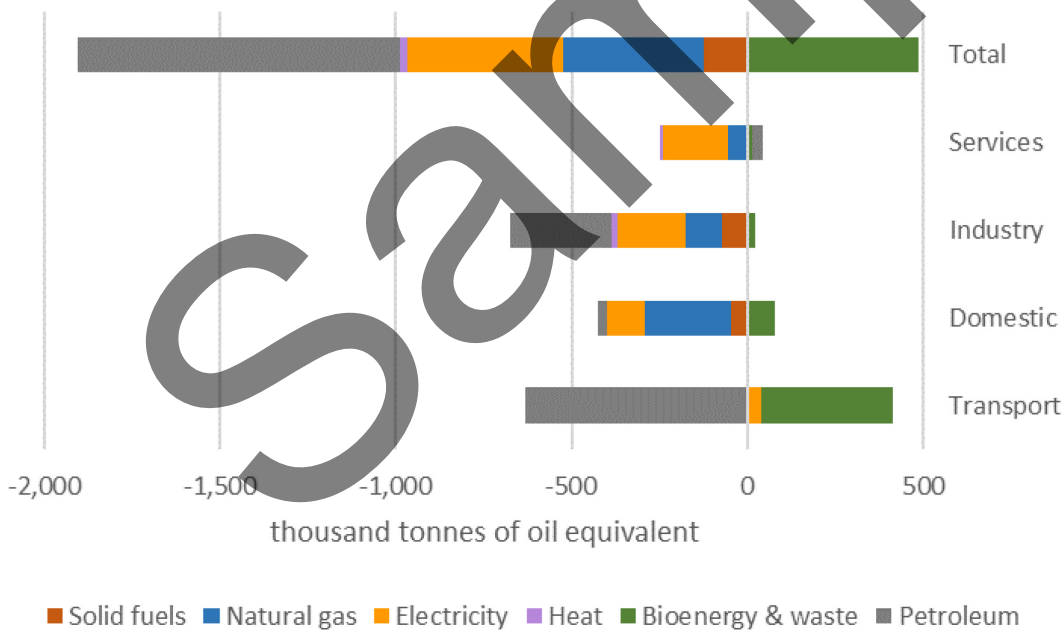
# Energy Consumption

Between 2018 and 2019, consumption (excluding non-energy use) decreased by 1.4 mtoe (1.0 per cent) to 142.0 mtoe, see [consumption tables](#) accompanying this publication, Table C1.

Figure 2 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. For example, it shows that a large proportion of the fall in petroleum consumption is in the transport sector, much of which has been offset by an increase in liquid biofuels leaving a small decrease overall (0.4 per cent) in transport.

If a sector shows a fall in consumption for all fuel types, rather than highlighting possible fuel switching, it could reflect an overall reduction in activity or improving efficiencies, although impacts of the latter are more likely to be seen over a longer time frame (see section on energy intensity). The industrial sector showed such a decrease across fuel types with petroleum falling the most in both absolute and percentage terms (by 0.3 mtoe, or 11.2 per cent) and with electricity falling by 0.2 mtoe (2.4 per cent). Gas consumption fell slightly (by 0.1 mtoe or 1.2 per cent) and solid fuels also fell but to a lesser extent. Bioenergy and waste, however, increased slightly by 1.7 per cent and now represents 6.6 per cent of industrial consumption though this is lower than its share in 2018 (6.3 per cent).

