Key points

- **Crude oil (including NGL) production** in 2019 grew for the second consecutive year reaching the highest level since 2010 following new projects that came online towards the end of 2017. Production in 2019 stands at 38 per cent of the UK’s peak in 1999 and is not sufficient to meet demand, meaning imports remain important (Chart 3.1, DUKES Table 3.1).

- **Imports of crude oil from the US continue to rise and in 2019 reached new record highs**, contributing 26 per cent of UK imports. While Norway remains the single largest source of crude to the UK, its share has fallen in recent years from more than 60 per cent to just under 40 per cent in 2019 (DUKES Table 3.9).

- **Exports of crude oil and NGLs reached a 10 year high in 2019.** The UK became a net importer in 2005, reaching a net trade peak in 2012. Annual net trade has since been in decline, although net imports halved to current levels in 2018 with the development of new projects that near exclusively export abroad (DUKES Table 3.1).

- **Over 40 per cent of the UK’s total energy production in 2019 was from crude oils** with UK refineries producing 61 million tonnes of oil products. Oil products made up nearly half of UK final consumption of energy in 2019. (DUKES Table 1.1, Chart 3.2)

- The gap between UK refinery production and domestic demand means that the UK exported 21 million tonnes of petroleum products. **Almost half of all UK exports is petrol**, much of which is to the Netherlands and the US (DUKES Table 3.10).

- **Russia, the Netherlands, Belgium and the US were large sources of road diesel in 2019**; these four countries accounted for almost three quarters of total road diesel imports. **The top three suppliers of jet fuel were Saudi Arabia, India, and Kuwait** in 2019, comprising more than half of UK jet fuel imports (DUKES Table 3.9).

- **Total demand fell by 1.9 per cent.** Transport contributes to more than 70 per cent of total demand, and transport fuels fell by 1.1 per cent in 2019. A further 9.4 per cent of demand is from the petrochemical industry and this also fell in 2019, by 6.6 per cent (DUKES Table 3.2, Chart 3.3).

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**Introduction**

3.1 As a key fuel in the UK’s energy mix, oil met nearly half of consumer demand in 2019. The majority of this is used for transport including road fuels and for air travel, and oil met 96 per cent of energy used in the transport sector in 2019. Production of crude from the UK Continental Shelf (UKCS) increased by 1.9 per cent to reach 52 million tonnes and comprised 44 per cent of total energy production in the UK. (Table 1.1)

3.2 The flow chart on the following page shows the movement of primary oils and petroleum products, illustrating how crude oils are supplied, transformed in refineries, and then consumed in the various sectors of the UK’s economy. The widths of the bands are proportional to the size of the flow they represent.
Petroleum Flow Chart 2019 (million tonnes)

Note:
This flow chart is based on the data that appear in Tables 3.1 and 3.2.
The numbers on either side of the flow chart will not match due to losses in transformation. Biofuels are not included.
Supply and demand for primary oil (Table 3.1)

3.3 Chart 3.1 summarises trends in production, trade and demand of crude oils since 1998. There has been a steep decline in primary oil production from the UKCS. From its peak of 137 million tonnes in 1999 UKCS production of primary oils has dropped by nearly two-thirds to 52 million tonnes, with the UK becoming a net importer in 2005. Crude oil (including NGL) production in 2019, at 52 million tonnes, grew for the second consecutive year (by 1.9 per cent) following new projects that came online since the end of 2017. This is the highest level of indigenous production since 2010 but is not sufficient to meet demand, at 59 million tonnes, meaning imports remain important.

Chart 3.1: Primary oil supply and demand, 1998-2019

3.4 The sources of crude oil imports from other countries are shown in Map 3A. The main source of the UK’s imports has historically been Norway given its proximity to the UK and similarity in its crude types. UK imports from Norway remained stable in 2019 compared to 2018, with Norway providing 39 per cent of total UK imports. However, this current stability follows recent sharp decreases in supply from Norway; in 2016 Norway provided 62 per cent of UK imports, which dropped to 39 per cent by 2018 (Table 3.9).

Map 3A: Source of UK crude oil imports 2019 (thousand tonnes, Table 3.9)
3.5 **Imports from the US continue to rise and in 2019** a 50 per cent (3.8 million tonne) increase was seen compared to 2018 as US exports reached new record highs since the lifting of the crude export ban at the end of 2015. The US share of UK imports reached 26 per cent in 2019 from 17 per cent in 2018. This was mainly at the expense of imports from Nigeria (down 2.9 million tonnes) and Algeria (down 1.5 million tonnes).

3.6 **Imports from OPEC countries accounted for just 20 per cent of the UK’s crude imports in 2019 at 9.0 million tonnes**, this being a 36 per cent reduction compared to 2018. Most imports from OPEC countries come from Algeria and Nigeria, with both showing substantial reductions by one-half and three-quarters, respectively, in 2019.

3.7 The UK is a significant exporter of crude oils as well as an importer. **Crude oil exports remained stable at 41 million tonnes in 2019**, following the 18 per cent increase in 2018 due to strong production and favourable price spreads resulting in strong demand for Brent crude from Asia.