**Figure 2: Change in consumption by sector and fuel, 2018 to 2019**



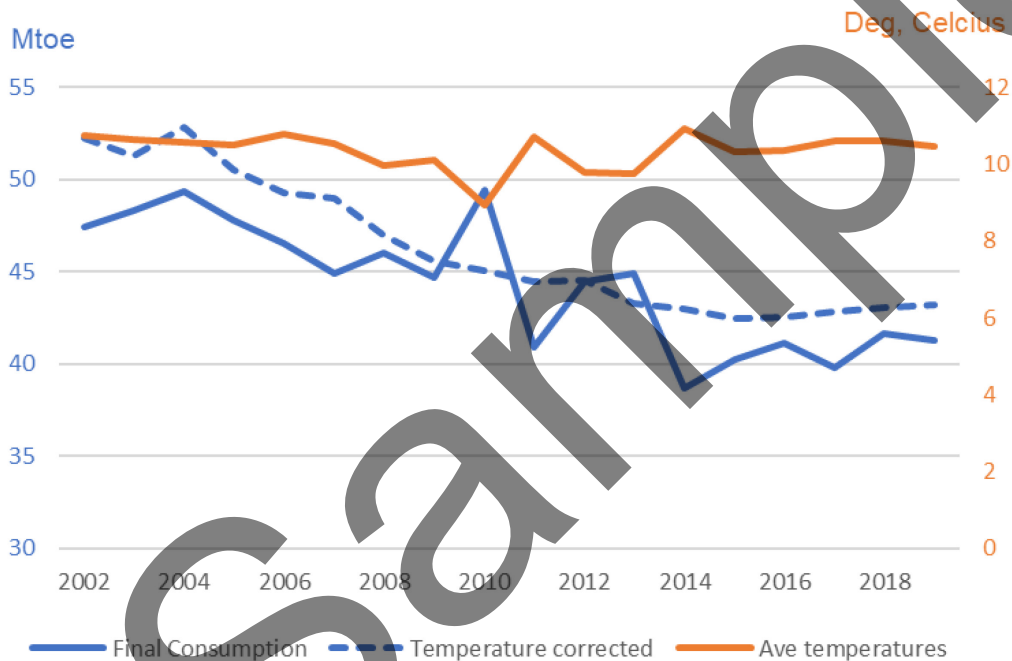
## Domestic

[Table C1](#) shows that consumption in the domestic sector decreased by 0.3 mtoe (0.8 per cent).

All fuels in this sector fell except for bioenergy which increased by 3.3 per cent.

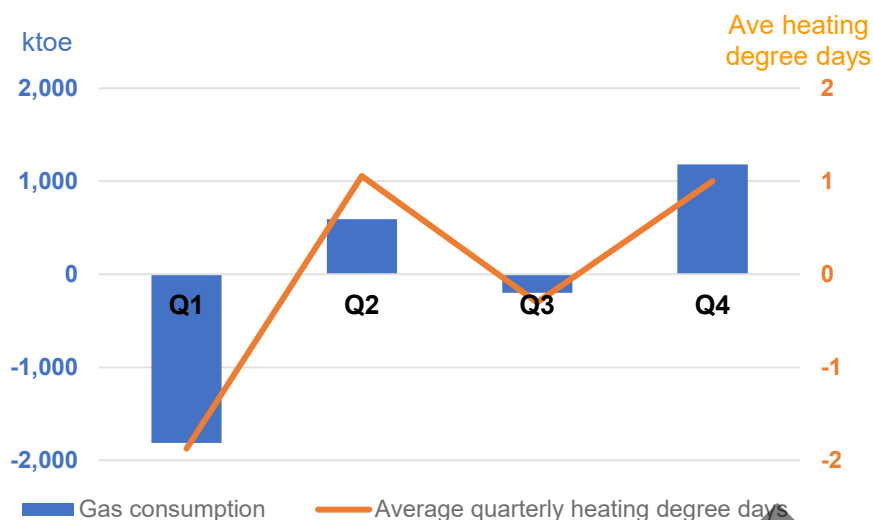
The domestic sector is the most responsive to temperature changes as a larger proportion of consumption is used for space heating. Between 2018 and 2019, the average temperature fell very slightly (from 10.6 degrees Celsius to 10.5 degrees Celsius) having a limited impact on consumption, which actually fell very slightly. Figure 3 shows the trend over a longer time frame and includes years with much larger year on year temperature changes, the effect of which can be more clearly seen in consumption behaviours.

**Figure 3: Domestic consumption, temperature-corrected consumption and average annual temperatures**



Average annual temperatures do not take account of the fact that a cooler summer will not necessarily impact on heating demand, comparing quarterly temperatures and consumption would be expected to show the dependency more clearly. Taking this a step further and considering heating degree days whereby on certain days, a small temperature difference could trigger a household switching on the heating and to what extent, a clearer pattern might emerge. In this case, changes in consumption would be in line with heating degree changes instead of opposing as in the case of average temperatures. Figure 4 below shows the difference in quarterly data for 2018 to 2019 compared with the difference in heating degree days.

**Figure 4: Change in quarterly domestic demand and heating degree days, between 2018 and 2019**



Source; Quarterly gas consumption [Energy Trends Table 4.1](#)

Heating Degree Days [Energy Trends Table 7.1](#)

Quarter one (January to March, the key heating season) shows the largest impact on annual data which could explain why overall heating demand for the year due to this milder heating season was lower overall.