3.8 The UK **remains a net importer of primary oil products at 7.3 million tonnes in 2019**, a 0.6 million tonne decrease compared to 2018. This is relatively stable when looking back at 2018 where we saw a sharp decline in net imports of primary oils as they almost halved to 7.9 million tonnes compared with 2017, the result of several factors including a decrease in refinery demand and a record low in use of indigenous crude during 2018. In 2019 refinery use of indigenous crude recovered on the record low seen in 2018 by 1.1 million tonnes in 2019 (Energy Trends, Table 3.10).

3.9 Crude oil has historically been principally exported to the Netherlands, Germany, and China, which together comprised 79 per cent of total crude exports in 2019, up from 69 per cent in 2018. This increase in share on 2018 is notably due to exports increasing by more than two-thirds to Germany (up 2.9 million tonnes) and by nearly half to China (up 3.3 million tonnes). China was the second largest recipient of UK crude exports after the Netherlands in 2019, which decreased by 12 per cent.

**UK refineries**

3.10 In 2019 UK refineries received 59 million tonnes of primary oils for processing, an increase of 0.5 million tonnes on 2018. Data for refinery capacity as at the end of 2019 are presented in Table 3A, with the location of these refineries illustrated in Map 3B. The location of the UK’s petrochemical refineries and major import terminals are also marked on the map.

**Table 3A: UK refinery processing capacity as at end 2019**

<table>
<thead>
<tr>
<th>Refinery</th>
<th>Atmospheric Distillation</th>
<th>Reforming</th>
<th>Cracking and Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fawley Exxon</td>
<td>13.3</td>
<td>4.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Stanlow Essar</td>
<td>9.8</td>
<td>1.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Pembroke Valero</td>
<td>10.9</td>
<td>2.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Grangemouth Petrolneos</td>
<td>10.2</td>
<td>1.9</td>
<td>3.5</td>
</tr>
<tr>
<td>Killingholme Phillips 66</td>
<td>11.9</td>
<td>2.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Lindsey Total</td>
<td>5.0</td>
<td>0.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Petrochemical refineries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harwich Petrochem Carless</td>
<td>&lt; 1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Eastham Refinery</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62.3</strong></td>
<td><strong>13.2</strong></td>
<td><strong>33.3</strong></td>
</tr>
</tbody>
</table>

_Million tonnes per annum_
3.11 Refinery capacity has decreased because of rationalisation in this sector and closures in recent years including Murco at Milford Haven in 2014, as well as the Petroplus Teesside refinery in 2009, and the Petroplus Coryton refinery in 2012.
Supply and demand for petroleum products (Table 3.2-3.4)

3.12 Chart 3.2 shows refinery production of petroleum products since 1998. Despite recent rationalisation in the sector the UK’s refineries produced 61 million tonnes of product in 2019. Relatively stable production in recent years has been at least partially due to higher margins for refinery operators following a fall in crude prices in 2016. In 2019, production of petroleum products increased by 0.3 million tonnes.

3.13 The UK’s refinery capacity remains substantial at 33 million tonnes, and one of the highest in Europe. However, over recent years the rationalisation in the sector has meant that in 2019 UK refinery production remains down by one-third since 2008.

Chart 3.2: Production and trade in petroleum products, 1998- 2019

3.14 In 2019 the UK remained a net importer of petroleum products by 13 million tonnes. As with crude oil, imports are critically important to meet UK domestic demand; the UK has been a net importer since 2013. In common with many other countries, domestic supply and demand are not matched on a product-by-product basis.

3.15 The UK’s refineries were developed to produce petrol and fuel oil for electricity generation. However, as demand for diesel and jet fuel have increased UK refineries have not been able to keep pace and now produce a surplus of petrol. To balance demand the UK trades widely and is one of the largest importers of jet fuel and road diesel in the OECD and one of the largest exporters of petrol.

3.16 Map 3C shows the principal product trading partners with the UK. Eight countries account for over three-quarters of the total volume of imports\(^1\). Historically the bulk of products have come via the Netherlands, which acts as a major trading hub (the fuel might have been refined elsewhere in Europe or beyond). Russia, the Netherlands, Belgium and the US were large sources of road diesel in 2019; these four countries accounted for almost three quarters of total road diesel imports in 2019.

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\(^1\) Netherlands, Russia, Saudi Arabia, Belgium, the US, India, Norway and Kuwait (DUKES Table 3.9)
3.17 **The diversity of supply is increasing as demand for key transport fuels increases.** There is a clear split between imports from European countries (which are mainly diesel) and imports from the Middle East (where the bulk of jet fuel is sourced from generally more modern refinery operations than seen in Europe). The top three suppliers of jet fuel were Saudi Arabia, India, and Kuwait in 2019, comprising more than half of UK jet fuel imports (Table 3.9).


3.19 The misalignment between UK refinery production and domestic demand means that the UK exported 21 million tonnes of petroleum products. Almost half of all UK exports is petrol, (much of which continues to go to the Netherlands and the US). Although the US has historically imported the largest share from the UK, this shifted in 2019 and exports to the Netherlands took a 38 per cent share of UK petrol exports compared to 31 per cent for the US. In 2019 gas oil accounted for 13 per cent and fuel oil accounted for 11 per cent of total exports. Exports by country are shown in the experimental table Exports of Crude Oil & Petroleum Products by Country of Destination (Table 3.10).