**Biomass** consumption (mostly wood combusted in stoves and open fires) increased 3.3 per cent (or 79 ktoe) reflecting the increasing contribution of renewables in the fuel mix. Its share is still relatively small (5.9 per cent) compared to gas consumption which accounts for 65 per cent of total domestic consumption, though this is less than its peak at 69 per cent in 2004. This compares to just 24 per cent in 1970 (before North Sea Gas came on line) and when solid fuels (coal, and other manufactured fuels) accounted for 49 per cent of domestic consumption (in the [consumption tables](#)).

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

#### [National Energy Efficiency Data Framework \(NEED\)](#)

Published 25<sup>th</sup> June 2020;

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

#### [Household Energy Efficiency Statistics](#)

Published 17<sup>th</sup> September 2020 (headline release) and 19<sup>th</sup> March 2020 (detailed annual statistics);

Statistics relating to the Energy Company Obligation (ECO) and Green Deal.  
The detailed report presents annual updates (last updated 19<sup>th</sup> March 2020) on in-depth ECO statistics and insulation levels.

#### [Fuel Poverty Statistics](#)

Published 25<sup>th</sup> June 2020 covering the year 2018

**Sub-national consumption statistics** (published 19<sup>th</sup> December 2019).

#### [Sub-national electricity consumption data](#)

#### [Sub-national gas consumption data](#)

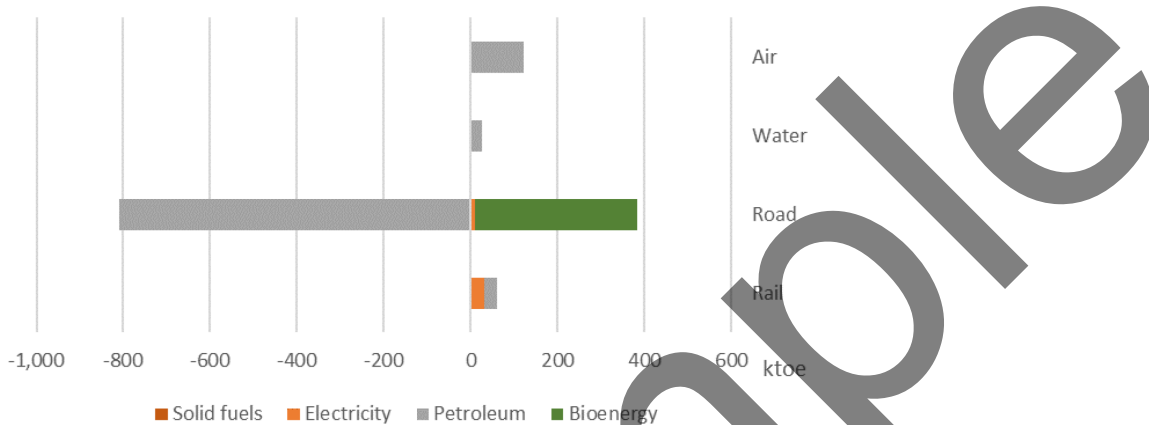


## Transport

Transport consumption decreased slightly in 2019 ([Table C1](#)), falling by 0.2 mtoe (0.4 per cent).

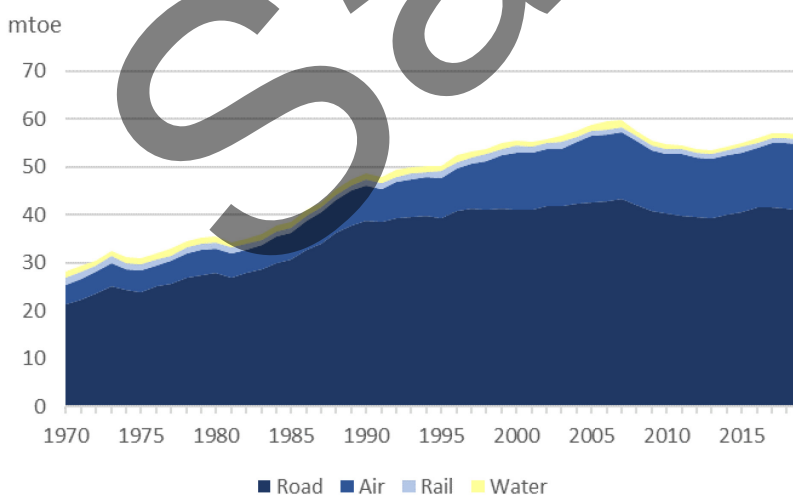
Although overall transport consumption remained broadly stable, Figure 5 shows the increase in the use of liquid biofuels (mostly biodiesel<sup>2</sup>), which partly offset a 1.1 per cent decrease in petroleum use in transport. There was a modest 0.1 mtoe (0.9 per cent) increase in petroleum use for air travel.