### Consumption of petroleum products (Tables 3.2. to 3.4)

3.20 More than 70 per cent of the demand for oil is consumed for transport purposes - for planes and road vehicles, including goods vehicles. Oil is critical to transport requirements and will likely remain so in the near term. Cars are more amenable to being adapted to electrification and alternative fuels, although technology to reduce the emissions from planes and large goods vehicles is a priority for government ambitions for Net Zero by 2050 and Project FlyZero.

3.21 Final consumption of petroleum products decreased for the second year running by 1.9 per cent in 2019, this also being the second decrease since 2013 following a period of growth (as illustrated in Chart 3.2). Chart 3.3 shows that consumption in 2019 was primarily for road and aviation fuel, and total transport demand decreased by 1.1 per cent, which was a contributor to the fall in overall consumption.

3.22 Outside of transport, ‘non-energy’ use of oil is the single most significant sector. Here oil is not burnt but instead used as a feedstock to produce plastics and vinyls within the petrochemical industry. Non-energy use of oil has been growing in recent years and is currently around 9 per cent of total demand for oil. Non-energy use was down 6.6 per cent on 2018.

3.23 Oil products are also used by refineries to fuel the refining process, and very small amounts are
3.24 Used for electricity generation. Use of oil products in the energy industry, which includes electricity generation and petroleum refineries, was 1.0 per cent lower in 2019.

3.25 Larger volumes are used by industry and to heat homes and businesses that are ‘off-grid’ and not connected to the gas transmission network. Use in these other sectors was down by 2.2 per cent in 2019 (Chart 3.3). This edition of the Digest continues to use the new method introduced in 2018 to estimate demand in these sectors, re-allocating previously ‘unclassified’ volumes to the domestic, public administration and commercial sectors.

For further detail see Energy Trends special article, Changes to method of estimating sector demand for oil products, at:

Chart 3.3: Oil consumption in the UK 2019

3.26 Historically consumption of petrol was greater than diesel until the end of 2004, which marked a period of crossover. Demand for petrol had until very recently decreased each year since 2000, whereas demand for diesel has increased in 17 of the last 19 years. Diesel has accounted for around two-thirds of road fuel consumption since 2014, but in a recent reversal of the trend of growth diesel consumption (excluding biodiesel) has fallen for the second year in a row since 2009. This is partly a result of slowing growth in the diesel vehicle fleet following sharp drops in new registrations after changes to diesel vehicle taxation announced in 2018, as well as increased efficiencies.

3.27 Table 3B shows that the volume of diesel being consumed by cars and taxis almost quadrupled between 1995 and 2019 as diesel registrations have doubled since 2001. This displacement of petrol registrations and demand reversed in 2018 meaning demand for diesel (excluding biodiesel) fell by 3.4 per cent in 2019. The first annual increase in petrol was seen with a growth of 1.1 per cent in 2019 compared to 2018.

For further information see Energy Trends special article, Road fuel consumption and the UK motor vehicle fleet, at:
Table 3B: Estimated consumption of road transport fuels by vehicle class

<table>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cars and taxis</td>
<td>19.9</td>
<td>20.2</td>
<td>18.1</td>
<td>14.1</td>
<td>11.3</td>
</tr>
<tr>
<td>Light goods vehicles</td>
<td>1.6</td>
<td>1.0</td>
<td>0.5</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Motorcycles etc.</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>21.7</td>
<td>21.4</td>
<td>18.9</td>
<td>14.6</td>
<td>11.7</td>
</tr>
<tr>
<td>Diesel:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cars and taxis</td>
<td>2.8</td>
<td>4.1</td>
<td>6.6</td>
<td>8.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Light goods vehicles</td>
<td>2.5</td>
<td>3.5</td>
<td>4.6</td>
<td>4.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Heavy goods vehicles</td>
<td>6.2</td>
<td>6.1</td>
<td>6.7</td>
<td>5.9</td>
<td>6.3</td>
</tr>
<tr>
<td>Buses and coaches</td>
<td>1.7</td>
<td>1.5</td>
<td>1.5</td>
<td>1.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>13.2</td>
<td>15.3</td>
<td>19.4</td>
<td>20.7</td>
<td>23.8</td>
</tr>
</tbody>
</table>

*Data for 2019 have been estimated using 2018 percentage splits

Stocks of oil (Table 3.7)

3.28 Under international commitments to both the European Union and the International Energy Agency, the UK is obliged to hold oil stocks to offset the impact of significant disruptions to the global oil market. Such disruptions are relatively rare, but since the Arab-Israel war of 1974 there have been three globally co-ordinated releases of oil in response to the Gulf War (1990–1991), Hurricane Rita (2005), and the civil war in Libya (2011).

3.29 At the end of 2019, the UK held 15.2 million tonnes of stocks (Energy Trends Table 3.6). Of this total, 12.8 million tonnes were held for emergency purposes (DUKES Table 3.7), broadly equivalent to around just over 61 days of typical consumption. These stocks are held both in the UK and overseas under contractual arrangements that allow stocks to be repatriated to the UK if necessary. For the last quarter of 2019, just under 4.7 million tonnes were held in other EU countries, most notably in the Netherlands. The UK also holds further stocks in the UK (not shown here) under contractual arrangement for other countries, but to a far smaller degree.