**Figure 5: Change in consumption in transport by travel mode and fuel, 2018 to 2019**



Road transport remains the dominant consumer in transport at 72 per cent (compared with 76 per cent in 1970). Figure 6 shows the increasing consumption in road and air transport; rail with water remaining comparatively small.

**Figure 6: Trends in transport consumption from 1970 by mode**

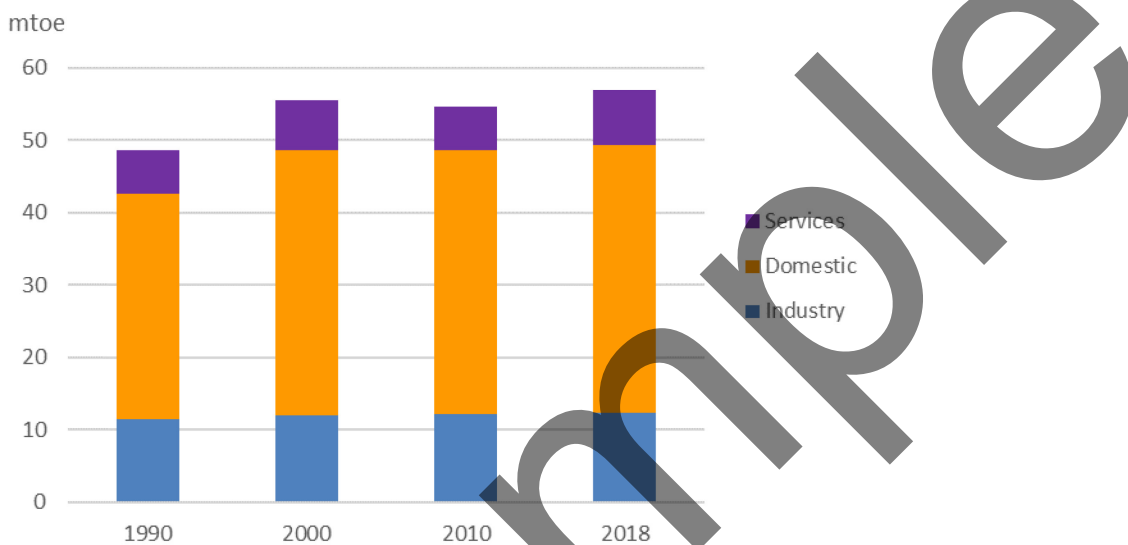


<sup>2</sup> See DUKES chapter 6, paragraphs 6.43 to 6.48; [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/736153/Ch6.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736153/Ch6.pdf)

Although electricity in rail consumption has been a key component of rail travel since 1970, it has only recently seen increasing use in road transport; DUKES has been reporting this since 2004 with just 2 ktoe being consumed during that year. In 2019, this had increased to 32 ktoe; although increasing rapidly, electricity remains a small proportion (less than 0.1 per cent) of road transport consumption<sup>3</sup>.

[Table C7](#) in the data tables models transport consumption by consuming sector; although overall transport has increased since 1990, each sector's share has remained relatively stable from 1990 to 2018 (the latest year for which data are available). Industry's share has fallen from 24 per cent in 1990 to 22 per cent in 2018 while domestic's share has increased from 64 per cent to 65 per cent over the timeframe. The service sector's share increased by from 12 per cent in 1990 to 13 per cent in 2018.

**Figure 7: Trends in transport consumption from 1990 by consuming sector**



## Road Transport Consumption

Figure 8 highlights diesel's increasing share (for all vehicles), notably from the early 1990s onwards until 2017 when diesel<sup>4</sup> narrowly overtook petrol demand. Although diesel demand remained marginally higher in again in 2018, consumption fell, by 1.7 per cent due to increasing volumes of bio-diesel supplied.

<sup>3</sup> See paragraph 5.18 of Chapter 5 of DUKES; [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/736152/Ch5.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736152/Ch5.pdf)

<sup>4</sup> See Energy Trends article for a detailed analysis; [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/812622/Road\\_fuel\\_consumption\\_and\\_the\\_UK\\_motor\\_vehicle\\_fleet.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/812622/Road_fuel_consumption_and_the_UK_motor_vehicle_fleet.pdf)