Oil resources

3.30 The Oil and Gas Authority estimates that there are 481 million tonnes of proven and probable (2P) oil reserves at the end of 2019, of which 390 million tonnes are proven reserves. The volume produced plus 2P reserves have more than doubled since 1980, reflecting new discoveries, new technology allowing exploitation of resources that were previously regarded as uncommercial, and the inclusion of already-known fields as they entered production or moved from 'prospective' to 'probable' status. Replenishment of sanctioned oil and gas reserves through exploration and maturation of contingent resources has recently flattened. The apparent decline in reserves in 2015 was due to re-classification of some reserves that had not yet been sanctioned - these will be included in future as and when sanctioned.

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2 The Oil and Gas Authority will update with detailed estimates in November 2020: www.ogauthority.co.uk/data-centre/data-downloads-and-publications/reserves-and-resources/
Further Information

3.31 In addition to the information in this chapter, there is considerable data on BEIS’s website. Information on long-term trends (Tables 3.1.1 and 3.1.2) and the annex on the oil and gas resources in the UK (Annex F) provide a more complete picture of the UK oil and gas production sector. These tables are at [www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes](http://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes).

List of DUKES oil tables

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</tr>
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<td>Primary oil commodity balances – alternative units (barrels and litres)</td>
<td>1998-2019</td>
</tr>
<tr>
<td>3.2-3.4</td>
<td>Petroleum products commodity balances</td>
<td>1998-2019</td>
</tr>
<tr>
<td>3.2-3.4au</td>
<td>Petroleum products commodity balances – alternative units (barrels and litres)</td>
<td>1998-2019</td>
</tr>
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<td>3.7</td>
<td>Stocks of crude oil and petroleum products at end of year</td>
<td>2012-2019</td>
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<td>3.8</td>
<td>Additional information on inland deliveries for non-energy uses</td>
<td>2012-2019</td>
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<td>Exports of crude oil and petroleum products by country of destination (experimental)</td>
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<td>Crude oil and petroleum products: production, imports and exports</td>
<td>1970-2019</td>
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<tr>
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<td>Inland deliveries of petroleum</td>
<td>1970-2019</td>
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<td>Natural gas liquids net production</td>
<td>1999-2019</td>
</tr>
<tr>
<td>F.4</td>
<td>Disposals of crude oil</td>
<td>1998-2019</td>
</tr>
</tbody>
</table>
Technical notes and definitions

3.32 These notes and definitions are in addition to the technical notes and definitions covering all fuels and energy in Chapter 1.

Sources of data

3.33 Most of the data included in the text and tables of this chapter are derived from BEIS’s Downstream Oil Reporting System (DORS), which replaced the UK Petroleum Industry Association (UKPIA) reporting system in 2005. Data relating to the inland operations of the UK oil industry (i.e. information on the supply, refining and distribution of oil in the UK) are collected from companies. The data format and coverage have been designed to meet most of the needs of both Government and the industry itself. Each member of UKPIA and several other contributing companies provides returns on its refining activities and deliveries of various products to the internal UK market. This information is supplemented whenever necessary to allow for complete coverage within the statistics, with separate exercises carried out on special topics (for example, supermarket shares) or with the use of additional data (such as trade data from HM Revenue and Customs (HMRC) to cover import activity by non-reporting companies). In addition to these data sources, BEIS make use of the Emissions data from the EU’s Emissions Trading Scheme provided on major energy users to ensure the consistency of data on fuel used within refineries (refinery gases and petroleum coke) and sectoral usage of Gas oil and Fuel oil.

3.34 In 2014 BEIS introduced a new reporting form to major oil importers. The new form indicated the need for more detailed surveys of large importers within the UK and from January 2015 all major importers were obliged to complete the more detailed DORS form used by refiners. The DORS survey now offers substantially greater insight (particularly with respect to trade and blending activities).

Statistical differences

3.35 The upper half of the balance tables represents the supply side and calculates overall availability of the various products in the UK by combining production at refineries with trade (imports and exports), stock changes, product transfers and deliveries to international marine bunkers (fuel used by ships travelling to a foreign destination).

3.36 The lower half of the table reports the demand side and covers the uses made of the different products, including the use made within the refining process, and details of the amounts reported by oil companies within the UK as delivered for final consumption.

3.37 In Tables 3.1 to 3.5, there are headings titled “statistical differences”. These are differences between the separately observed figures for production and delivery of crude oil and products during the path of their movement from the point of production to the point of consumption.

3.38 The statistical differences headings listed in the primary oil commodity balances (Table 3.1) are differences between the separately observed and reported figures for production from onshore or offshore fields and supply to the UK market that cannot be accounted for by any specific factors. Primarily they result from inaccuracies in the meters at various points along offshore pipelines. These meters vary slightly in their accuracy within accepted tolerances, giving rise to both losses and gains when the volumes of oil flowing are measured. Errors may also occur when non-standard conditions are used to meter the oil flow.

3.39 The statistical difference for primary oils in the table includes own use in onshore terminals and gas separation plants, losses, platform and other field stock changes. Another factor is the time lag that can exist between production and loading onto tankers being reported at an offshore field and the arrival of these tankers at onshore refineries and oil terminals. This gap is usually minimal and works such that any effect of this at the start of a month is balanced by a similar counterpart effect at the end of a month. However, there can be instances where the length of this interval is considerable and, if it happens at the end of a year, there can be significant effects on the statistical differences seen for the years involved.

3.40 Another technical factor that can contribute to the statistical differences relates to the recording of quantities at the producing field (which is the input for the production data) and at oil terminals and refineries, since they are in effect measuring different types of oil. Terminals and refineries can measure a standardised, stabilised crude oil, that is, with its water content and content of Natural Gas Liquids
(NGLs) at a standard level and with the amounts being measured at standard conditions. However, at the producing field they are dealing with a “live” crude oil that can have a varying level of water and NGLs within it. While offshore companies report live crude at field, the disposals from oil terminals and offshore loading fields are reported as stabilised crude oil. This effectively assumes that terminal disposals are stabilised crude production figures. These changes were introduced in the 2002 edition of this Digest.

3.41 Part of the overall statistical difference may also be due to problems with the correct reporting of individual NGLs at the production site and at terminals and refineries. It is known that there is some mixing of condensate and other NGLs in with what might otherwise be stabilised crude oil before it enters the pipeline. This mixing occurs as it removes the need for separate pipeline systems for transporting the NGLs and it also allows the viscosity of the oil passing down the pipeline to be varied as necessary. While the quantity figures recorded by terminals are in terms of stabilised crude oil, with the NGL component removed, there may be situations where what is being reported does not comply with this requirement.

3.42 With the downstream sector, the statistical differences can similarly be used to assess the validity and consistency of the data. From the tables, these differences are generally a very small proportion of the totals involved.

3.43 Refinery data are collated from details of individual shipments received and made by each refinery and terminal operating company. Each year there are thousands of such shipments, which may be reported separately by two or three different companies involved in the movement. While intensive work is carried out to check these returns, it is possible that some double counting of receipts may occur.

3.44 Temperature, pressure, and natural leakage also contribute to the statistical differences. In addition, small discrepancies can occur between the estimated calorific values used at the field and the more accurate values measured at the onshore terminal where data are shown on an energy basis. The statistical differences can also be affected by rounding, clerical errors or unrecorded losses, such as leakage. Other contributory factors are inaccuracies in the reporting of the amounts being disposed of to the various activities listed, including differences between the quantities reported as going to refineries and the actual amounts passing through refineries.

3.45 Similarly, the data under the statistical difference headings in Tables 3.2 to 3.4 are the differences between the deliveries of petroleum products to the inland UK market reported by the supplying companies and estimates for such deliveries. These estimates are calculated by taking the output of products reported by refineries and then adjusting it by the relevant factors (such as imports and exports of the products, changes in the levels of stocks etc.).

3.46 It may be thought that such differences should not exist as the data underlying both the observed deliveries into the UK market and the individual components of the estimates (i.e. production, imports, exports, stocks) come from the same source (the oil companies). While it is true that each oil company provides data on its own activities in each area, there are separate areas of operation within the companies that report their own part of the overall data. Table 3C illustrates this.

**Table 3C: Sources of data within oil companies**

<table>
<thead>
<tr>
<th>Area covered</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery production</td>
<td>Refinery</td>
</tr>
<tr>
<td>Imports and exports</td>
<td>Refinery, logistics departments, oil traders</td>
</tr>
<tr>
<td>Stocks</td>
<td>Refinery, crude and product terminals, major storage and distribution sites</td>
</tr>
<tr>
<td>Final deliveries</td>
<td>Sales, marketing and accounts departments, trade associations</td>
</tr>
</tbody>
</table>

3.47 Each individual reporting source will have direct knowledge of its own data. For example, refineries will know what they produce and how much leaves the refinery gate as part of routine monitoring of the refinery operations. Similarly, other data such as sales to final consumers or imports and exports will be closely monitored. Companies will ensure that each component set of data reported is as accurate as
possible but their reporting systems may not be integrated, meaning that internal consistency checks across all reported data cannot be made. Each part of a company may also work to different timings as well, which may further add to the degree of differences seen.

3.48 The main area where there is known to be a problem is with the “Transfers” heading in the commodity balances. The data reported under this heading have two components. Firstly, there is an allowance for reclassification of products within the refining process. For example, butane can be added to motor spirit to improve the octane rating, aviation turbine fuel could be reclassified as domestic kerosene if its quality deteriorates, and much of the fuel oil imported into the UK is further refined into other petroleum products. Issues can arise with product flows between different reporting companies, for example when company A delivers fuel oil to company B who report a receipt of a feedstock. Secondly, and in addition to these inter-product transfers, the data also include an allowance to cover the receipt of backflows of products from petrochemical plants that are often very closely integrated with refineries. A deduction for these backflows thus needs to be included under the ”Transfers” heading so that calculated estimates reflect net output and are thus more comparable with the basis of the observed deliveries data.

3.49 There is scope for error in the recording of these two components of transfers. With inter-product transfers, the data are recorded within the refinery during the refining and blending processes where the usual units used to record the changes are volumes rather than masses. Different factors apply for each product when converting from a volume to mass basis, as shown by the conversion factors given in Annex A of this Digest. Thus, a balanced transfer in volume terms may not be equivalent when converted to a mass basis. This is thought to be the main source of error within the individual product balances.

Revisions to published data

3.50 Substantial revisions were made in 2019 to sector estimates of demand following an extensive programme of improvement that is ongoing. This work has been delayed by the UK-wide lockdown during the COVID-19 pandemic. For further information see Energy Trends special article, Change to method of estimating sector demand for oil products, at: [www.gov.uk/government/publications/energy-trends-june-2019-special-feature-article-change-to-method-of-estimating-sector-demand-for-oil-products](http://www.gov.uk/government/publications/energy-trends-june-2019-special-feature-article-change-to-method-of-estimating-sector-demand-for-oil-products)

3.51 Minor revisions have been made following updates received from data suppliers.

Indigenous production

3.52 The term indigenous is used throughout this chapter and includes oil from the UK Continental Shelf, both offshore and onshore. Production of feedstocks at petrochemical plants that are delivered to refineries as backflows have not been included in production figures in the text or charts in this chapter.

Deliveries

3.53 These are deliveries into consumption, as opposed to being estimates of actual consumption or use. They are split between inland deliveries and deliveries to marine bunkers. Inland deliveries will not necessarily be consumed in the UK (e.g. aviation fuels).

Imports and exports

3.54 They can differ in some cases from the import and export figures provided by HMRC that are given in Annex G on BEIS’s energy statistics website. Such differences arise from timing differences between actual and declared movements but also result from the Customs figures including re-exports. These are products that may have originally entered the UK as imports from another country and been stored in the UK prior to being exported back out of the UK, as opposed to having been produced in the UK.

Marine bunkers

3.55 This covers deliveries to be used by ocean going and coastal vessels under international bunker contracts. Other deliveries to fishing, coastal and inland vessels are excluded. As part of BEIS’s audit programme, UK refinery contacts reviewed the provision of fuel to marine bunkers in 2009. Whilst several companies have reviewed their methodology there are still issues with determining the final destination of fuel when these are supplied to third parties that are not part of BEIS’s monitoring programme. This issue impacts on both the volumes delivered directly to marine vessels, and whether those vessels are engaged in domestic or international navigation. Whilst BEIS will continue to work closely with reporting
companies to improve the estimation of marine fuel use. We have aligned energy demand for shipping in line with the estimates of marine fuel use in the UK's National Atmospheric Emissions Inventory (NAEI). The NAEI figures use BEIS’s estimate of marine fuels and derive the split between international and domestic use based on an activity-based study of the UK's marine fuel use.

**Backflows from the petrochemical sector**

3.56 BEIS and Industry have also worked to better understand product flows between refiners and petrochemical plants. Whilst most petroleum products are used for energy purposes, substantial volumes are delivered to the petrochemical industry as a feedstock for the manufacturing of plastics, synthetic fibres and other products. These products are used, but they are not combusted. The refining and petrochemical industries are often closely related as shown in Figure 3.1 below. Refineries deliver product to a petrochemical plant for the production of a range of products, but these plants also return some petroleum products back to refineries for further processing.

![Figure 3.1: Deliveries to the Petrochemical Sector (Source: IEA)](image)

3.57 Since the 2015 edition of this Digest BEIS has separately identified deliveries of backflows from petrochemical plants under both the upstream side of the balance (in Table 3.1 they are included as part of the ‘feedstocks’ column) and the downstream part of the balance (in Table 3.2 to 3.4 the volumes are shown on the ‘other’ row in the transformation section).

**Crude and process oils**

3.58 These are all feedstocks, other than distillation benzene, for refining at refinery plants. Gasoline feedstock is any process oil whether clean or dirty which is used as a refinery feedstock for the manufacture of gasoline or naphtha. Other refinery feedstock is any process oil used for the manufacture of any other petroleum products.

**Refineries**

3.59 Refineries distil crude and process oils to obtain petroleum products. This excludes petrochemical plants, plants only engaged in re-distilling products to obtain better grades, crude oil stabilisation plants and gas separation plants.

**Products used as fuel (energy use)**

3.60 The following paragraphs define the product headings used in the text and tables of this chapter. The products are used for energy, either directly as a fuel or as an input into electricity generation.

- **Refinery fuel** - Petroleum products used as fuel at refineries.

- **Ethane** - A naturally gaseous straight-chain hydrocarbon (C2H6) in natural gas and refinery gas streams. Primarily used, or intended to be used, as a chemical feedstock.

- **Propane** - Hydrocarbon containing three carbon atoms (C3H8), gaseous at normal temperature but generally stored and transported under pressure as a liquid. Used mainly for industrial purposes, but also as transport, Liquid Petroleum Gas (LPG), and some domestic heating and cooking.
Butane - Hydrocarbon containing four carbon atoms (C4H10), otherwise as for propane. Additionally, used as a constituent of motor spirit to increase vapour pressure and as a chemical feedstock.

Naphtha (Light distillate feedstock) - Petroleum distillate boiling predominantly below 200 °C.

Aviation spirit - All light hydrocarbon oils intended for use in aviation piston-engine power units, including bench testing of aircraft engines.

Motor spirit - Blended light petroleum components used as fuel for spark-ignition internal-combustion engines other than aircraft engines:

(i) Premium unleaded grade - all finished motor spirit, with an octane number (research method) not less than 95.

(ii) Lead Replacement petrol / Super premium unleaded grade - finished motor spirit, with an octane number (research method) not less than 97.

Aviation turbine fuel (ATF) - All other turbine fuel intended for use in aviation gas-turbine power units and including bench testing of aircraft engines.

Burning oil (kerosene or “paraffin”) - Refined petroleum fuel, intermediate in volatility between motor spirit and gas oil, used primarily for heating. White spirit and kerosene used for lubricant blends are excluded.

Gas/diesel oil - Petroleum fuel having a distillation range immediately between kerosene and light-lubricating oil:

(i) DERV (Diesel Engine Road Vehicle) fuel - automotive diesel fuel for use in high speed, compression ignition engines in vehicles subject to Vehicle Excise Duty.

(ii) Gas oil - used as a burner fuel in heating installations, for industrial gas turbines and as for DERV (but in vehicles not subject to Vehicle Excise Duty e.g. agricultural vehicles, fishing vessels, construction equipment used off road and usually coloured with a red marker dye). Gas oil used for oil and gas extraction is included from 2005 onwards.

(iii) Marine diesel oil - heavier type of gas oil suitable for heavy industrial and marine compression-ignition engines.

Fuel oil - Heavy petroleum residue blends used in atomising burners and for heavy-duty marine engines (marine bunkers, etc.) with heavier grades requiring pre-heating before combustion. Excludes fuel oil for grease making or lubricating oil and fuel oil sold as such for road making.

Products not used as fuel (non-energy use)
3.61 The following paragraphs define the product headings used in the text and tables of this chapter, which are used for non-energy purposes.

Feedstock for petroleum chemical plants - All petroleum products intended for use in the manufacture of petroleum chemicals. This includes middle distillate feedstock of which there are several grades depending on viscosity. The boiling point ranges between 200 °C and 400 °C. (A deduction has been made from these figures equal to the quantity of feedstock used in making the conventional petroleum products that are produced during the processing of the feedstock. The output and deliveries of these conventional petroleum products are included elsewhere as appropriate.)
White spirit and specific boiling point (SBP) spirits - These are refined distillate intermediates with a distillation in the naphtha / kerosene range. White spirit has a boiling range of about 150°C to 200°C and is used as a paint or commercial solvent. SBP spirit is also known as Industrial spirit and has a wider boiling range that varies up to 200°C dependent upon its eventual use. It has a variety of uses that vary from use in seed extraction, rubber solvents and perfume.

Lubricating oils (and grease) - Refined heavy distillates obtained from the vacuum distillation of petroleum residues. Includes liquid and solid hydrocarbons sold by the lubricating oil trade, either alone or blended with fixed oils, metallic soaps and other organic and/or inorganic bodies. A certain percentage of inland deliveries are re-used as a fuel, but all inland deliveries of lubricating oils have been classified as non-energy use only. Some deliveries are used for energy purposes, but it is difficult to estimate energy use figures with any degree of accuracy, hence no such estimates appear in the commodity balance tables. DUKES Table 3.8 (prior to 2010, table 3D, within the main text) provides limited information on the use of lubricants and grease. The information which was published under the heading of "Motors" has been amended to now include “Gear Oils and Transmission” to give a full picture of the lubricants used by vehicles.

Bitumen - The residue left after the production of lubricating oil distillates and vacuum gas oil for upgrading plant feedstock. Used mainly for road making and building construction purposes. Includes other petroleum products such as creosote and tar mixed with bitumen for these purposes and fuel oil sold specifically for road making.

Petroleum wax - Includes paraffin wax, which is a white crystalline hydrocarbon material of low oil content normally obtained during the refining of lubricating oil distillate, paraffin scale, slack wax, microcrystalline wax and wax emulsions. Used for candle manufacture, polishes, food containers, wrappings etc.

Petroleum cokes - Carbonaceous material derived from hydrocarbon oils, uses for which include metallurgical electrode manufacture. Quantities of imports of this product are used as a fuel as it has a higher energy content than coal, though a lower energy content than fuel oils.

Miscellaneous products - Includes aromatic extracts, defoament solvents and other minor miscellaneous products.

Main classes of consumer
3.62 The following are definitions of the main groupings of users of petroleum products used in the text and tables of this chapter.

Electricity generators - Petroleum products delivered for use by major power producers and other companies for electricity generation including those deliveries to the other industries listed below which are used for autogeneration of electricity (Tables 3.2 to 3.4). This includes petroleum products used to generate electricity at oil refineries and is recorded in the Transformation section, as opposed to other uses of refinery fuels that are recorded in the Energy Industry Use section. From the 2009 chapter of the Digest, data in Chapter 3 (Table 3.2 to 3.4) has been aligned with Chapter 5 (Table 5.4). The data on oil used for electricity generation collected from major power producers and autogenerators is judged to be at least as accurate as the data from refiners on deliveries, and has the advantage of consistency.

Agriculture - Deliveries of fuel oil and gas oil/diesel for use in agricultural power units, dryers and heaters. Burning oil for farm use.

Iron and steel - Deliveries of petroleum products to steel works and iron foundries. This is now based on information from the Iron and Steel Statistics Bureau.

Other industries - The industries covered correspond to the industrial groups shown in Table 1G of Chapter 1, excluding Iron and Steel.

National navigation - Fuel oil and gas/diesel oil delivered, other than under international bunker contracts, for fishing vessels, UK oil and gas exploration and production, coastal and inland shipping and for use in ports and harbours.
Railways - Deliveries of fuel oil, gas/diesel oil and burning oil to railways now based on estimates produced by Ricardo Energy and Environment as part of their work to compile the UK National Atmospheric Emissions Inventory (NAEI).

Air transport - Total inland deliveries of aviation turbine fuel and aviation spirit. The figures cover deliveries of aviation fuels in the UK to international and other airlines, British and foreign Governments (including armed services) and for private flying. In order to compile the NAEI, Ricardo Energy and Environment need to estimate how aviation fuel usage splits between domestic and international consumption. Information from Ricardo Energy and Environment suggests that virtually all aviation spirit is used domestically while just 5 per cent of aviation turbine fuel use is for domestic consumption. A further 5 per cent is estimated to be consumed by the military.

Road transport - Deliveries of motor spirit and DERV fuel for use in road vehicles of all kinds.

Domestic - Fuel oil and gas oil delivered for central heating of private houses and other dwellings and deliveries of kerosene (burning oil) and liquefied petroleum gases for domestic purposes (see Tables 3.2 to 3.4).

Public services - Deliveries to national and local Government premises (including educational, medical and welfare establishments and British and foreign armed forces) of fuel oil and gas oil for central heating and of kerosene (burning oil).

Miscellaneous - Deliveries of fuel oil and gas oil for central heating in premises other than those classified as domestic or public.

Biofuels in transport

3.63 The quantity of biofuels blended into motor spirit and DERV are shown in Table 3.6 of this chapter. Total consumption of biofuels and road fuels are shown in Table 3D, this is based on the volume of fuel for which excise duty has been paid to HM Revenue and Customs (HMRC). As a percentage of road fuels biofuels increased significantly from 2007 until 2010 however this percentage has remained relatively flat since at 5 per cent, up 1 per cent on 2018. Whilst petrol has remained flat in recent years there has been an increase in consumption of bio diesel, up 40 per cent on 2018. Further details on biofuel consumption can be found in Chapter 6. Biofuels are also included in the overall energy balances in Chapter 1.

Table 3D: Consumption of Biodiesel and Bioethanol in the UK 2008 to 2019

<table>
<thead>
<tr>
<th>Year</th>
<th>Biodiesel</th>
<th>All diesel including biodiesel</th>
<th>Biodiesel as % diesel</th>
<th>Bioethanol</th>
<th>All petrol including bioethanol</th>
<th>Bioethanol as % petrol</th>
<th>Biofuels as % total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>886</td>
<td>25,686</td>
<td>3.4%</td>
<td>206</td>
<td>22,709</td>
<td>0.9%</td>
<td>2.3%</td>
</tr>
<tr>
<td>2009</td>
<td>1,044</td>
<td>25,089</td>
<td>4.2%</td>
<td>320</td>
<td>22,029</td>
<td>1.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>2010</td>
<td>1,049</td>
<td>25,773</td>
<td>4.1%</td>
<td>631</td>
<td>20,650</td>
<td>3.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>2011</td>
<td>925</td>
<td>25,926</td>
<td>3.6%</td>
<td>652</td>
<td>19,548</td>
<td>3.3%</td>
<td>3.5%</td>
</tr>
<tr>
<td>2012</td>
<td>634</td>
<td>26,348</td>
<td>2.4%</td>
<td>775</td>
<td>18,792</td>
<td>4.1%</td>
<td>3.1%</td>
</tr>
<tr>
<td>2013</td>
<td>766</td>
<td>26,969</td>
<td>2.8%</td>
<td>820</td>
<td>18,020</td>
<td>4.6%</td>
<td>3.5%</td>
</tr>
<tr>
<td>2014</td>
<td>954</td>
<td>27,985</td>
<td>3.4%</td>
<td>814</td>
<td>17,672</td>
<td>4.6%</td>
<td>3.9%</td>
</tr>
<tr>
<td>2015</td>
<td>669</td>
<td>28,884</td>
<td>2.3%</td>
<td>795</td>
<td>17,319</td>
<td>4.6%</td>
<td>3.2%</td>
</tr>
<tr>
<td>2016</td>
<td>708</td>
<td>30,106</td>
<td>2.4%</td>
<td>759</td>
<td>17,101</td>
<td>4.4%</td>
<td>3.1%</td>
</tr>
<tr>
<td>2017</td>
<td>697</td>
<td>r 30,410</td>
<td>2.3%</td>
<td>753</td>
<td>r 16,783</td>
<td>4.5%</td>
<td>3.1%</td>
</tr>
<tr>
<td>2018</td>
<td>r 1,139</td>
<td>r 30,513</td>
<td>3.7%</td>
<td>761</td>
<td>r 16,601</td>
<td>4.6%</td>
<td>4.0%</td>
</tr>
<tr>
<td>2019</td>
<td>1,598</td>
<td>30,032</td>
<td>5.3%</td>
<td>752</td>
<td>16,852</td>
<td>4.5%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

Source: HM Revenue and Customs
**Monthly and quarterly data**

3.64 Monthly or quarterly aggregate data for certain series presented in this chapter are available. This information can be obtained free of charge by following the links given in the Energy Statistics section of the BEIS website on GOV.UK at:


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